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The Frontier of Education Reform and Development in China

Articles from *Educational Research*

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Reversing the Trend Toward Utilitarianism in Education

Youchao Deng and The Research Group

Abstract The trend toward utilitarianism in education, characterized by short-sightedness, lopsidedness, simplicity and infectiousness, excludes the all-round development of students, alienates the educational process, causes the overload of education, and triggers anxiety about education. As a phenomenal problem occurring in a particular historical stage, this trend reflects social utilitarianism in the field of education and constitutes an inevitable pain in the current stage of social development. This results from the instrumental concept of education among members of society, the insufficient supply and structural imbalance of high-quality educational resources, the complicity between the participants of education and society, and the "theater effect." From an international perspective, one can find that this trend is an educational crisis worldwide. From the perspective of the future changes of China's economy and society, one can find that challenges and opportunities coexist in the reversion of this trend. There will be a sharper contradiction between technological innovations plus industrial upgrading and utilitarianism in education; changes in the size, distribution and migration pattern of the population dictate the concentration of future educational demands in urban areas and middle-class families, making it difficult to alleviate this utilitarian trend in a short period of time. Although technological developments have brought about opportunities for the reversion of this trend, we need to take active measures, such as extending the concept of cultivating talents by molding people's high morals from the educational system to the entire society, establishing and improving an education system that features better integration of different stages of instruction, a mechanism allowing transfers between different types of schools, and a credit system allowing lifelong learning.

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Since its founding, the People's Republic of China has achieved impressive success in education. With the overall development level of education entering the upper half of the global rankings, China has stepped on a new journey from a large country of education to a powerful country of education. However, there are still some problems that need to be addressed in education, among which the most prominent problems are the short-sighted and utilitarian practices in running schools and the fact that primary and secondary school students have a hard time and are too tired (Xi, 2020). Obviously, the utilitarian trend deviates from the education policies of the Communist Party of China, deviates from the principles of socialist education with Chinese characteristics, and deviates from the fundamental mission of cultivating talent by molding people's high morals. Therefore, the reversal of the utilitarian trend of education is the key to the future of China's education, and it is the only way to speed up the modernization of education, construct a powerful country in education, and run education to the satisfaction of the Chinese people.

This paper defines the utilitarian trend of education, analyzes its characteristics, harms, and causes, and conducts an comprehensive investigation in the international dimension and temporal dimension. The international comparison helps to evaluate utilitarian trends in China, the prediction section analyzes the trend of utilitarianism in education, and macro strategies are proposed to reverse the utilitarian trend in China.

1 Basic Understanding and Judgment of Utilitarian Trends in Education in China

What is the utilitarian trend of education? What are its characteristics and harms? How should we analyze the trend? The answers to these questions are the starting point of the research.

1.1 Utilitarian Trend of Education and Its Characteristics

The utilitarian trend of education, which is hidden behind education thoughts, education systems, and education practices, exaggerates and absolutizes the instrumental function of education, places instrumental rationality above value rationality, steers people's beliefs and behavior away from the principles and the fundamental mission of education.

The utilitarian trend of education has four basic characteristics. First, short-sightedness refers to prioritizing immediate interests over long-term interests. The trend emphasizes the realization of immediate interests and neglects the positive role

of education in the long-term and sustainable development of individuals and society. As a result, people pursue high scores and key university diplomas as their main goals, and the negligence of education principles and the emphasis on competitive edges at the beginning of schooling have become prevalent practices. Second, lopsidedness refers to attaching importance to benefits in certain aspects while ignoring the overall interests. The essence of education is to promote the overall development of human beings, including the development of everyone and every aspect of human beings. However, the utilitarianism of education narrowly focuses on the role of education in such aspects as personal income, talent selection efficiency and social resource allocation while neglecting the role of education in the pursuit of truth, cultural culti-vation, moral quality, personality shaping and physical health, which leads to the imbalance between different aspects of individual development and the imbalance between individuals and society. Third, simplicity means emphasis on the test results and negligence of the process. As education is oriented toward individuals who are live, concrete and complex, the education process should be complicated. However, utilitarianism of education emphasizes the standard mentality underlying industrial society and tends to simplify the complex educational process to achieve utilitarian goals more effectively. This leads to the alienation of the educational process and makes education deviate far from the essence of education. Fourth, infectiousness refers to the trend of pursuing fashion while neglecting rational thinking. It is gener-ally convinced that the best education is the education that suits you best, and careful selection is always needed. However, the utilitarianism trend in education is driving parents into the panic of "lagging behind in education", irrational competitions in various aspects, and registration of extracurricular classes for their children, regard-less of the need or suitability of such classes. Such trends keep their momentum, and one kind of irrational comparison by parents fuels another, resulting in the theater effect in education.

1.2 Major Harms of Utilitarian Trend of Education

The utilitarian trend of education deviates from the essence of education, accelerates the proliferation of the thinking mode of "development using whatever means", and brings profound negative effects on the development of education.

First, the utilitarian trend of education ignores the overall development of students. The slogan of "training socialist builders and successors with all-round development of moral, intellectual, physical, aesthetic and labor" is the foothold of education policy in the new era. However, under the influence of utilitarian trends, the object of education is reduced to "one-dimensional persons" by the excessive emphasis of scores, enrollment rates and diplomas. Accordingly, too much emphasis is placed on scholastic achievement, the attainment of scores outweighs the cultivation of character, and admissions to prestigious schools or universities are regarded as the core of educational goals. It is obvious that test scores are becoming indicators of performance. The rate of admissions to prestigious universities has become a major

indicator for governments to evaluate educational authorities, educational authorities to evaluate schools, and schools to evaluate teachers. Moreover, these views of administrative achievements blend into people's way of thinking and resource allocation, which stimulates education stakeholders to care less about the mission of education. Practices such as "preoccupation with score", "score first" and "score-based seating plan" are common and may even lead to extreme tragedies. In the long run, this will inevitably lead to the failure of the goal of "all-round development".

Second, the utilitarian trend of education alienates the educational process, although the process is the basic attribute of education. As an activity of cultivating people, education exists in the form of a process and unfolds as a process. Without processes, we cannot understand educational activities, let alone achieve educational goals. The process of education is generative and developmental (Guo, 2005), and it contains the possibility of creation (Huang & Li, 2013). However, under the influence of utilitarianism, principles of physical and mental development, as well as principles of education and teaching, are paid lip service only. The education process, which is stuffed by eager quest for quick success and instant benefit, is reduced into merely a teaching process, the teaching process is reduced into merely examinations, and examinations are reduced into simplistic rankings, which makes intensive exercise and rote learning the main ways of learning, resulting in a serious lack of sleep time for students. According to the *Annual Report on Chinese Children's Development (2019): Children's Out-of-School Life Condition*, nearly 80% of primary and secondary school students do not get enough sleep, and homework is the biggest time consumer.[1] Moreover, under the pressure of high-stake examinations, "jump-the-gun" learning, which means learning ahead of what is designated by the curriculum, has become a common phenomenon. For example, junior high school students will learn high school courses in advance, while senior high school courses for three years will be compressed and taught within two years or one year and a half. As a result, curriculum standards and teaching plans are ignored in the process of alienation of education, and teaching order and rhythm are seriously disturbed. Students' individual differences, curiosity and creativity are ignored or even dampened in the process of pursuing high scores and entering a prestigious school or college. Even if high scores are achieved, the cost is too high, as innovative ability, health, aesthetic and humanistic quality are sacrificed.

Third, the utilitarian trend of education gives birth to education overload. As the summative and external embodiment of educational results, a diploma has value, which can be exchanged with social identity, social human resources, social power and personal social relations. Studies have shown that the privileges attached to the diploma itself are still being acknowledged, with different diplomas bringing different proportions of additional benefits (Shen & Zhang, 2015). Under the current

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[1] The Ministry of Education and nine other departments jointly issued the *Measures to Reduce the Burden of Primary and Secondary School Students* and the relevant regulations on students' health and hygiene, which stipulates that the primary school students shall sleep for no less than 10 h a day, junior high school students shall sleep for no less than nine hours a day, and students in high schools shall sleep for no less than eight hours a day. Lengths of sleep less than stipulated will not meet the standard.

education system, good academic performance means a greater chance of entering a good university, a prestigious college diploma means a better job prospect, and a good job also largely determines one's social status and future of life. The theater effect accelerates the pace of education: once someone achieves high scores by taking courses in advance, it will inevitably lead to education overload because the collusion of parents and teachers, intentionally or unintentionally, increases students' homework burden, and students' normal social life, such as basic rest and communication, cannot be guaranteed. Teachers of all subjects will try their best to assign homework to obtain excellent performance in examinations. As a result, the assignments are characterized by a lack of overall planning and coordination, a low level of management, and boring content. To obtain more high-quality educational resources, parents constantly make their children learn too much difficult content and learn in an adult's style, regardless of their children's receptive ability, interests, physical and mental development, and personality characteristics. According to the report entitled *Value of Education: Higher and Higher* by HSBC, 93% of Chinese parents pay private tuition, ranking first in the world (HSBC, 2017). Their children are either doing their homework at the desks or shuttling among all kinds of after-school tutoring classes when they are supposed to rest or play with their friends. In the long run, children's interest, self-confidence, potential, emotion and many other nonintellectual factors are gradually overdrawn and consumed in education overload.

Fourth, the utilitarian trend of education leads to educational anxiety. Excessive and persistent anxiety will hinder human development and social progress. Under the influence of the thinking mode of "being troubled by inequality instead of poverty", parents begin to worry about whether their children will obtain high-quality education resources, good job opportunities and higher social status in the future from the moment of their birth. Under the influence of utilitarianism, parents are obsessed with the outcome and process of their children's education. In particular, middle-class parents, who have relatively rich educational resources, prefer their children to receive education in line with the values and standards of the information society, but in reality, they still have to adapt to the existing education systems and standards. This gap between ideal and reality aggravates educational anxiety. Frequently, people choose prestigious schools on the basis of money, power or houses, resulting in a vicious circle of "education resources imbalance- scramble for prestigious schools - more serious imbalance - more intensive scramble for enter prestigious schools". Moreover, the anxiety of "don't lose at the starting line" has spread from the city to the countryside, and it is not uncommon for rural children to go to the city to study at private learning centers in the "third semester", the summer vacation (Feng, 2019). According to the *Report on Chinese Parents' Education Anxiety Index* in 2018, Chinese parents are in a relatively anxious state as a whole, with an overall education anxiety index of 67 points (Smart Study, 2018). The anxiety of parents and society spill over into schools. Both parents and schools are forced to speed up, and all kinds of education activities are moving forward as far as possible, which adds more pressure to students. This development is illustrated by some abnormal slogans appearing on middle school campuses or those in classrooms, such as "getting one more point to kill thousands of candidates" or "learn intensively as long as you

breathe". Some schools make headlines simply because they are good at sending students to colleges via intensive training. Some parents let their children go to international schools or send their young children to study abroad to escape the domestic education system. Under heavy pressure, students can only alienate the ambition of "gentleman", forget the value of "benevolence" and become what is known as "refined egoists", who are calculating, tactful and sophisticated, and take the maximization of personal interests as the only driving force. Ideals, principles and beliefs can be sacrificed to make way for their interests.

1.3 Basic Understandings of Utilitarian Trend of Education

First, the utilitarian trend of education has long been in existence, and now it is more prominent, becoming a phenomenal problem. With the transformation and development of China's economy and society, the pragmatism of traditional Chinese culture, such as "there is a golden house in the book, and there is a beauty in the book", coincides with the logic of modern efficiency, which leads to education industrialization, education investment, education competition and so on. Education is rapidly changing from a process that aims to fully develop everyone's internal endowment under the guidance of core values to a process that aims to endow everyone with the most suitable external characteristics for social competition (Wang, 2012). Utilitarianism of education infiltrates into the bones of every stakeholder and into every corner of society. Whether one is a school administrator, scholar or supervisor of teaching and learning, they all measure the value of education by performance. The problem of utilitarianism of education is deteriorating and cannot be more serious.

Second, the utilitarian trend of education is the reflection of social utilitarianism in the field of education. As a relatively independent social subsystem, education itself is a complex and large field, inevitably engraved with political, economic, cultural and other social factors (Wu, 2016). There is a trend of "panutilitarianism" in China's social life, which regards utilitarianism as the standard of measuring, examining, and judging the good and bad, good and evil, beauty and ugliness of everything. The utilitarian social mentality of seeking fame, profit, money and speed and treating people and doing things according to their returns has caused real damage to all aspects of our social body (Li, 2011). Social utilitarianism has gone deep into education, and all participants of education have basically the same views on scores, college admissions, diplomas, publications, titles, etc., which makes the trend of educational utilitarianism surpass some groups and become the collusion of all members of society.

Third, the utilitarian trend of education is inevitable pain in the current stage of social development. During the development of society from one level to a higher level, we are bound to face and solve many contradictions. The *Report to the 19th National Congress of the Communist Party of China* pointed out that the principal contradiction facing Chinese society had evolved. What we now face is the contradiction between unbalanced and inadequate development and people's ever-growing

needs for a better life. The changes in the principal contradictions facing Chinese society pose higher requirements and expectations for the supply of high-quality education resources. However, the current level of education development cannot fully meet the new requirements and expectations. Therefore, the pain of education utilitarianism caused by scrambling for high-quality education resources is often inevitable. In light of the social development stage, the utilitarian trend of education follows a spiral development route, alternating between aggravation and alleviation. Regarding the stage of educational utilitarianism, we should be sober-minded and fully prepared: The pains of education utilitarianism may not be eliminated in a short period of time, and they can but be cured when we have continuous social development.

2   The Mechanism of Utilitarianism of Education in China

The utilitarian trend does not result from the behavior of a single group of education participants but from the collusion of various groups of education participants and society, from the education beliefs of society, the market-based distribution of good education resources, simplification of the education process, and the herd effect of education participants.

2.1   The Traditional Beliefs of "Education Changing Individuals' Destiny" Are Deeply Rooted, While the Room for Upward Mobility of Society Is Shrinking, Resulting in the Instrumental Education Beliefs of Society

China has a long tradition of emphasizing the social function of education. The conviction of "education changing individuals' destiny" is embodied by the influence of education on one's social status, namely, one can have a new identity and a higher social status after receiving education. In China, one's education level is highly correlated with their income and status, and this has been the case over the last centuries. For a long time after the founding of the People's Republic of China, one would be a "cadre of the state" upon enrollment in a college or after graduation. Naturally, people were convinced that education would change one's destiny. After the 1990s, college graduates were regarded as "high-quality workers". In such a social environment, people more eagerly expect education to change their identity and give them higher social status and higher income (Gu, 2013).

Contrary to traditional beliefs and expectations, the room for upward mobility via education is shrinking in contemporary societies. The Great Gatsby Curve proposed by some economists revealed a positive correlation between the degree of social

inequality and intergenerational elasticity. In other words, the more unequal a society is, the more heavily the development of the offspring depends on their parents' success. In China, both the development of intergenerational social mobility and intergenerational education mobility follow an inverted U-shaped trend, and such trends exist among both urban and rural populations. For those born between the 1930s and the 1960s, intergenerational social mobility and intergenerational education mobility followed an upward trend. For those born after the 1960s, both intergenerational social mobility and intergenerational education mobility steadily declined (Li et al., 2017).

This situation attaches more instrumental value to education. Under the influence of "education changing individuals' destiny", people rush into the shrinking upward channel more eagerly, emphasize the role of education more than ever, and regard education as the only inexpensive tool to change their destiny. This conception results in the transformation of "education changing individuals' destiny" into the instrumental attitudes of society toward education. People try every means to maximize education's social function. The social conception, which regards education as an instrument of obtaining new identity and social status, constitutes the conceptual basis of utilitarianism in education.

2.2 The Distribution of High-Quality Education Resources Is Made More Market-Oriented by the Deficient and Unbalanced Supply of High-Quality Education Resources, as Well as Parents' Scrambling to Obtain Such Resources and Education Benefits

In 2020, the urbanization rate of the permanent resident population in China exceeded 60% for the first time. Population migration and fast urbanization resulted in the relative shortage of high-quality education resources and an imbalance of supply structure in the inflow area and cities, which can be summarized as "crowded cities, empty towns and weak villages". The unreasonable distribution of high-quality education resources causes a market-oriented trend. The social atmosphere of the "famous school effect" and "diploma discrimination" aggravates the scramble for high-quality education resources by parents for their children. The lack of public quality education resources has prompted affluent families to spend more money on education services provided by the market, especially those provided by off-campus training institutions. In a survey of Chinese family education finance, the participation rate of students' off-campus training in primary and secondary schools was up to 48.3%, with an annual per capita cost of 2697 yuan (Wang, 2018). For families whose annual consumption expenditures rank among 5%, the per capita cost for off-campus training is 14372 yuan per year, which is approximately 20 times as much as that of families with the lowest consumption expenditure (710 yuan per year) (Wang, 2018).

Parents who invest heavily in education are bound to pursue educational benefits. High-quality educational resources have a high rate of return. Previous studies have shown that graduates with diplomas from famous universities have higher income, and the income gap expands over time. According to the *Chinese Graduate Salary Rankings* (2018), students graduating from "double first-class" universities occupy the top of the list. The future benefits brought by the graduation from famous schools urge families to invest more money in high-quality education resources. The higher the investment, the higher the expectation of the return rate of high-quality education resources.

Among their scramble for high-quality education resources, parents further intensify the market orientation of education. Private training institutions on the market have alleviated the shortage of high-quality education resources, which are often distributed on the basis of market mechanisms (as reflected by expensive private schools and enrollment quotas based on unreasonably expensive houses). As a result, the role of family economic background has been strengthened in the distribution of educational resources. As high-quality education resources are distributed under the influence of family economic conditions, the market orientation of the high-quality education resource distribution is aggravated, and the scramble for such resources is intensified, leading to the continuous increase in investment in education. The relationship between the market supply of high-quality education and parents' investment in education generates a utilitarian connection between family education benefits and the distribution of high-quality education resources, constantly fueling the utilitarian trend.

2.3 The Excessive Emphasis on Scores, Admission Rate, Diplomas, Publications and Titles Caters to the Demand of Society, Generates Collusion Between Education Participants and Society, and Results in the Simplification of the Education Process

As there is a mechanism that places an excessive emphasis on scores, admission rate, diplomas, publications and titles, education practice deviates from the fundamental mission of cultivating talent by molding people's high morals. This mechanism meets the instrumental expectations of education by society and caters to the demands for a simple and effective means of evaluation by society, which provides educational resources in response. Thus, a cycle of collusion comes into being: the more one adheres to the mechanism, the more social resources they will obtain, fueling the extreme utilitarianism behavior of using education as a means to scramble for social resources.

The collusion between education and society makes the mechanism a simplistic criterion for talent cultivation, talent evaluation and talent selection. Education practice is reduced into a talent cultivation process merely based on knowledge learning,

test scores and diplomas. The educational behaviour of schools, parents and teachers has become a kind of utilitarian chase of "scores", "college admission", "publications" and "titles". Talent evaluation and employer selection have also become a simplistic screening process with only "diplomas", "publications" and "titles". As a result, school education becomes highly competitive, government management performance becomes overly dependent on indicators, talent selection at the government, colleges and enterprises becomes standardized, the flow of talent between universities becomes a consumption process, and talent becomes commodities with different titles in the labor market. In other words, the collusion between education and society strengthens the utilitarianism of education.

2.4 The Theater Effect Destroys the Education Rules, Raises the Threshold of Education Competition, and Causes the Participants of Education to be Strongly Constrained by the Utilitarian Trend of Education

From the behavioral perspective, utilitarianism of education is a kind of continuous and group behavior. Conformity psychology prompts individuals' behavior to be utilitarian on a continuously deepening basis. Viewed from the practice level, utilitarianism of education is a continuous trend of comparison. Once an individual enters the field, they will be influenced by the "*habitus*" in practice (Bourdieu, 2017), making individuals exhibit the trend of comparison and utilitarianism. Although individuals may realize the consequences of utilitarian behavior, they will still attribute their unreasonable behavior to the current education system and mechanism, which further aggravates the utilitarianism of education.

The theater effect destroys the education rules, constantly raises the threshold of success, and aggravates the competition among individuals, who may be cued psychologically and lead to a loss of personality consciousness and do something contradictory to their own character or habits (Le Bon, 2015). Individuals show obvious conformity psychology in the process of competition. With the rise of the competition threshold, they blindly increase investments in education, aggravating the intensity of education utilitarianism. For example, diplomas constitute an important condition to enter the main labor market. Colleges and universities, governments and enterprises generally base their selection of talent on the diplomas. To obtain high-quality higher education diplomas, people generally scramble for high-quality education resources, pursue jump-the-gun learning, and overload students. With the threshold rising constantly, competition is becoming increasingly fierce. The quality and quantity of publications serve as an important basis for the promotion of professional titles for teachers or researchers. People continue to increase the number of publications and upgrade the level of publications to win the competition. Titles are the basis for the flow of talent and are closely linked to the income of professionals, further intensifying competition for the number and level of titles.

As individuals are coerced in this process, they have to participate in this competition to avoid failures. In the practice field, influenced by "*habitus*" and conformity psychology, individuals' utilitarian behavior and trends are constantly reproducing and intensifying. Individuals will find themselves bogged down deeper and deeper in this competition, unable to get out of it.

3   Utilitarian Trend of Education Viewed from an International Perspective

Currently, the trend of educational utilitarianism is not a problem unique to China. From an international perspective, developed countries such as Europe, America, Japan and the Republic of Korea also have a certain degree of education utilitarianism under their specific educational concepts, educational systems, educational system structure and social culture. This trend has been expanding and gaining strength in recent years.

3.1   *The Global Expansion of Shadow Education Aggravates the Burden of Extracurricular Tutoring and the Utilitarian Trend of Education*

Extracurricular tutoring for primary and secondary school students is generally called "shadow education" by international scholars (Bray, 2007). Shadow education has a long history in East and Southeast Asia, which is deeply influenced by Confucian culture and attaches great importance to examination and admission to college. For example, the participation rate of primary and secondary school students in private training institutions in the Republic of Korea and Japan generally exceeds 60% (Liu, 2018). Since 2000, shadow education has been expanding all over the world (Zhu, 2013). From 2005 to 2014, the proportion of students receiving extracurricular tutoring in the UK increased from 18 to 23%, while the proportion in London reached 37% (Sutton Trust, 2014). In the United States, 14 to 21% of high school students take remedial courses before the Scholastic Assessment Test or the American College Test (Dang & Rogers, 2008). Even in Nordic countries, where there is no tradition of extracurricular tutoring, shadow education has been expanding in recent years (Bray, 2020). Generally, extracurricular tutoring is more common in education systems featuring selective examinations and in countries and regions where the personal economic return rate of education investment is higher (Bray, 2012).

The global expansion of shadow education is influenced by multiple factors. First, under the influence of human capital theory, people are increasingly convinced that investment in education will bring greater economic returns. Second, under the trend of globalization, the development of international academic evaluations and

education rankings has boosted the demand for shadow education. Even in Western European countries and northern European countries, where there is no outstanding cultural tradition of competition, the government and the media have paid close attention to the performance of their students in the Program for International Student Assessment (PISA) and other assessments in recent years, which has an impact on the educational mentality of society and parents. Third, the development of shadow education in some countries is related to the demand to promote consumption and increase teachers' income under the background of stagnant economic development (Yang, 2012). Different from off-campus learning and specialty training based on interest, shadow education is an extension of school education content, and its main goal is to improve students' academic performance in school, especially in high-stake examinations. This kind of close relationship between education and the test results strengthens the short-sighted behavior of students and parents, and it also leads to blind comparisons, aggravates the family economic burden and anxiety, and further aggravates the utilitarian problem of education.

3.2 The Prevalence of Over-Education as a Manifestation of Utilitarianism

The concept of "over-education", first put forward by economists in their analysis of the American labor market (Rumberger, 1981), has become a global issue. Overeducation reflects the pursuit of higher education degrees and diplomas by individuals, parents and employers, and underemployment thus incurs a mismatch between skills and posts, as well as an education return rate that is lower than expected. Overeducation highlights the instrumental value of degrees and diplomas, stimulates blind pursuit of high diplomas, inflation of diplomas on employment markets, causes widespread utilitarian behavior and education anxiety, and wastes social education resources.

The United States is a country with an outstanding issue of overeducation. Currently, the gross enrollment rate of higher education in the States has reached 80%. However, research shows that since 1990, 38% to 49% of American college graduates have actually been engaged in jobs that do not require a university degree. Ten years after graduation, the proportion is 30% (Abel & Deitz, 2014), and in recent years, the trend has even expanded (Clark et al., 2017). It is common that they cannot pay off their loans several years or even decades after graduation because American college students generally use loans to pay their college tuition. From 2014 to 2020, US student loan debt increased from US \$1.06 trillion to US \$1.57 trillion. The average debt level reached US \$38,000, resulting in a heavy debt burden and a huge waste of social resources (Kurt, 2021). Nevertheless, Americans are convinced that higher education will bring better jobs and economic benefits and that employers are more inclined to recruit college graduates. Relevant data also show that the

average income of individuals with a university degree is higher than that of individuals without a university degree. Thus, a problem chain takes shape in the United States: the pursuit of a college diploma causes the payment of higher education with loans, and long-term loans result from underemployment and lower-than-expected income", which has aroused the concern of society.

3.3 Intensive Parenting Causes Educational Anxiety

In recent years, family education anxiety has become an increasingly common problem in major developed countries, as reflected by the fact that "intensive parenting" has become a mainstream education culture. In the 1990s, with the evolution of social and economic structure as well as the development of early childhood development theories, an expensive parenting mode featuring the central position of children, expert guidance, emotional input and labor intensiveness gradually became mainstream in middle-class families in the United States and other countries (Hevs, 1998). This education mode combines the characteristics of authoritative education and arbitrary education. Parents tend to intervene in the whole process of children's development, and they constantly increase their energy, time and economic input in early care, interest training and after-school supplementary study (Doepke & Zilibotti, 2019). This intensive education was originally a way for the upper class and high-income families to maintain family culture and social capital, but it has spilled over into the rest of society. A survey involving 3,642 parents in the United States found that parents of different social classes, races and income levels generally agreed that children should be raised in more expensive ways (Ishizuka, 2019). Economists and sociologists believe that economic anxiety is the most important driving force behind intensive education. In recent years, the economic development of Western countries has slowed down while the uncertainty of future prospects increases. Compared with the "baby boomer" generation after WWII, parents today are concerned about whether their children will be able to maintain their economic status in the future or succeed in climbing the social ladder, and they are convinced that they can help only by increasing their investment in parenting and education. Public media in the Internet era and commercial institutions have greatly promoted this kind of anxiety (Miller, 2018). The spread of shadow education in developed countries in Europe and America also proves the existence of universal education anxiety in these countries.

3.4   Extreme Education Utilitarian Events Occur from Time to Time

In developed countries, utilitarianism in education also brings some extreme issues. First, the excessive pursuit of diplomas and degrees leads to fraud and other illegal behaviors. In the beginning of 2019, an enrollment scandal broke out in the United States. It was reported that to send their children to the top universities, dozens of parents paid hundreds of thousands of dollars to bribe examiners and teachers of colleges and universities, faking their children's academic or sports achievements. Involved in the scandal are many business executives, lawyers and celebrities in the performing industry. This scandal exposes the extreme utilitarian choice of family education and the loopholes in the enrollment system of famous universities. Similarly, since 2010, plagiarism has been found in the doctoral dissertations of several political figures in Germany, including the former Federal Minister of Defense, which highlights the problem of extreme pursuit of the instrumental value of diplomas and degrees in a country with a good academic tradition. Second, the performance evaluation in the education system also gives birth to some utilitarian fraud. In 2001, the federal government of the United States promulgated the *No Child Left Behind Act* to improve the quality of basic education. The act stipulates that funding for public schools depends on their performance in standardized unified examinations. Moreover, many states link the results of the unified examinations with teachers' performance evaluation and income. As a result, in 2005, there was a scandal in Texas in which students' grades in 400 schools leaped abnormally due to teachers' fraud. This scandal also shows that utilitarian problems may come from excessive exaggeration of performance evaluation, accountability systems and market-oriented resource competition as well as incentive mechanisms in the education system (Liu, 2017).

The analysis above reveals that the utilitarian trend in education is not unique to China but also a common phenomenon in the world. The trend varies only in the aspects and degree in different countries. It can be said that the utilitarian trend of education is the common enemy of global education and causes a crisis in education across the world. Thus, governments of different countries have to consider how to put education back to the mission of cultivating talent, how to promote the diversified development of talent and how to more effectively allocate education resources.

4   The Utilitarian Trend of Education in China as Reflected by Future Changes in the Economy and Society

The development of education is not isolated but embedded in the economic and social development of a country. The development of the economy requires intellectual support for education. The innovations of science and technology provide new opportunities for educational reform. Changes in population size, structure and

migration pattern affect the allocation of educational resources. In the future, education will evolve according to changes in the economy and society, which challenges and provides opportunities for the reversal of the utilitarian trend in education.

4.1 Utilitarian Education Will Seriously Hinder Technological Innovation and Industrial Upgrading Because It Cannot Cultivate Innovative Talent

In the future, the global economy will be more strikingly multipolarized,[2] and emerging economies will continue to rise, with the new technology revolution and digital economy accelerating industrialization in developing countries (Li et al., 2018). As an emerging economy, China has become the second largest economy in the world, but there is still a gap between China and developed countries in terms of global competitiveness and innovation.[3] At present, China is at a pivotal stage of economic transformation and industrial upgrading, key to which is independent innovation. In the future, its industrial transformation will be driven by technological innovation and the upgrading of human capital (Jin, 2011), especially the support of innovative talent. However, the cultivation of such talent has been seriously hindered by the utilitarian trend of education.

First, economic transformation requires better basic research and top-notch innovative talent. Key to such transformation is the upgrading of industrial structure. To realize the transformation from "follower", "chaser" and "parallel runner" to "innovator" and "leader", China needs to base its industrial technology on many original, forward-looking and cutting-edge studies. For example, in the past two years, under the background of international trade disputes, the supply problem of some core technologies such as chips has been exposed, which highlights the extreme importance of mastering core technologies in key fields. Only when importance is attached to basic research on a long-term basis can a country have a strong industrial system. At present, utilitarian education is too concerned about students' scholastic achievement and college admission to be able to foster students' curiosity and interest and is not conducive to the cultivation of top-notch talents who truly love science and have innovative spirit. The trend of simplistic emphasis on publications and titles affects the research environment and drives researchers into pursuits of short-term, fast research results and market benefits, ignoring long-term and difficult basic research. In this sense, utilitarian education is not compatible with what is needed in the transformation and development of the national economy: the spirit of innovation, devoted research and dedication of scientists.

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[2] The total GDP of developing countries will exceed that of developed economies, and the proportion of developing countries in the global economy and investment will be close to 60%.

[3] In 2019, China ranked 28th in the *Global Competitiveness Report* released by the World Economic Forum, and it ranked 14th in the global innovation index (GII) in 2019.

Second, industrial upgrading needs the support of applied technical talent and the cultivation of craftsmanship. The upgrading of industrial structure necessitates the adjustment of talent training systems in China. The degree to which the quantity, structure and type of human capital match China's industrial structure determines the efficiency of industrial structure transformation (Jin, 2010). At the present stage, there is a shortage of applied, compound and skilled talent needed by China's economic and social development, and the reserve of engineering and scientific talent urgently needed by strategic emerging industries is seriously insufficient. The enrollment of science and engineering students declines rapidly, while the manufacturing industry develops quickly, and the demand of the human resource market in the same period runs high (Du, 2015). To meet the needs of industrial upgrading, it is necessary to increase the number of technical and application-oriented innovative talents and improve the training quality, especially to cultivate the craftsman spirit of devoting themselves to research, innovation and excellence in practice. The trend of excessive emphasis of diploma in education draws students' attention to the threshold effect and market value of education rather than personal skills improvement. This trend is contrary to the requirements of the times that technical talent should have a craftsmanship spirit. Utilitarianism in personal career development is not conducive to the formation of a good professional culture and social atmosphere.

In short, viewed from the perspective of economic development, the utilitarianism trend in education goes against the demands of economic development for talent and against the great mission of revitalizing the Chinese nation and hinders the cultivation of innovative talent and the development of disruptive innovations. The reversal of utilitarianism in education is urgently needed to better facilitate China's industrial upgrading and economic transformation and to realize the centenary goals for the Communist Party of China and the centenary goals for the People's Republic of China.

4.2 The Utilitarianism Trend in Education Will Last in the Near Future Because the Future Education Demand Will Accumulate with the Increase of Student Population, and the Demand Will Also be Concentrated in Cities and Among the Middle-Class Families

Future changes in the size, structure and migration pattern of the population will bring about regional differences between the total amount of educational resources and structural demand. The changes in the school-age population, the migration of the educational population and the increase in the middle-class population will affect the size, structure and regional distribution of the school-age population in different periods and at different education stages. The changes in the relationship between the supply and the demand for enrollment capacity will have an impact on the utilitarian trend in education.

First, the maximum gap between the supply and demand of preschool education resources will not come until 2030 because the preschool-age population will climax before it declines and the demands for enrollment capacity at all levels will reach their peaks in a wavy order. Accordingly, the utilitarian trend of education will not be alleviated in the near future, and pain will continue to be felt during this stage. With the implementation of the universal two-child policy, China's birth population is expected to have significant growth in the short term and then decline after it climaxes. According to the latest forecast results, the number of kindergarten students in China will climax in approximately 2021 (Li et al., 2018), the number of primary school students will climax in approximately 2024, and the number of junior high school students will climax in approximately 2030. After 2035, the school-age populations at all levels will have negative growth to varying degrees. In the short term, the demand for enrollment capacity in basic education will still be strong and sustained. If the contradiction between the increasing demand and insufficient supply of enrollment capacity cannot be solved in time, the enrollment competition pressure brought by the shortage will aggravate the degree of education utilitarianism. This situation will be alleviated to a certain extent with the decline of the school-age population, but problems will still exist. The allocation of educational resources should consider not only the strong enrollment demand in the near future but also the stabilizing trend first and then the declining trend of the enrollment demand that follows (Sun et al., 2018).

Second, both the population migration between regions and that between urban and rural areas are on the decline. The migration between cities and the migration within cities are increasing, and utilitarian education will be increasingly concentrated in cities. Population migration will affect the educational needs of the region. The growth rate of China's population migration tends to slow down at present and in the future,[4] the migration between cities and the migration within cities will be on the rise, and the migrant populations in cities are settling down in cities (Zhu et al., 2016). With the continuous development of high-skilled service industries such as finance and trade, cities with developed tertiary industries and large cities will absorb more migrant populations in the future, and the trend of population concentration in large cities will intensify (Xia et al., 2015). At the same time, regarding the migrant population accompanied by children, the net inflow trend of migrant children in supercities and type-I cities will be more prominent in the future.[5] The large-scale migrant children generally exist in large cities, and the carrying pressure of primary school is higher than that of junior middle school (Ding et al., 2018). population mobility will aggravate the shortage of educational resources in some cities, and the

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[4] According to the results of the sampling survey based on 1% of the national population in 2015, the growth of China's migrant population is still growing. However, the future growth rate will slow down compared with the annual increase of 10–13 million migrant population from 2010 to 2014 and the corresponding growth rate.

[5] A supercity refers to a city with more than 10 million permanent residents. A mega-city refers to a city with 5 to 10 million permanent residents. The type I city refers to a city with a permanent population of 3–5 million. The rate of migrant parents living with children was 26.32% in supercities, 31.43% in megacities cities, 51.39% in type-I cities and 42.86% in type-II cities.

structure of educational demand in inflow areas will change. It is necessary to meet the educational needs of local school-age children and provide enough school opportunities for the children of the floating population. The carrying capacity of educational resources in municipal districts will face challenges. If it cannot be solved well, the problem of urban education utilitarianism will be more concentrated in these cities.

Third, with the growth of the middle class population, both the demand for high-quality education and education expenditure will grow, and the utilitarian trend of education will further concentrate among the middle class population. Its scale will further expand, and the degree of utilitarianism will deepen. With the advancement of industrialization and urbanization, the number of well-educated urban white-collar jobs is increasing, while the number of blue-collar jobs such as farmers and workers is relatively decreasing, which leads to the growth of the middle class. The report delivered by Xi Jinping at the 18th National Congress of the Communist Party of China proposes to "expand the middle-income group". From 2020 to 2035, the proportion of the middle-income group will increase from 30 to 50%, and Chinese society will gradually develop an olive-shaped income distribution pattern. With changes in social structure, the middle class will play an increasingly important role in the future. White-collar workers, represented by entrepreneurs, managers and professional technicians, have accumulated certain professional status, social prestige, property and social influence and articulated increasingly higher requirements for the social environment and more expectations for their children's education. As most of the middle class obtain the corresponding social status through education, they have the corresponding requirements for the opportunities and quality of their children's education. They hope that their children can maintain their social class by obtaining high-quality education. With the expansion of the middle class, the demand for better education will be further expanded, and their competition for high-quality education resources will be fiercer. Their competition will sustain education utilitarianism. In other words, the expansion of the middle class is good for social stability and development, but it imposes unprecedented pressure on education.

4.3 The Development of Science and Technology Promises to Alleviate the Utilitarianism Trend in Education to a Certain Extent by Changing the Method of Education, Expanding Educational Resources and Reshaping Educational Evaluation

At present, a new round of scientific and technological development is accelerating, and new technologies such as artificial intelligence, blockchain, big data, and the Internet of Things (IOT) are constantly emerging, which drives human society into an intelligent era of human–computer symbiosis, cross-border integration, and co-creation and sharing. The popularization of information technology in education provides new tools and means for education and teaching, transforms the concept and

the mode of education, and provides new possibilities for the reform of educational evaluation, which is expected to ease the utilitarian trend of education to a certain extent.

First, the development of science and technology changes the methods of education. The new technology can be used to remove the temporal and spatial barriers of education so that education will no longer be limited to the campus, a multi-dimensional interactive pattern between the school and society will be developed, high-quality information sharing, business cooperation and intelligent service will be realized, the reconstruction of the education process will be promoted, and new learning methods, such as ubiquitous learning, deep learning, adaptive learning, hybrid learning and human–computer interaction learning, will be popularized. Then, we will build an open and flexible education ecosystem that is personalized. This will have the value of standardized tests reexamined by the education evaluating personnel, who will pay more attention to the complex and advanced cognitive skills and implicit noncognitive learning and evaluate education quality with the promotion of people's overall development and their adaptation to economic and social development.

Second, the development of science and technology expands educational resources. We can use big data technology to collect and aggregate high-quality educational resources, promote the convergence and sharing of open resources, build a digital learning environment that is interconnected, accessible to all and covers the whole country, provide schools of all levels and types and all learners with appropriate learning resource services, meet the personalized needs of learners, teachers and administrators, break through the problem of educational balance that is difficult to solve by conventional means, and gradually narrow the gap between regions, the gap between urban and rural areas, and the gap between schools. On the basis of high quality and balanced development of education, we will break the evaluation orientation of "score first" and get out of the dilemma of "whoever reduces the burden first will suffer", and guide schools not to evaluate students by a single criterion, but to incorporate character, behavior, physical health and social practice into the evaluation index portfolio, and strive to reflect the overall performance of students' growth in the evaluation.

Third, the development of science and technology reshapes education evaluation. We can establish a more comprehensive education evaluation system using learning analytics, student portraits, big data and other technical means to set different standards for different students and turn the "one size fits all" standardized tests into personalized evaluations with "one more ruler". The goal of evaluation will shift from screening and selection to improving and promoting students' development. The content of evaluation will shift from simplistic evaluation of knowledge to comprehensive evaluation of knowledge, ability and emotional attitude. The methods of evaluation will be more intelligent, personalized and data-based, and the results will be more accurate, comprehensive and objective. More attention will be paid to students' motivation and sustainable development ability so that every student has the opportunity to excel.

5 Macro strategies to reverse the utilitarian trend in education of China

Utilitarianism in education in China must be reversed. However, the process will be complicated, comprehensive and lasting. Based on the analysis above, we would like to formulate macro strategies from changing the instrumental education beliefs of society, reforming the education system, strengthening the governance of education in cities, enhancing intergovernmental learning ability, etc.

5.1 Extend the Concept of "Cultivating Talents by Molding people's High Morals" to the Whole Society

The report delivered by Xi Jinping at the 18th National Congress of the Communist Party of China points out that the fundamental task of education is to cultivate talents by molding people's high morals. *The Opinions on Deepening the Reform of Education System and Mechanism* issued by the general office of the CPC Central Committee and the general office of the State Council proposes to improve the systematic implementation mechanism of establishing morality and cultivating talent. In accordance with the requirements of the CPC Central Committee, education administrators and schools are speeding up the implementation of the fundamental task of building morality and cultivating people. To implement the task and reverse the utilitarian trend of education, there are two understandings that need to be further clarified. First, regarding the fundamental task, "education" is not confined to school education, and it should be understood as education in general, covering different social classes, various social sectors and school education at all levels. Second, regarding the systematic implementation of education reform, the word "systematization" refers to not only the overall development of morality, intelligence, sports, beauty and labor in education but also the coordination of school, family and society in the education cause.

We need to extend the fundamental concept of "cultivating talents by molding people's high morals" to the whole society, upgrade the education concept of the society, and align the educational beliefs of all education participants to the fundamental concept. Government departments should reverse their view of "education achievements as GDP", keep performance competition from spilling over into education, and resolutely break the mechanism of replacing education quality evaluation with scores and promotion rate. At present, the state attaches increasing importance to family education and has issued several documents, such as the *Guiding Principles on Strengthening Family Education*, which requires the formation of a family education mechanism consisting of "government leadership, department cooperation, parent participation, school organization and social support". However, the implementation of family education is hindered by problems such as formalism, fragmentation and

polarization, which may become the intermediary variable to intensify social stratification in the long run (Luo et al., 2018). Family education should be improved by establishing a family education guidance mechanism and changing parents' idea of education. Society should establish evaluation standards for different talent, enrich evaluation tools and means, adhere to the evaluation of talent based on their ability and actual achievements and contributions, and build and improve the work-based income distribution system, which is supplemented by various distribution modes under the new era conditions. Correspondingly, we should establish a social culture that promotes "equal dignity and equal confidence despite different industries and different diplomas". At the same time, we should transform educational research achievements and popularize advanced education concepts to society as a whole.

5.2 Establishing an Education System that Features Better Integration of Different Stages of Instruction Allows Smooth Transfers Between Different Types of Schools and Facilitates Lifelong Learning

A country's education structure system is related to its national education ability and international education competitiveness. The utilitarian trend of education is related to the total amount of high-quality education resources and the structure of the education system. The expansion of high-quality education resources has been done in recent years and will continue to be done in the future. However, we need to pay more attention to the reform of the education structure system.

Supply side reform should be the perspective in which we consider how to improve the education structure. The aim of the reform should be to break institutional barriers such as excessive emphasis on diplomas and formal education and to establish an education system that features better integration of different stages of instruction, allows transfers between different types of schools, and facilitates lifelong learning. First, the different stages of instruction should be substantially integrated, curricular systems should be connected, and the enrollment exam and evaluation system should be perfected. Second, communication between different types of schools should be strengthened. The key is to strengthen the full communication of curriculum, credit and resources between general education and vocational education while emphasizing vocational education as a type of education and improving the quality of vocational education in the post-popularization era of high school education. We should strengthen the full communication and overall development among tertiary education after middle school, speed up the establishment of the mechanism for credit recognition, accumulation and conversion, and establish and improve the system governing inter-school transfer and transfer between different majors. Third, regarding admission and graduation, the key is to enhance the flexibility of the education structure system, take learners as the center, implement credit systems, and forge

an open and flexible lifelong learning system. In addition, there should be competition within the education structure system, and development with characteristics should be highlighted to enhance the vitality of the system and meet the diversified needs of learners.

5.3   Strengthening the Governance of Education in Cities

Cities, especially large- and medium-sized cities, are most heavily influenced by the utilitarian trend. With the rapid urbanization in China over the last 40 years of reform and opening up, the population has gradually concentrated in cities, especially in a few large- and medium-sized cities.[6] In the future, urbanization will be furthered, and the focus will shift from "urbanization of land" to "urbanization of people", which means that the migrant population and urban residents will have the same basic public services in education, employment, medical care, pension, affordable housing and other aspects (Chu, 2015). Accordingly, in a long period of time, it will be difficult to change the educational pattern of "crowded cities, empty towns and weak villages", and the gap between the supply and demand of education resources in cities will be widened, which will further aggravate the educational anxiety of the urban population. At the same time, the insufficient supply and uneven distribution of high-quality education resources drive up the family's education and training expenditure, which aggravates the anxiety of the middle class, the main group to spread education anxiety, lead public opinion and intensify the utilitarian trend of education.

Therefore, while adhering to the integration of urban and rural areas and attaching importance to rural education, we should strengthen urban education governance and prioritize the adjustment of education tempo in cities and the alleviation of urban middle class parents' education anxiety. First, we should enhance the prediction of the demand and supply of urban school enrollment capacity. To effectively forecast the trend of urban population migration, scientifically analyze the changes in the total population and age structure, and estimate the demand for urban school enrollment capacity, we should make good use of information technology and integrate a variety of variables, such as industries, population, environment, talent policy and other factors. Accordingly, the planning and adjustment of school scale, layout and education investment will be carried out to ensure an adequate supply of enrollment capacity. In addition, we should actively explore the transfer payment system of migrant population education funds and gradually enroll the children of the migrant population in cities of different levels. Second, the balanced development of urban education should be promoted substantially. To realize balanced development, we should promote the unification of school-running standards in cities, promote the

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[6] The sixth population census in 2010 shows that China's migrant population reached 221 million in 2010, and the top 50 cities with the highest proportion of migrant population absorbed 72.74% of the total migrant population in China (Xia et al., 2015).

synchronous and coordinated development of public and private education, and ensure a relatively equal starting point for children from different family backgrounds. At the same time, the supply of high-quality resources should be expanded, the group education system should be implemented substantially, branches of prestigious schools should be established, and the overall level of schools within the groups as well as branches of prestigious schools should be elevated. The overall urban education level should be raised via the exchange of principals and teachers of prestigious schools, the increase of online courses, and other measures. In particular, we should coordinate the resources in city centers, outskirts and outer suburban areas and eliminate the excessive concentration of high-quality education resources and excessive burden of education resources in particular regions (Ding et al., 2018). Third, we should make good use of the complementary role of off-campus education. We should be aware of the roles and values of off-campus education institutions and make good use of them to bridge class differences in education participation and education achievement while adhering to good school education and enhancing the confidence of parents and students in public schools (Yang, 2020). Meanwhile, we should strengthen the governance of off-campus education institutions so that they can better supplement school education. Schools, libraries, galleries, museums, science & technology associations, community colleges and other institutions should be encouraged to provide beneficial services such as student care, learning guidance, and specialty education to alleviate the pressure of parents' training expenditure and promote education equity.

5.4 Strengthening the Implementation Capability of Education Policies

To reverse the utilitarian trend of education, China has issued a series of policies, covering many aspects on a comprehensive basis. Then the implementation becomes particularly important. Domestic and foreign experience shows that although all policies may have their "the first kilometer" in implementation, they may not have the "last kilometer", and the effect of implementation may be positive or negative. In addition, China is a large country with differences in the quality of education between urban and rural areas, between regions and between schools. In the process of implementing education policies, we should strengthen the "intergovernmental learning capacity" and avoid mechanical implementation, selective implementation and the ostrich phenomenon.

First, we should resolve the conflict between top-level design and grassroots operation, understand the fact that grassroots education relies on educational *habitus*, local social culture, and local government assessment and evaluation, and find the balance points for the creative implementation of policies. Second, we should resolve the conflict between general requirements of policies and specific reality, grasp local characteristics, school conditions and students' foundation, hold fast to the soul of national policies, and find the specific details of local implementation. Third,

we should resolve the conflict between policy deployment and corollary support, pay close attention to the guarantee of supporting conditions, especially support for practitioners, and cultivate a large number of educational reformers (Deng, 2018). At the same time, we should give full play to the function of educational supervisors, strengthen the supervision and evaluation of local governments, and prioritize the implementation of educational policies adapted to local conditions as an important evaluation content.

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A Typology of Research Paradigms and Sources of Knowledge in Educational Research

Fengqi Ma and Ailei Xie

Abstract The wide divergence in the methodologies used in educational research is a sign of the weakness of education as a discipline. However, as stakeholders and education practices vary, there are inevitable differences in the questions to be asked and the needs to be satisfied, and thus, a diverse range of methodologies in educational research may be justified. This paper categorizes the research paradigms used in educational research into three types: empirical, logic-based, and lived experience (das Erlebnis)-based. Empirical research is based on people's perceptions and formal logic. It can be quantitative or qualitative and should be objective and reliable. Logic-based research depends on analytic judgments, axiomatic reasoning, and reflective equilibrium. Lived experience-based research is individualized, often socially and culturally contextualized, and based on our common humanity. Nevertheless, challenges to the legitimacy of lived experience-based research remain. If we value reliability and accuracy, we should choose empirical research rather than logic-based and lived experience-based research. The choice between a quantitative research design and a qualitative research design rests fundamentally on the nature of the research question being asked.

Keywords Educational research · Empirical research · Lived experience (das Erlebnis)-based research · Logic-based research

1 Introduction: The Divergence Among Paradigms in Educational Research

Academia represents a collective lifestyle. In China, however, it is clear that such a common lifestyle has not been formed among educational researchers. There is much greater divergence among the methodologies used in education research than there is in other disciplines. This is a sign of the weakness of education as a discipline.

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On January 14, 2017, a national conference on empirical education research was held at East China Normal University. The conference, attended by the heads of schools (departments) of education science at 14 universities across the country, the editors of 32 education research journals, and the heads of the National Office for Education Sciences Planning, the Education Research Centre of *Guangming* Daily, and the East China Normal University Press, issued the *ECNU Declaration for Action on Empirical Education Research* (hereinafter referred to as the "Declaration"). The Declaration stated that "To improve the quality of education research in China, it is imperative to intensify empirical education research and promote the transformation of research paradigms", where "empirical research" means "research based on facts and evidence" (ECNU et al., 2017).

Although the *Declaration* received an enthusiastic response, it failed to bridge the differences among education researchers; indeed, it may even have highlighted the divergence among them. Some researchers believe that empirical research is necessary for education but that it has limitations (Li, 2018); blindly advocating a single research methodology is harmful and dangerous, risking the "Plague of Frogs". That was the National Research Council (USA) experienced after publishing *Scientific Research in Education* (2001). One criticism of the report is that it advocates the dogma of positivism (Zeng et al., 2018).

However, only a few researchers hold a monistic view of education research methodology. If education research ranges on a spectrum from purely empirical scientific methodology to purely humanistic methodology, monists are at the two extremes. Most researchers, including most advocates of empirical research, do not regard empirical research as the only valid paradigm. *Scientific Research in Education* states that it is the scientific community that enables scientific progress, not adherence to any one scientific method (Shavelson & Towne, 2006). Some signatories to the *Declaration* believe that empirical research goes hand in hand with ideological research, theoretical research, or philosophical research, and they complement each other; due to the complexity of educational issues, we cannot rely solely on a single method to perceive all educational phenomena but need to improve the scientificity of research findings through mutual verification of various methods; valuing empirical research does not mean rejecting other education research methods. In addition to strengthening and improving empirical research, rationally selecting and appropriately integrating various research methods will surely produce a magic 'blended' effect (ECNU Declaration for Action on Empirical Education Research). (Journal of East China Normal University, 2017). Given the diversity in education practices, the rich variety of objects of educational research, and the varying academic backgrounds of researchers, most researchers agree that it is appropriate to use multiple paradigms in education research. Thomas Kuhn defined a paradigm as what the members of a certain scientific community have in common, which includes symbol systems, beliefs, values, theories, and examples (Kuhn, 2003). In this paper, the term "paradigm" refers to different education research methods as well as their epistemologies, methodologies, and specific research strategies and methods.

Discussions about the paradigm of education research and its typology have continued for a long time. Since modern times, natural science based on experiments, observations, and measurements has achieved great success and become the epitome of science. However, in social science, the humanistic paradigm, which focuses on comprehension, has constantly fought back, and in the education domain, with its strong humanistic hues, the humanistic paradigm may even stand equal to the natural science paradigm. Natural science and humanistic paradigms are two classical paradigms in educational research (Keeves, 2011). There are other dichotomies, such as the division of educational research into factual and normative research according to the subject matter: the former reveals empirical truths by empirical means, while the latter reveals rational truths through transcendental reasoning (Jin, 2015). Another dichotomy is the division of education research into empirical research and speculative research according to the characteristics of the research process: the former takes facts as the research basis to explore the essential attributes and development laws of things, whereas the latter aims to reveal the essential characteristics of things through the logical deduction of concepts and propositions (Yao, 2017; Yuan, 2014). With the rise of critical theory in the mid-twentieth century, one researcher classified educational research paradigms into three categories according to their research purpose: positivist, hermeneutic, and critical theory paradigms, corresponding to quantitative, qualitative, and action research, respectively (Chen, 2008). Another researcher divided education research paradigms into speculative, empirical, critical, and action paradigms according to their philosophical basis (the idealism versus the empiricism dimension) and methodological characteristics (the collectivism versus the individualism dimension). Speculative research falls under idealism and collectivism, empirical research under empiricism and collectivism, critical research under idealism and individualism, and action research under empiricism and individualism (Wang, 2006).

In this typology, the paradigm of natural science, factual research, and empirical research have similar and distinct meanings; that is, their research paradigm is based on empirical evidence and uses mathematics and logic as tools. This is a classic scientific paradigm, and there is little controversy over its use in educational research. Other paradigms are yet to be fully explained. The humanistic model of educational research has vague connotations and complex denotations. Its epistemological basis, process norms, and quality criteria are ambiguous, and it intersects with normative, speculative, and qualitative research. The relationships between speculative research and normative research and their epistemologies and methodologies are also unclear, resulting in a lack of specific process norms and quality criteria. Action research and critical research focus on educational practices and involve both transcendental normative research and empirical factual issues.

There are various criteria for defining typologies. The classical division between natural science and humanistic paradigms is based on differences in the focuses and value orientations of research—natural science focuses on nature and regards human beings as part of a natural order, whereas humanistic research focuses on human beings and perceives the world through their spiritual vision. The dichotomy between factual research and normative research classifies research paradigms according to

two kinds of questions in educational practices, while the dichotomy between empirical and speculative research classifies research paradigms according to the characteristics of the research process. These two typologies are not directly related to the epistemological basis of research paradigms—educational research is an issue of epistemology, and its research paradigms belong to the epistemological category. The trichotomy of positivism, hermeneutics, and critical theory involves the consistent judgment of ontology (whether there are objective facts), cognitive theory (insisting on subject–object dualism or interactionism), and methodology (from the scientific experimental method to the specific choice of hermeneutic spectrum). However, with positivism as the frame of reference, the dichotomy at the epistemological level tends to mean that the rich connotations of epistemology are ignored. Moreover, the three categories are not mutually exclusive, as action research does not exclude empirical research (including quantitative research), and qualitative and quantitative research can both be empirical. It is appropriate to take the philosophical basis of methodology as the criterion for classification of research into speculative, empirical, critical, and action research, but it is inappropriate to take individualism as one of the characteristics of methodology—educational research is not the researcher's soliloquy.

The above typology of educational research paradigms has different meanings and features. For example, the distinction between positivist and logic-based research directly shows the characteristics of two different ways of doing research. However, the fundamental difference among the different types of educational research is that they construct educational knowledge on different foundations or on different information. This is the core issue of epistemology, which determines the norms of different types of educational research processes and the nature of educational knowledge produced from them. For example, if pedagogic knowledge is constructed based on objective facts and evidence, subjectivity must be excluded from the research process, the information about facts and evidence must be objective, reliable and complete, and the reasoning process must be logically complete. The knowledge obtained by strictly observing the process norms is objective and real—this is the kind of empirical research advocated by the *Declaration*. However, are the facts and evidence that form the basis of empirical research the only source of educational knowledge? According to the consensus on the diversity of educational research paradigms, they are certainly not; what, then, are the sources of educational knowledge? On this basis, how should educational research paradigms be classified? Answering these questions properly will help to understand the essential differences between different education research paradigms, standardize the educational research process, distinguish different types of educational knowledge, and recognize their differences.

2 Theoretical Basis of the Typology of Education Research Paradigms

Based on the foundations of educational knowledge—that is, the different types of information that form educational knowledge and the varying reasoning processes of educational research—this paper classifies educational research paradigms into three types, namely, empirical, lived experience-based, and logic-based. Based on a historical analysis of the following social science methodologies, this classification encompasses the research paradigms currently used by researchers in China while taking into consideration the different kinds of questions that are relevant to educational practices.

2.1 Empirical

Empirical research, as advocated by the Declaration, takes facts and evidence as the basis of educational knowledge. This accords with the basic idea of empirical epistemology and the basic spirit of modern sciences, of which natural science is the epitome. For some core issues in educational practices, such as the relationship between the educational environment and learners' physical and mental changes and the relationship between education and economic development, empirical research is a feasible, suitable, and necessary approach. In this paper, this kind of research approach is referred to as the "empirical paradigm" and includes quantitative research, partial qualitative research, etc.

The term "empirical" is used instead of "positivist" for two reasons. First, the criterion adopted here for the classification of educational research paradigms is the source of knowledge: experience is the source of knowledge, and positivist research is a process of knowledge acquisition. Second, the essence of "facts and evidence" in positivist research is empirical. Empirical research, rather than presenting people's experiences and summarizing and reflecting on them, involves researchers' descriptions of the characteristics and development of the researched objects based on their perceptions of scientific research. Natural science represented by physics is a typical empirical science, and social sciences such as economics and sociology are committed to becoming empirical sciences.

Immanuel Kant stated that "Objects are therefore given to us by means of sensibility…" (Kant, 2004). Experience is the result of the independent action of the researched object on the researcher to whom it is given. This means, first, that researched objects are perceived by the senses; and second, they are not provided by the senses but are produced by external objects that stimulate the senses. They have concrete external sources, so they are real, not subjective fictions (Wang, 2015). The "given" object is publicly observable, and therefore, the experience resulting from its observation has intersubjective validity (Zhang, 2010); that is, people's

experiences of the object are communal and do not vary due to individual subjectivity, which constitutes the objectivity of empirical research. Vision is people's main channel of perception and source of experience; other perceptual channels include hearing and touch. The reasons for the commonality of people's experiences of an object are that the characteristics of and changes in objects are not controlled by the subjective will of the researchers and that humans have similar senses and nervous systems for processing sensory information. In the middle of the nineteenth century, inspired by brilliant achievements in natural science, Auguste Comte proposed the concept of positive philosophy, which incorporated positivist methods into scientific experimental observation and mathematical logical reasoning. After reviewing the achievements in mathematics, astronomy, physics, chemistry, and biology since the sixteenth century, he argued that empirical scientific methods and knowledge could also be used in social–historical research, forming the sixth positivist science—social physics, or sociology (Zeng et al., 2018). The empirical research advocated by the *Declaration* and the empirical paradigm herein have inherited the basic ideas of Comte's positive philosophy.

2.2 Lived Experience (Das Erlebnis)

Unlike Comte, however, Wilhelm Dilthey did not want to apply the positivist methodology of natural science to social research. He proposed another knowledge system, geisteswissenschaften (spiritual science) based on observation and logic. He devoted his whole life to finding an independent methodological basis for spiritual science. Dilthey proposed that natural science aims to research "existing physical and material reality", while spiritual science aims to research "social-historical reality". Differing from the physical nature of natural science, spiritual science essentially refers to the "self-consciousness of human beings," which represents a unique domain of facts different from the former, namely, the fact of consciousness (*bewuβtseinstatsache*). The two are based on different ways of perceiving. Dilthey distinguished between two epistemic processes: "the process by which things that act on the senses or are produced by the connections among thoughts are taken as materials" and "the process by which a range of facts are originally produced from inner experience without the intervention of senses." The former is the direct experience produced by the senses upon contact with external objects, while the latter represents a special domain of experience in the sense that "it has an independent origin and its own materials in inner experience" (Dilthey, 2004). Dilthey called the latter "experience" (das Erlebnis), or to be more exact, lived experience.

Dilthey juxtaposed lived experience and experience as two basic ways of perceiving He claimed that lived experience is unique and really exists for I, and it is not opposed to I as an object of sense or representation; it is not given to us—on the contrary, we sense it by introspection. Real lived experience exists for us only because we regard it as something that belongs to us in a certain sense and thus directly possesses it (An, 1990). For the epistemic subject, experience is "given", but

lived experience comes directly from the spiritual world of the subject, which is their "innere wahrnehmung" ("inner consciousness") (Li, 2001); in other words, "a direct consciousness in our life, which goes ahead of reflection: a reflective or spontaneous consciousness" (Van Manen, 2003). I directly possess it rather than obtaining it by empirical or logical means. However, this does not mean that experience has nothing to do with lived experience. Lived experience is the perception of experience, which is "empirical" and has a clear empirical object, but the perceived experience is not experience per se.

As an important part of our spiritual life, lived experience has a significant impact on our living conditions and educational practices. If it were excluded from educational research, it would not only reduce our means of obtaining useful information but would also reduce the practical significance of educational research. The concepts of sympathetic understanding and eidetic intuition in the qualitative research methodology of modern Western social sciences and that of realization in Chinese humanistic research highly accord with the concept of lived experience. In this paper, the educational research approach that mainly obtains information through lived experience is referred to as the "lived experience-based paradigm" and includes qualitative research and some humanistic methods.

2.3 Logic

In Dilthey's ideological framework, spiritual science provides not only a description of social history and human activities but also value judgments and ethical norms (Zhang, 2010). In social practices, particularly educational practices, the latter are very important. Humans are part of nature and follow the laws of nature in many respects, but humans are also characterized by subjectivity, which is mainly manifested in self-consciousness and free will. This is the so-called "dual nature of life" (Cui, 2013). Not all human behavior is dominated by natural laws and external conditions because if that were the case, the concept of free will would be meaningless. Human subjectivity leads people to ask ultimate questions and, on the basis of their answers, consider the value orientation of action. Human beings transform objects, including themselves, through their understanding of them (for example, life science and medicine help extend the human lifespan), but how should objects be transformed to cater to the better existence of human beings? Furthermore, what is the better existence of human beings? What is the significance of human existence? The last two questions are interrelated and constitute the basis for the survival and action of human beings.

How do we approach these ultimate questions and the value norms derived from them, as we can hardly find the answers from facts and experiences? History and society offer the most telling observations of the de facto inequality between individuals. However, is this the reality we are willing to settle for? Children and teenagers are generally taken as the means rather than ends in educational practices. Could we tacitly accept such a situation? Dilthey considered spiritual science to provide

answers to the ultimate questions of philosophy through inner intuition and reflection on lived experiences. However, lived experience is, to a certain extent, an emotional, subjective, and personal matter (Zhang, 2010). Is it possible to address such questions using a more convincing, universal approach? Philosophy is exactly the instrument of investigation into nonempirical ultimate questions and value norms. Philosophers of education believe that the central mission of educational philosophy is to answer the question of "What is ideal education" (Jin, 2010)?

Bertrand W. Russell regarded philosophy as "something intermediate between theology and science" in that both theology and philosophy aim to address issues beyond the ken of science, such as ultimate questions and value norms. Philosophy takes a different path from theology, as the former resorts to reason and the latter to dogma. Although both philosophy and science appeal to human reasons, their fields of inquiry are different. Science deals with empirical matters in light of definite knowledge, while philosophy (and theology) explores matters that surpass empirical certainty (Russell, 2015).

Philosophy seeks to solve value norm-related questions through reason and logic rather than relying on lived experience, opinions, and beliefs. This paper defines the logic-based methodology adopted in educational value norms research as a logic-based research paradigm for educational value norms research (logic-based paradigm), the third paradigm of educational research identified in this study. This paradigm depends on methods such as analytical judgment, axiomatic reasoning, and reflective equilibrium.

While theoretical continuity can be found within the empirical and lived experience-based paradigms, there is little theoretical common ground between the two and the logic-based paradigm, which is, however, a necessary and commonly used approach in educational research.

3 The Empirical Paradigm in Educational Research

3.1 Empirical Problems in Education

Most attempts to define "science" from an essentialist perspective have failed. Generally, science can be grouped into three broad categories: (1) empirical science, represented by natural science, involving truth-grounded judgments that are empirical, objective, and universal; (2) formal science, which is based on nonempirical, yet objective and universal, knowledge, and covers the science of logic and mathematics; (3) a systematic body of knowledge acquired through argumentation, which covers philosophy, literature and the arts, and other liberal studies. The first two groups represent science in the narrow sense, and the third group is similar to what is known as academic studies.

Some educational knowledge derives from empirical science, such as the knowledge acquired in the process of psychology-based education and the knowledge acquired from educational development research based on social sciences.

In essence, educational process describes the changes in learners' physical and psychological characteristics that occur in a specially designed learning environment. The fundamental interest of research on educational process lies in the relation between the design of the learning environment and the changes in learners' physical and psychological characteristics. Because both the learning environment and a learner's physical and psychological characteristics are observable variables, an empirical paradigm is a reliable and appropriate means of outlining the relation between them. Quantitative and qualitative methods can both be deployed to record and describe the characteristics of and changes in the learning environment (the independent variable) and the learner's physical and psychological characteristics and their changes (the dependent variable). Logical and mathematical tools can be used to identify the interplay between the two variables; for example, how curriculum content, class organization and teaching methods affect students' learning outcomes and how class size is related to students' academic performance. All relevant factors, such as physical and psychological health and academic performance, need to be clearly defined to facilitate empirical description. The definitions should be operational so that the relevant characteristics and levels of the factors can be measured in observable and measurable dimensions using valid data collected from observations.

Education is also a public service that is inevitably interconnected with other social practices, which is of great significance to the development of education and society. This interplay is evident in, for instance, government expenditure on education as a percentage of GDP, the relationship between higher education structure and the demand for human resources in socioeconomic development, and the relationship between educational characteristics and social innovation. Education development and other social practices are also observable variables that can be analyzed using empirical methods.

Experience is the foundation of and a key element in research on the above issues. Logic and mathematics are necessary research instruments, but they only work as ancillary means. The experience from which educational knowledge is acquired mainly consists of ascertained facts and events and characteristics of objects that are described by means of observation, measurement, investigation, and statistics. Primitive experience is the raw material for knowledge creation before it is processed and normalized through logic and scientific methods.

3.2 Quantitative and Qualitative Research

There are different kinds of experiences, so as empirical educational research. Quantitative research relies on quantifiable data, whereas qualitative research focuses on nonquantifiable facts such as events, the characteristics of objects, and archaeological findings (e.g., through excavation and investigation of an ancient tomb in Nanchang,

China between 2011 and 2016, researchers identified the owner of the tomb as Liu He, the first Marquis of Haihun of the Western Han Dynasty, according to historical documents and unearthed cultural relics, such as a jade seal with the name "Liu He" carved in it and text-bearing gold slabs and memorials to the throne.) (Yang & Xun, 2016). Some researchers hold that only quantitative research is accurate and can be considered scientific, as it is based on quantifiable data and mathematical modeling. Generally, quantitative descriptions are more accurate than qualitative descriptions. For example, the statement "too much exercise is bad for health" conveys general, imprecise, and uncertain information, while a curve graph vividly expressing the relation between the amount of exercise and health conveys a clearer message. Although empirical studies typically rely on quantitative research, it is not the only option. Quantitative research cannot promise absolute reliability or objectivity when data collection and processing involve subjective elements. In addition, some research questions do not invite quantifiable answers; for example, did the Xia Dynasty truly exist as described in some historical documents? What important figures and events have played a key role in supporting and expanding the autonomy of higher education institutions in running schools since the start of the reform and opening-up policy? Are there any lessons to be learned? These questions must be answered through qualitative research.

Qualitative research has been given various definitions. Before the 1990s, qualitative research in the Chinese context was similar to speculative research and historical research. Later, when the western definition of qualitative research was introduced in China, the term was translated into Chinese as "质性研究" (research on qualities and characteristics) under the influence of the Chinese language academic circle outside China. Quantitative research can be categorized into speculative quantitative research, empirical quantitative research, and explanatory quantitative research. The last resembles qualitative research and falls under the lived experience-based paradigm, whereas speculative quantitative research falls under the logic-based paradigm.

There are various methods for conducting empirical quantitative research. Historical research based on cultural relics and archeological findings is a typical example. In contrast, literature research is not a typical approach because it involves interpretation and analysis of written records, which is more or less subject to researchers' subjective views. Grounded theory and case studies can also be applied to empirical research. Even the "ideal type" methodology developed by Max Weber can, to an extent, serve as quantitative empirical research, although Weber firmly opposed the application of positivism to social studies.

Grounded theory is a research methodology concerned with the generation of theory from empirical data. This approach posits that research is a process of discovering, developing, and testing theories generated from systematically obtained information and analyzed in regard to a certain phenomenon. The results of the analysis are the theoretical representation of reality; theories that are constructed through systematic collection and analysis of information are thus called "grounded theories" (Chen, 2015). To generate new theories, researchers do not formulate a hypothesis in advance of the study or during data collection, coding, and analysis, but they

must maintain high theoretical sensitivity. To develop a complete theory, researchers should collect as much data as possible to the point of theoretical saturation, at which point no new theories emerge or conflict with existing theories from the analysis of additional data. Weber's "ideal type" construction is also a method of developing conceptual tools. It rejects subjective values and seeks to collect as much empirical information as possible, and the theory and empirical data must be consistent.

Qualitative research aims to draw general conclusions that ensure authenticity and objectivity, which is often restricted by the deficiencies of research methods. The generalization of qualitative research results is based on the similarities that are assumed to exist between general rules or laws.

3.3 Personal Initiative in Empirical Research

In grounded theory approach, data analysis and theory/concept generation are key steps in which researchers act on their own initiative rather than reacting passively to or photographically describing the objects' characteristics. Researchers' personal initiative comes into play when they analyze and compare, code, and categorize the collected empirical materials and finally construct concepts and theories. Given the same research question and the same empirical materials, different researchers are likely to develop different concepts and theories. The famous physicist Stephen Hawking also asserted that the same phenomenon may be described by two very different theories.

A question thus comes to the fore: does empirical educational research allow researchers' personal initiative? The question is relevant not only to qualitative research but also to quantitative research and natural science research. In general, theories of natural science cannot be generated inductively from empirical data but must be deduced from limited evidence. Therefore, theories cannot be reduced to experience, which constitutes the core difference between post-positivism and positivism. Albert Einstein said that scientists' mission is to grasp the universal elementary laws that govern the world, and "there is no logical path to these laws; only intuition, resting on sympathetic understanding of experience, can reach them" (Einstein, 1976). A conclusion derived from intuition and conjectures is just a rough theory that is "controlled by criticism; that is, by attempted refutations, which include severely critical tests" (Popper, 1986). It needs to be reconstructed by reasoning and subjected to further empirical and logical testing before being recognized as a scientific theory, and a scientific theory will continue to be tested against new experience. This process is elaborated in Karl Popper's *Conjectures and Refutations*, and it also holds true in both grounded theory and Weber's "ideal type" approach. Researchers' personal initiative should not and cannot be detached from empirical research. Personal initiative enables us to determine how things work, yet at the same time, it restricts our knowledge of the world because without an omniscient view, we can see nothing beyond our ken.

Nevertheless, personal initiative does not go against the purpose of empirical paradigm. In this paradigm, experience takes priority. First, theories must be generated from all of the relevant experience available and should be able to account for all known, relevant phenomena without contradicting existing experience. Second, if new, verified evidence emerges that contradicts an accepted theory, the theory should be modified or overturned to form a new theory that can accommodate the new facts. Any inconsistency between the theory and the facts should not be ignored or set aside.

4 Lived Experience (Das Erlebnis)-Based Paradigm in Educational Research

Lived experience comes in various forms, including intuition and sense perception, realization and understanding, inspiration and enlightenment, sympathetic understanding, sense of meaning, attitude, and preference. Lived experience is not the direct reaction of the senses to given, publicly observable objects, nor is it applicable to logical reasoning. However, it is as authentic as empirical evidence. The feeling we experience when reading Wang Wei's "Lone smoke rises erectly amid the vast desert, and the round sun falls in the endless river" is surely different from that when reading Liu Yong's "Only remaining are the willows along the bank, the morning wind and the waning moon". Suppose that an eighth-grade student named *A* did not attend school today. *A* did not finish yesterday's homework, as is often the case, and was severely reprimanded by the teacher. *A* is not a good student. His classmate said that *A* intends to drop out. Only his grandparents are at home to take care of him as his parents work elsewhere. Why would *A* want to drop out of school? Is it related to how he feels at home and school? These questions are very important. To answer them, we cannot rely on our sensory experience but must communicate with the student to truly understand his feelings.

4.1 Lived Experience (Das Erlebnis) in Educational Research

In contrast to the weak scientific tradition, China has a profound humanistic tradition that has long been a source of inspiration for Chinese pedagogy. Scholars from a humanistic perspective consider personal experience as the starting point of educational research, which embodies the wisdom derived from conscious, situational teaching practices (Zhu & Wu, 2011). Other scholars believe that education is the commitment to human development and belongs to humanistic disciplines: "We approach pedagogy through the lens of humanism." Human beings are sacred and

mysterious (Zhang, 2011). "Enlightenment is the fundamental approach to humanistic studies." Through enlightenment and humanistic sensitivity, we can gain penetrating insights into the overall profound nature of human beings and sympathize with the destinies of individuals. As such, the individuality, independence, and value of individuals may shine through in history and culture, and the long-foregone belief in the divinity existing in human nature may be re-ignited in reaction against the increasing prevalence of utilitarianism (Liu, 2008). In Chinese studies on humanistic pedagogy, most judgments have been made on the basis of lived experience.

However, lived experience was first elaborated as a methodology for educational research in western qualitative research. Qualitative research is explanatory; nevertheless, like quantitative research, it is empirically grounded, with the first step being the collection of empirical data. The qualitative approaches then follow separate paths. One approach is confined to the empirical dimension, where data are analyzed inductively and deductively based on logical reasoning to construct empirically grounded theories. In the explanatory approach to qualitative research, empirical data are explored to reveal their subjective meaning and essence rather than being subjected to empirical analysis. Edmund G. A. Husserl's attitude toward phenomenological givenness resembles that of an archeologist toward neatly piled up archeological discoveries, where the real work is not in describing them but in reconstructing them (Husserl, 2018). Reconstructing the pieces in the givenness is activated and structured into a wholistic understanding of a phenomenon. In qualitative educational research, there are several methods of reconstructing the meanings and essences of objects, as described below.

Interpretation is the core concept of hermeneutics. Interpretation was initially considered a means to discover the original intent of an author and the original meaning of an event. However, an author's original intent is hard to discern, and the original meaning of an event is lost in obscurity. Such effort is further jeopardized by interpreters' inevitable presuppositions and prejudices, as all interpretations emerge from pre-understanding. Hans-Georg Gadamer said that "the historicity of our existence entails that prejudices, in the literal sense of the word, constitute the initial directedness of our whole ability to experience. Prejudices are biases of our openness to the world" (Gadamer, 2004). Interpretation is more of a process of creation than discovery, as it accommodates the current status of the interpreter (including the interpreter's thoughts, attitudes, and preferences) and the situation and the object facing the interpreter to achieve the fusion of horizons. This process makes the subject's perception of the object meaningful and thus expands the subject's spiritual horizon.

Hermeneutics can be applied as a research methodology not only for the interpretation of texts but also for research in other fields. For instance, the commonly used concept of sympathetic understanding in anthropology and ethnography is derived from hermeneutics. It is "a process of insightful creation, discovery and continual revelation," which is an "open activity unbounded by rules to see meanings freely" (Van Manen, 2003). Different from empirical research that requires the researcher to be an impersonal observer, in hermeneutic research, the researcher is the research instrument and is engaged in the researched event, involving the observation and collection of data through interaction with the object under study. In this process,

the subject and the object of the research can share subjective states and develop real empathy and a mental connection with each other, which enables the researcher to gain interpretive insights into the object's behavior and intended meanings (Chen, 2008). However, empathy can be potentially harmful to the research, as empathetic access to a setting or an event may entail the risk of being unable to exit. Some people argue that a person cannot "truly understand" religion if he or she does not have any religious faith. But is a believer able to "truly understand" religion?

Sense perception is a core part of the phenomenological method, which distinguishes phenomena from facts: facts are empirical things that exist in the natural world, whereas phenomena are meaningful things that are made prominent through the lens of human consciousness and reflection (Zeng et al., 2018). How do things become meaningful and prominent? Consciousness and reflection represent the researcher's account of a researched object's experience and lived experience and the object's account of his or her lived experience. These accounts allow the researcher to directly face the object. The transcendental ego constructs the object based on various information through intuition and imagination, a process in which the researcher uncovers the object's essence and intended meanings (Cui, 2010). This process is called "eidetic intuition" (eidetische Anschauung). Husserl's student, Gerda Walther, had a mystical understanding of this concept. She claimed that one can discover such intuition only when one is immersed in the lived experience that stems from the deepest depth of the subject. She further explained that when one is completely dedicated to such experience, it is possible to feel the "source-points" of the original essence (*ureigen*) specific to the subject. These "source points" form the core point of the personality, which has its root in God. When we obtain a deep understanding, we usually think of such insight as flowing from a central source of spiritual light from beyond the I; the I then lifts itself into the source, where the spiritual light bathes and penetrates the I. According to Husserl, Walther's explanation is of "the most complete accuracy" (Husserl, 2018).

4.2   Legitimacy of the Lived Experience-Based Paradigm

Different from experience, lived experience is contextual and logically self-inconsistent, which violates the principle of objectivity and the universality of knowledge. Hence, lived experience-based research is argued to be illegitimate. Husserl's student, Winthrop P. Bell, raised serious questions about "eidetic intuition." In a 1922 letter to Husserl argued that eidetic cognition, which relies on uncontrollable, mystical intuition, has no pivot as a general philosophical principle. Bergson used intuition to explain the most intricate conclusion. If intellectual intuition can be used to deal with problems that have material content (sachhaltig), then why cannot spiritualists and daydreamers draw on the evidence of an intuition at will (Husserl, 2018)? Husserl did not answer Bell's question.

However, lived experience is not purely subjective. To some extent, people feel and think alike about a particular object. Psychologists would presumably also agree

that one's life experience may also happen to others (Van Manen, 2003). Therefore, the findings of lived experience-based research on a particular object are instructive in similar situations, and the same experience may even happen again in similar contexts. That is why lived experience-based research is valuable in practice.

We can assume that we have a common lived experience partly because we share a common biological and chemical basis of feelings and common lifestyles. Certainly, a person's lived experience with a particular object is affected by his or her mentality, life experience, and social background. Therefore, lived experience is personal but also common to all humans, and it is associated with society and culture. For example, as social beings, we are naturally attracted to people who are similar to us. "Apathy" is a negative experience in most populations. However, individuals in a particular society or culture may downplay their negativity because they feel freer when they are apathetic toward others.

Nevertheless, it is still necessary to increase the reliability and universality of lived experience-based research results. Mutual corroboration is an effective way to do so, and qualitative researchers advocate triangulation. Researchers can corroborate the research process within research groups or by engaging other people, relevant or irrelevant, in the process. If many people have the same or similar lived experience in a particular situation, the research results will be more reliable. Researchers should reflect on their own lived experience and combine it with empirical knowledge to discover the limitations and contextual aspect of lived experience. They can also use a combination of logical deduction and lived experience-based approaches to produce more reliable results when studying, for example, the intuitive positioning of people in liberal education. Intuitions about an object constitute a rough theoretical structure that is the starting point of empirical research and logical analysis. Rational reconstruction based on experience will further improve the reliability of research results.

5 Logic-Based Paradigms in Educational Value Norms Research

5.1 Role of Value Norms in Educational Practice

Hawking claimed that philosophy is dead because scientists have become the bearers of the torch of discovery in our quest for knowledge (Hawking & Mlodinow, 2011), and science can answer philosophical questions such as what the essence of reality is and how we know the world. Hawking was overconfident (as was the *Declaration*). His statement shows that he had a shallow understanding of philosophy and society. Indeed, modern science has increased our knowledge of the world, transformed our understanding of it, and changed the way we know it. Epistemology, however, is not equivalent to philosophy and cannot answer all philosophical questions (Li, 1984).

Apart from the issue of knowing the objects, we also need to deal with the ultimate questions about subjects and those concerning the value norms of practice.

Education is not an object that exists in the natural world, such as a stone or a tree. Instead, it is a practice whose essence and form are greatly influenced by subjective factors, such as the vision for people and social development and the value positioning of people. Concerning the ultimate questions, these factors provide a basis for educational practice and a major basis for criticizing and improving educational practice. Critical theory in education is built on these factors in combination with empirical research on educational practice.

Many consider the ultimate questions and value questions in philosophy to be opinions or faith-like obsessions due to the uncertainty of experiences, yet this is a misunderstanding of philosophy. Philosophy is not literature or religion and is different from experiences, opinions, and faith. The former President of Harvard University, Derek Bok, proposed three stages of critical thinking for handling loosely structured questions: (1) looking for answers from authorities, including teachers, experts, and books; (2) accepting that not everything is right or wrong and subsequently thinking that all opinions are equally valid (naive relativism); (3) choosing the most reasonable and convincing among a variety of positions based on careful reasoning and knowing that this position is not an absolute truth and may be replaced by another someday (Bok, 2012). If we stay at the stage of mediocre, shallow, and naive relativism, society will inevitably fall into chaos. Philosophy and educational research must go far beyond this stage.

5.2 Three Ways to Corroborate Value Norms

How can we solve the ultimate questions and the questions about educational value norms without relying on empirical evidence? Philosophical research is primarily a logical argument based on human thoughts, experiences, and intuitions. Its aim is to find convincing answers to the ultimate questions and questions about value norms. It is similar to speculative research, except that it has defined research questions and methods. The charm of philosophy usually lies in sophisticated arguments rather than groundbreaking conclusions. There are three ways to corroborate value norms.

(1) ANALYTIC JUDGMENT is the most reliable way to solve value norm questions. According to Kant, analytic judgments are made up of a subject and a predicate. The predicate expresses nothing that is not already contained in the subject (Kant, 2017). Judgments based on logical reasoning are absolutely true. Take the Chinese word for 教育(education), for example. According to *Shuowen Jiezi*, an ancient Chinese dictionary compiled by Xu Shen, a Han Dynasty scholar, the word consists of 教, which means teaching something to others who then will follow what they have been taught, and 育, which means raising children to be kind. "教育", therefore, has at least two aspects of meaning: first, one influences the other; second, such influence is positive. Hence, education does not include the natural growth of children's body and mind and spontaneous learning. Education aims to develop valuable

qualities in students, and educational practice is subject to certain ethical principles. Although what constitutes a valuable quality may vary across situations, stealing, for example, is definitely not a valuable quality. Analytical judgments based on logical reasoning provide a constitutive norm for educational practice. Any activities that do not conform to this norm are not educational activities.

Unlike empirical knowledge, analytic judgments are highly reliable and are impossible to prove false. However, they do not provide new knowledge and therefore cannot answer most value questions in educational practice. In the previous example, we made an analytic judgment: Education should teach people to be good, but we do not have any clue as to what is good.

(2) REASONING FROM SELF-EVIDENT PRINCIPLES is more common than analytic judgments in value norm research. Different from mathematical axioms that are generally accepted to be true, value axioms are self-evidently true. There are boundaries on rational discourse in abductive reasoning, as Martin Luther asserted: "To go against conscience is neither right nor safe. Here I stand, I can do no other, so help me God. Amen" (Dahl, 2013). Value axioms are similar to the "Principle of Heaven" and the "Way of Heaven" in Chinese philosophy and the "natural law" and "divine command" in Western philosophy. From the historical materialist perspective, however, they are basic value principles formed during the evolutionary history of mankind to maintain the continuity and development of mankind. They are general principles of social rationality (Li, 1999). Value axioms, such as "people are the purpose" and "people have a special value in the world," are where value reasoning starts. Based on the axiom that "people are the purpose," we can make an analytic judgment: people have rights, everyone has an equal right to education, teachers and students are equal in personality, and education is not about cramming information; instead, students should learn with understanding on a voluntary basis. Based on the axiom that "people have a special value," we can make an analytic judgment: people should live a moral life. All of these are important value principles that have a profound impact on educational theory and practice.

(3) REFLECTIVE EQUILIBRIUM. However, a major flaw in this research method is that the reliability of these value principles, which have an anthropocentric tendency, has not yet been proven. Therefore, John Rawls proposed a new method, reflective equilibrium (Rawls, 2009). According to Rawls, people express their values in two ways, through value principles and value judgments. Value principles are usually universal; for example, the right to equality in education requires student recruitment to follow a unified standard. Conversely, value judgments are usually situation specific; for example, the higher education admission rate is 80% in Region A and 30% in Region B; therefore, students in the two regions do not have an equal right to education. If all students are recruited according to the same standard, the higher education admission rate will vary across regions given the huge gap in education quality. Thus, there is an imbalance between the value principle and the value judgment. In this case, we need to adjust the value principle to strike a balance between the two if the value judgment is well thought out with full confidence under the most favorable conditions, that is, if it is made in a free and safe condition without being affected by personal interests and biases.

Researchers argue that knowledge pertaining to the ultimate questions and value norm questions is obtained by logical deduction and is therefore constant, universal, and inevitable (Jin, 2015). This idea coincides with the thought expressed by Socrates and Plato: virtue is knowledge. However, being independent of experience is actually a disadvantage to the reliability of knowledge because only a few of the ultimate questions and value questions can be solved logically, and most are associated with value axioms and value judgments, which are less reliable than experience and are not scientifically reliable.

6 Conclusion: "Opportunism" in Educational Research

Einstein observed that to the systematic epistemologist, a scientist appears as a type of unscrupulous opportunist: he appears as a realist insofar as he seeks to describe a world independent of the acts of perception; as an idealist insofar as he looks upon the concepts and theories as the free inventions of the human spirit (not logically derivable from what is empirically given); and as a positivist insofar as he considers his concepts and theories justified only to the extent to which they furnish a logical representation of relations among sensory experiences. He may even appear as a Platonist or Pythagorean insofar as he considers the viewpoint of logical simplicity as an indispensable and effective tool of his research (Einstein, 1976). What is true to natural scientists is even truer to educational researchers. As opportunists, they choose different research paradigms for different types of questions.

However, educational practice faces mixed problems, such as stress overload in students and "tiger parenting," which need a combination of empirical, lived experience-based, and logical paradigms. However, researchers have their own limitations in terms of research methods, so when choosing a research question, they should avoid mixed questions or break them into separate questions. If mixed paradigms are used, they should specify how each judgment and conclusion is made and what materials are used.

The three paradigms vary in authenticity, objectivity, and universality. The empirical paradigm performs well in terms of authenticity and objectivity but poorly in terms of universality when applied to qualitative research; the lived experience-based paradigm performs well in terms of authenticity but poorly in terms of objectivity and universality; and the logical paradigm performs well in terms of universality but poorly in terms of authenticity and objectivity. Overall, educational research should prefer the empirical paradigm and quantitative methods.

Education features "internal rationality" (Liu, 2008), which can be experienced through enlightenment but needs logical and empirical evidence to improve its reliability. "Education is subject to the influence of people's aspirations, ideology, and values. Researchers need to carefully examine such influence by science and other means" (Shavelson & Towne, 2006). Researchers must also study and follow relevant laws when dealing with the objects of educational practice, which is both subjective

and objective. Otherwise, they will inevitably fall into nihilism and relativism as a result of a narrow emphasis on value, sense of meaning, and intuition.

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Nobody Left to Hate: The Root Cause Interventions to Bullying and Violence in Schools

Xiangyang Huang and Elliot Aronson

Abstract Peripheral interventions and root-cause interventions for school bullying are discussed in this paper. The analysis of the Columbine Massacre and the Mizhi Massacre shows that unhandled bullying can sow the seeds of hatred and revenge in the minds of its victims. The analysis of the Douglas Massacre shows that the peripheral intervention measures of school bullying have limited effects, that the zero-tolerance policy of school bullying is full of risks and that severe punishment of bullies will sow the seeds of hatred and revenge in the minds of the punished. The root cause of exclusion, taunting and bullying among students lies in the general competitive atmosphere in the classroom. The Jigsaw Method, as a kind of cooperative learning, can not only enhance empathy and sympathy among students but also resolve resentment among students, which is an effective measure to root out school bullying and not let a child hurt. Win–win cooperation, where there is nobody left to hate, is also the right way to resolve international hatred and to combat international bullying.

Keywords School bullying · Hatred · Jigsaw Method

1 Bullying > Hate > Revenge

Dear Professor Aronson, How time flies! It has been nearly five years since I visited you on November 10, 2014. I am very grateful that you have authorized me to translate your book, *Cooperation in the Classroom: The Jigsaw Method* (Aronson & Patnoe, 2011), and presented me a copy of your book, *Nobody Left to Hate: Teaching Compassion after Columbine*

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(Aronson, 2000). I did not expect you to have another book on education. Have you expected that the latter will be published in Chinese version earlier than the former?

No, I am not surprised that you first translated *Nobody Left to Hate* before translating *Cooperation in the Classroom. Nobody Left to Hate* in some ways is more interesting because it deals with a fascinating and universal problem: Taunting and bullying which leads to violence.

> This is a book that combines humane care with professional insight. Its title made my eyes light up and my heart move. In my opinion, the title "Nobody Left to Hate" is profound and perfect. It is a wonderful title. I apologize that the title of its Chinese version was changed to *No Child Left to Harm* (《不让一个孩子受伤害》) for the sake of attracting and touching Chinese readers. (Aronson, 2019)

The book looks very handsome, indeed. I agree with you that the editor's decision to change the title ignores both the subtlety and the irony contained in the original English version. But it is possible that the editor understands these things better than I do. In any case, it is not a problem for me.

> Your work focuses on bullying and violence in schools. What do you mean by titling the book *Nobody Left to Hate*? Are you admonishing students not to bully in case they might be hated, or are you persuading teachers to be kind to all children in case children might hate each other, or are you telling teachers something else?

I chose that title after reading a popular American novel, *Birdy*. In this novel, one of the characters, who is a tough, aggressive kind of person, is very angry at another character—until he learns something about him; specifically, he learns that some of that person's unattractive habits were caused by some horrible experiences he had while serving in the military during a brutal war. So, his anger and aggressive feeling toward that person are tempered by feelings of empathy and compassion. And then, he says to himself, with supreme irony, "You had better be careful. Because the more you learn about a person, the more you understand their problems, and the more you like them. If you are not careful, there will be nobody left for you to hate" (Wharton, 2012).

Because my book is about learning empathy and compassion toward people, I entitled it "Nobody Left to Hate" because empathy and compassion reduce hatred and aggression.

> Your book discussed the Columbine Massacre. It was the deadliest school shooting in U.S. history at the time. And it seemed to give you a great shock.

The massacre happened in the Columbine High School on April 20, 1999, in which two students, Eric Harris and Dylan Klebold, consumed by rage and armed with an arsenal of guns and explosives, went on a rampage, killing a teacher and 11 students. Another 23 students were injured and needed to be hospitalized. The two shooters ended up shooting themselves. They planted explosive devices in some places as well. Fortunately, the explosive devices failed to go off because of a simple electronic failure. Otherwise, the casualties would be much higher.

Before the massacre, Harris and Klebold made video tapes in which they showed their anger and hatred at being bullied at school for so long. According to their own statements and some students' reviews, they had been teased and excluded by their schoolmates. However, bullying occurred with little seriousness. Therefore, is the bullying just an excuse for them to kill?

No, I do not believe that Harris and Klebold were using the bullying as an excuse to kill. I believe that inclusion is a very important social motive. Being excluded, taunted, and humiliated may not seem like much when viewed from a distance. However, for young people, especially in adolescence, when being accepted and valued is very important, it can trigger anger, and they need to be recognized as an important person. As I write in that book, it is at the heart of almost all the school shooting in America.

Let me explain further with another massacre happened in No.3 Middle School in Mizhi County, Shanxi Province, China. Students were attacked by a man with a knife during the afternoon break of school on April 27, 2018. 9 students were killed and 12 wounded. Zewei Zhao, the killer, confessed after his arrest that he had studied at the middle school more than a decade ago and had been teased by classmates for a long time. His career was tough after graduation. He tried to avenge his classmates but failed to find them, so he diverted his anger to the school. Zhao's excuse is unreasonable. No one can accept his justification that murdering innocent students only because he was bullied by his classmates more than a decade ago. Zhao's parents provided proof that Zhao suffered from depression disorder after being bullied by his classmates and had been taken around for treatment. However, it was still hard to imagine that teasing and exclusion from peers would be so serious that it could cause such a deep hatred in a person's heart and last for more than ten years. Public opinions are inclined to treat long-term bullying as an excuse for this crazy loser to kill innocent children.

The incident you mention that took place in Shanxi Province, China, is a bit more difficult to explain. I would guess that the perpetrator was deeply hurt by the incident—and, ten years later in his anguish and depression, may have blamed the school for his failures and for his mental difficulties, for his depression. Of course his behavior was irrational. But it is understandable. Again, one must not underestimate the importance of inclusion in the mind of an adolescent—and how that can carry over into adulthood—especially if there is a degree of mental illness involved. Yes, people who do crazy things are not necessarily crazy. Sometimes they can be pushed over the edge of rational behavior even though they are perfectly sane. But sometimes, people who do crazy things ARE actually crazy!

I agree it is difficult to accept this as a reason for the killings. But what other reason could he have had? One must try to understand that the anger and the thoughts of revenge might have festered and erupted after 10 years. Again, it is not rational…but it is likely.

This is precisely why I believe that it is important to build empathy and compassion, which will lead to inclusion. This is at the heart of the problem. That is why the jigsaw method is important because that is what jigsaw does.

In my country, leaders like President Trump, foolishly are suggesting that we station policemen at all schools—and even go so far as to suggest that we give teachers handguns to carry to class—to protect the students. This is completely

wrong because it does not address the root cause of the problem and will almost certainly result in more bloodshed.

According to Aronson's First Law, however, people who do crazy things are not necessarily crazy (Aronson & Aronson, 2018: 7–9). If Zewei Zhao, Eric Harris and Dylan Klebold created murder like crazy because they hate their schools, if they hate their schools because they were bullied at school, and the school bullying they suffered is not very serious, then we may suppose whether persistent mild bullying is more likely to accumulate hate than one-time severe bullying. You and some other social psychologists have demonstrated in experiments that light punishment is more likely to change people's attitudes than heavy punishment; that light reward is also more likely to change people's attitudes than heavy reward; and that people in an emergency are more likely to get help when there are fewer people around than when there are more. Is there any experiment or other evidence that mild bullying is more likely to accumulate hate than severe bullying?

No, the mild punishment effect works only in a specific domain: If you want a person to refrain from doing a particular unpleasant thing—then it is best to find a way to induce him to find that thing unattractive. And by punishing him severely, you do not succeed in getting him to find it unattractive because he knows that the only reason he is not doing that thing is because the punishment is so severe. But if the punishment is mild—just enough to get him so stop doing that thing—then he cannot tell himself that the reason he is not doing it is because of the severe punishment—because the punishment is, in actuality, very mild. So he will convince himself that he doesn't really enjoy doing that thing.

This might influence the bully.

However, the best way to influence the bully is by building empathy in him. And Jigsaw is the best way I know of to do that. We have successfully decreased bullying and taunting in hundreds of classrooms.

Based on my observation, I speculated that severe bullying would easily cause school attention, the bully would be punished, and the bullied would receive timely protection and relief so that he would not have too much resentment. Mild bullying, on the other hand, is not easily identified and taken seriously by school authorities, which makes the victim bitter. By repeated mild bullying, he would build up in his heart a greater hatred than if he had been subjected to one-time severe bullying. Is there any empirical evidence in social psychology for this speculation?

If there is empirical evidence on this specific issue, I am unaware of it. I agree that so-called mild bullies are harder to detect. But if all of the students are learning by jigsaw, then all of the students—including the mild bullies—will develop more empathy. I would also combine this with some lectures or videos discussing the issue of bullying in why it is something that youngsters should not do.

2   Pump-Handle Interventions & Root Cause Interventions

The term "pump-handle interventions" seems to be a unique concept of yours. It's very interesting, vivid and intuitive to the readers. When you talk about "pump-handle intervention" in English, it is sometimes translated into "peripheral intervention" (外围干预) in Chinese

(Aronson, 2019). Has your conceptualization been misunderstood or misinterpreted? Could you briefly explain what the pump-handle intervention means for bullying and violence in schools?

I think "peripheral" is a pretty good translation. Yes, I invented the term "pump handle solution" as an acute to John Snow, a nineteenth century British physician, and one of the founding fathers of epidemiology. In responding to a cholera epidemic in London, he noticed that all the victims had been getting water from the same well. His first response was simply to remove the pump handle from the well—thus preventing people from drawing water from that well. But it didn't help us understand the root cause of the problem. So, Dr. Snow continued investigating and found that people had been building their latrines too close to the well and that the actual cause was feces from the latrines. With this knowledge, they could enact laws about latrine construction and thus prevent future outbreaks of cholera. So, a pump handle solution is a solution to the specific problem—without understanding of the cause of that problem. Thus, metal detectors in schools could prevent students from carrying guns into the school, but it does not tell us why students are angry enough to want to kill their classmates.

> Chinese laws prohibit private ownership of guns, so we do not have gun control problems. However, it is not just guns that can kill. With a knife, Zewei Zhao could kill many students. It is almost impossible to keep lethal devices in strict control in case of abuse in peer conflict resolution by teenagers. Many schools in China try to keep students focused on their studies. Students have few opportunities to interact informally at school. Student conflicts (including bullying and violence) are thus kept at a low level. Is this a kind of pump-handle interventions?

Yes, exactly. It does not get at the root cause of the problem. The root cause question is: Why are students feeling aggressively toward each other, and what can we do to reduce those aggressive feelings?

> You treat the massacre such as Columbine Shootings as an extreme and pathological response of the perpetrators to the general exclusion atmosphere in their school (Aronson, 2000). According to this definition, many people may attribute the external cause of school bullying and violence to the environment or atmosphere of school and the root cause to the personality or values of the perpetrator. Thus, the root cause intervention will point to their personality or values. You seem to have a very different judgment and analysis. Could you explain why the methods such as Jigsaw are root cause interventions?

In our research, we determined that the root cause of exclusion, taunting, and bullying was the generally competitive atmosphere of the classroom, which pitted students against one another for the scarce resources of good grades and the respect of the teachers. Jigsaw was a solution because it required cooperation. Behaving cooperatively increased feelings of empathy and compassion among students helped them see the common humanity and internal beauty of their fellow students, made them want to work together and help one another rather than destroy one another.

> The Jigsaw Method you invented in the 1970s was introduced to mainland China in the 1990s. It is literally translated as "拼图法" or loosely translated as "combinatorial group cooperative learning" ("组合式小组合作学习"). Is the Jigsaw particularly different from the other models of group learning?

I chose the word "jigsaw" because, in America, there is a well-known kind of puzzle called the jigsaw puzzle that consists of many pieces of cardboard or wood cut in different shapes. When the person assembles them correctly, they form a beautiful picture. Thus, in jigsaw, each student is like a piece of the puzzle. When the students work together cooperatively, it is as though they are assembling a beautiful picture.

> Some teachers in China have tried to use Jigsaw to enhance class participation, to enliven the classroom atmosphere and to improve academic performance. However, you recommend it in the book as a measure to ease academic competition, to avoid students' hatred for each other, to improve the students' relationship, and to cultivate an atmosphere of cooperation, empathy and compassion. Your analysis and argument is persuasive. However, there are also teachers who worry that having conflicted students work together risks exacerbating their conflict. How to reassure this kind of teachers? Is the Jigsaw a magical way to cause cognitive dissonance in students and change their unfriendly or even hostile attitudes toward certain peers?

At the beginning of introducing jigsaw, teachers must be vigilant. It often takes students a few hours in jigsaw before they begin to see that behaving in a conflictual manner can be counterproductive to their own aims of doing well in school. In a competitive situation where people are behaving to enhance their individual performance, it might be useful to insult another student. However, in jigsaw, conflictual behavior will decrease the aggressor's opportunity to do well because my doing well depends on my paying close attention to your oral performance. If while you are reciting, I say something that upsets you, it will hamper my own ability to learn the thing you are trying to teach me—and we will all perform poorly as a result. If a student behaves disruptively in a jigsaw group, the teacher should intervene and remind the disrupting student that his behavior will decrease his own learning and thus, he had better listen carefully to the other student and even help the other student perform better because, ultimately that will be to his own benefit.

> Within cooperative learning structures, students do help other members of their group for their own good academic performance, even if they did not like one of them before. Here is one of my questions: How can this kind of help make helpers like classmates they did not like before? You mentioned in *Nobody Left to Hate* that all of this is accomplished through a self-persuasion mechanism (Aronson, 2000). Is there any particular explanation for this mechanism from the theory of cognitive dissonance and the theory of self-consistency?

Yes. When you help another person—a person who you dislike, it causes dissonance. In effect, you ask yourself why I am helping this person whom I dislike. In order to reduce dissonance, you begin to pay attention to that person, looking for things about him that you might find attractive. In this way, you can convince yourself that you have not done a foolish thing; that foolish thing would be doing something nice for someone you dislike. So, in order to reduce dissonance, you look for the positive and ignore the negative and then, after a while, you can honestly say, "I really do like this guy. Look at all of his positive traits!".

3 Zero Tolerance V. Teaching Compassion

> Nearly 20 years have passed since the publication of this book, during which a lot have happened in the United States and the whole world. Within one year after the publication of *Nobody Left to Hate*, for example, the Bush administration enacted the "No Child Left behind Act of 2001 (NCLB)" to improve school performance. This Act seemingly referred to your book title pretty much. However, it seemed that the U.S. Department of Education had critical divergence with you upon the education issue. What's your comments on this situation?

"No Child Left Behind" failed miserably. It was a well-intentioned idea but it was deeply flawed. Because the Department of Education rewarded teachers for how well students performed on standard tests, the unintended consequences were that teachers were training students to do well on the testes rather than truly understanding the material. If they had consulted with a few social psychologists, they would not have made this error. Moreover, there was no attempt to address the problem of bullying or to increase empathy and compassion among schoolmates.

> A few months after the publication of *Nobody Left to Hate*, the 911 terrorist attack shocked the world. Since then, the United States has launched a global anti-terrorism campaign. Anti-terrorism operations were also carried out on American campuses. School safety concerns in the United States did not seem to end with the Columbine Massacre in 1999, which was followed by many other cases. Some states had even legislated to prevent school bullying and violence. Countries such as Japan and South Korea followed the suit. China is now making similar efforts. Due to the exposure of some cases of bullying and violence in schools with bad plots and serious injuries through we-media, the people and the government of China attach great importance to, are highly sensitive to, and are highly anxious about bullying and violence in schools, and have formed a "Zero Tolerance" public opinion and policy that will never tolerate and severely crack down on bullying and violence in schools. In general, the response to school bullying and violence in countries such as China, the United States, Japan and South Korea seems to go to the extreme you object to. What do you think about that?

Zero tolerance is similar to what I have called a pump handle solution. Yes, it may be partially effective to punish bullies or even to expel them from school, but it does not get at the root cause of bullying—which is the competitive aspect of classroom learning. Jigsaw has proven effective at reducing bullying by building empathy and compassion among students. Moreover, students in schools where empathy is encouraged will frequently intervene to prevent bullying—rather than simply be bystanders who assume it is none of their business. Jigsaw encourages students to care about the welfare of their fellow students.

It must be said that jigsaw, by itself, does not totally eliminate all bullying because some bullies are pathologically aggressive. For those students, therapy must be used to get them to reduce their aggressive tendencies. Expulsion is a last resort—if therapy does not work. But expulsion does not always solve the problem—because the perpetrator may seek revenge at school.

> Cracking down on bullying and punishing bullies tends to win public support. However, zero tolerance policies often produce unexpected results. On Valentine's Day 2018, Marjory

Stoneman Douglas High School in Florida suffered a horrific shooting. The killer Nikolas Cruz went on a shooting spree on campus in the style of Harris and Klebold, killing 17 people and wounding 14. Cruz was not a victim of school bullying like Harris and Klebold but a bully, a dangerous person suspected by the school. He was expelled from two private schools and rejected by two others for repeatedly posting threatening and violent messages on the Internet. He was a student at Douglas High School. He was warned and banned from carrying a backpack on campus to threaten other students. And he was eventually expelled from the school for beating and bullying fellow students. This is a case of a strict Zero Tolerance policy. However, the ending was tragic because Cruz avenged himself cruelly on the school that expelled him. The tragedy might have been prevented if *Nobody Left to Hate* had been read by the principal and teachers of the school. As you suggested, the root cause of murder is not weapon but hatred. How to deal with a black sheep like Nikolas Cruz so there is nobody left to hate?

Yes, in this case, the perpetrator needed therapy—not expulsion. Expulsion should be a last resort. Students who are pathologically aggressive need therapy—not punishment.

Dr. Binbin Gu (2019) recently published "From Punishment to Mediation: A New Orientation against School Bullying" in a Chinese journal, *Research in Educational Development*. She recommended your book *Nobody Left to Hate* to the educators of China, as well as *No Place for Bullying: Leadership for Schools That Care for Every Student* and *Reframing Bullying Prevention to Build Stronger School Communities* written by James E. Dillon, a principal of an American primary school. On the one hand, she looks forward to teachers in China being inspired by these books to improve school life, curb the kind of exclusive competition, promote cooperative learning, create a friendly and cooperative learning atmosphere, build classrooms without losers, and ensure that there will not be any student left to hate because of failure or injury. On the other hand, she worries that the professional measures proposed in these books will not be understood and recognized but will be criticized in China. Public opinions tend to believe that applying such methods to deal with bullying is too weak or even condoning. After all, when bullying and violence have occurred in school, the root cause interventions you discovered and invented sometimes find it hard to race against the clock. Do you have any response or suggestion to this concern?

These are excellent suggestions. Cooperative learning is not weak and is not slow. We were able to show huge gains in empathy and compassion in only six weeks. True, it take a longer time for it to become fully effective, but I see nothing that is more effective. Pump handle solutions may be quicker but, ultimately, will be only partially effective because they do not address the root cause of the problem. And as the great philosopher and sage, Lao Tse has said, "The journey of a thousand miles begins with a single step." To which I would add, yes, but be certain that you chose the best path before take that first step!

4   Case Study Methodology

You're the only psychologist to have won APA's highest awards in all three major academic categories: *The Social Animal* for distinguished writing, the high-impact experimentation for distinguished research, and the Jigsaw Method for distinguished teaching. I read in the

translation postscript of the Chinese version of your autobiography, *Not by Chance Alone*, that if there were a Nobel Prize for social psychology, you would be the first to win it (Aronson, 2012). However, in my opinion, the Jigsaw Method deserves the Nobel Peace Prize for its work in eliminating racial prejudice and interpersonal hatred.

Well, it was a very distinguished intellectual leader in the behavioral sciences, Gardner Lindzey, who suggested that I deserved a Nobel Prize in social psychology. It was kind of him to say so. And it is kind of you to suggest that I might deserve a Nobel Peace Prize for the jigsaw classroom. I appreciate those feelings. However, I must tell you that I am not interested in prizes. Of course, being recognized by my peers as someone who has made important contributions—that is very nice. But the important thing is the work, not the prize. So winning a prize always comes as a pleasant surprise. It is like a piece of candy after a good meal—but it is not the meal.

So, what is the meal? What makes me happy and excited in my professional life—as a teacher, researcher, and writer is to find out something interesting about how the human mind works—and, if possible, to apply that knowledge to improve the human condition—even if it is only a small improvement. Finally, I write about my findings in an accessible way that might inspire people in powerful leadership positions to find a way to utilize my research on a broad scale.

The process, in and of itself, of doing an experiment, of writing a book, and of teaching students makes me very happy. To then see that my work is useful and perhaps even inspirational to others—that brings me great joy. On my jigsaw website, www.jigsaw.org there is a wealth of material for teachers. Everyone, from any country, is free to download this material. I am happy to give it away without compensation.

Professor Paul Meehl said that anyone reading your work can easily see the joy you take in doing it (Aronson, 2010). You are committed yourself to experimental research, writing and teaching, and enjoy the processes. By the way, you have made outstanding achievements in all three aspects. It is truly the envy of all living things that you enjoy a good meal, followed by dessert. Your Jigsaw Method has contributed to a new pattern of collaborative learning for the education community, and your professional perspectives on creating school atmosphere in which there is no one to left hate are compelling. And I believe that the idea of "Nobody Left to Hate (NTLH)" could play a larger role in solving international conflicts. Do you have some advice for the conflicted and love-hate world?

My only advice to the conflicted love-hate world, as you put it, is to think in the long term not the short term. The powerful nations of the world—notably China and the USA—should be doing more to reduce climate change—by thinking long-term rather than short-term. We also need to build trust between nations so that our countries can feel comfortable reducing their military budget and spend that money on the health and welfare of their people, on helping out poorer countries, and on combatting global problems—like climate change. For this, we will need to build trust—and, again, this is a long-term process. And it starts with our children—learning trust and appreciation of each other, learning to cooperate rather than to defeat one another. As in the jigsaw classroom. We humans, through evolution, are hard-wired to compete and to win; but we must try to overcome the wiring—so that

we feel happy when we cooperate with others and help them achieve what they are looking to achieve.

> You are well known as a social psychologist. It is a much-told story in psychology that you are listed among the 100 most eminent psychologists of the 20th Century (APA Monitor, 2002) together with your three mentors, Abraham Maslow, David McClelland and Leon Festinger (Haggbloom et al., 2002). Moreover, you're also an outstanding education researcher in our eyes. How did you move from the experimental research on social psychology in the laboratory to the experimental research on education in the field?

When I began graduate school, my intention was to help people. I was not certain how I would do that. Perhaps as a psychotherapist. And then I met Leon Festinger who became my mentor at Stanford. And it was Festinger who taught me how to design and conduct high impact experiments to discover how the human mind works. And, much to my surprise, I fell in love with the process and began to get interesting ideas about the human mind that I could test in the laboratory. And I was very good at doing that. So good at doing that, that I almost forgot about my initial desire—the desire to help people.

And then, while I was teaching at the University of Texas, the primary and secondary public schools in the city were desegregated—and students of different races were brought together for the first time. And there was turmoil. Anger and fighting. Some of my former graduate students were administrators in the school system and asked me if I could help solve the problems of hostility and hatred. And that is how I invented the jigsaw classroom. And it was extremely successful. Not only did it cause students of different races to like and respect one another, it also produced more efficient and more enjoyable learning of the intellectual material—and produced a great liking for school and for learning.

I was able to accomplish that only because I had learned how to do good science. And I eventually found the opportunity to become a good scientist who could also use that scientific ability to help people. The combination of those two threads was essential.

> Reports or papers around a case are not uncommon. However, it is too hard to write a monograph based on a case study. The book *Nobody Left to Hate* presents us with a perfect example of case studies in education. The readers will be surprised how you have so much to say about a school massacre.

Yes, case studies are not easy. But, once again, my training as an experimental scientist helps me to examine a complex situation—like a school massacre—and separate hearsay from actual events and scrutinize these events through the very powerful lens of scientific social psychology. *Nobody Left to Hate*, was widely read and appreciated. However, the most gratifying thing for me was that several parents of students at Columbine High School who had survived the massacre wrote to me to tell me that not only did they find the book accurate and important—but that it gave them a greater understanding—that reading the book enabled them to understand things about the situation that they never would have thought about on their own.

Your experiments in social psychology are both interesting and creative. The methodology you developed in *The Handbook of Social Psychology* based on your high-impact experiments has benefited generations of psychology researchers (Lindzey & Aronson, 1968). The book *Nobody Left to Hate* is the result of a case study. Are case studies very different from experimental studies? As researchers, we would like to share your methodological experience in doing this case study.

Yes, of course, experimentation is very precise and a good, well designed, well conducted experiment in social psychology is like a work of art. Doing a case study requires a different set of skills. But, as I said in my response to the previous question, being a good experimentalist is a great asset to doing a good case study because, as an experimentalist, I have an enormous respect for accuracy and precision—so that I subject all of the things I am told about the incident to the highest standards of scrutiny. That is of vital importance. There is no room for idle speculation or groundless assumptions. When doing a case study, one must start with the hard data and work outward.

The research method contains considerable tacit knowledge that can be learned generally not from textbooks but by doing. However, in your autobiography, you tell the stories of your experiment with relish and make your tacit knowledge explicit so that we can share your precious experimental research experience. We look forward to reading your story of case study in the new version of your autobiography. I truly appreciate your time and effort in answering my questions. I'm sorry that your eyesight has been badly affected by disease. And I wish the interview online has not caused you any new damage.

You ask very interesting questions. It is a pleasure for me to try to answer them—as clearly and fully as I can—while remaining brief. You are quite right, I am almost completely blind. I am very grateful for that small amount of eyesight that I still have—and my aim is to use it as productively as I possibly can. I find responding to your questions to be a productive way for me to spend some time. Additionally, I want very much to give the jigsaw to the people of China, and I see you as my good partner in this noble endeavor.

Thank you so much for recognizing my efforts! You are not only an example to me but also a role model to my child. He read many biographies of famous people when he was in middle school. He once told me that only Charles Robert Darwin was a happy scholar. I told him that you are also a happy scholar, not only with high academic achievements but also with a perfect life. He agreed with me after he read your autobiography and *The Social Animal*. He has entered university life, following your footsteps. Maybe he will have a wonderful life like yours.

I am pleased to learn that your son now believes that it is possible to be a happy scholar who leads a good, happy, interesting, peaceful life. If he chooses to use me as a role model, it pleases me. This has been an interesting and enjoyable project. I wish you very good luck and I hope to hear from you again.

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Curriculum Design Based on Big Ideas: Connotations and Implementation

Lijie Lv

Abstract Human knowledge continues to increase, but the contents of school curricula are limited. In recent years, the national curriculum standards of the United States, Canada and Australia have connected the knowledge system in their curricula by using big ideas. The study of big ideas can be traced back to Bruner's model of teaching. At present, the big ideas used in curriculum design are differentiated in a broad sense and in a narrow sense with different categories and levels, and are of great significance to the development of students' transferable skills. With the "unit" being an important carrier, important elements of big idea-based teaching include the goal of concept understanding, potential learning materials, situation creation, and independent construction.

Keywords National curriculum standard · Curriculum design · Big ideas · Types of knowledge

For more than half a century, the progression of human technology has grown exponentially. In the face of the social changes driven by science and technology, the total amount of knowledge has surged. Meanwhile, the devaluation of stock knowledge has accelerated, while the linear growth of learning cannot keep up with the growth of knowledge. The growth model of learning first and working later no longer exists. Lifelong learning is not only an idea but also a need for survival. Building the foundation for learners' lifelong learning and learning to learn will inevitably become important educational functions of basic education. Therefore, some countries and international education organizations have proposed a framework of core literacy for talents to guide curriculum reforms in primary and secondary schools. Some countries with decentralized education systems have also begun to develop and introduce national curriculum standards, and these governments have intervened in school education and teaching activities. The curriculum is endowed with multiple meanings: "to achieve social equity, improve the quality of education, satisfy personal development and lifelong learning through the formulation of the curriculum. The

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curriculum has increasingly become an important means for countries to seek national future competitiveness and to improve the adaptability of human beings to economic, social and scientific progress" (Marope, 2018). At the same time, the existing "universal" school curriculum has been criticized and questioned in many countries. Such courses are overwhelming for teachers and students, and more importantly, they are difficult to grasp the core content, which often results in far less productivity. Therefore, during the process of curriculum reform, many countries begin to connect the knowledge system and organize the curriculum contents by using big ideas.

1 The Origin of Constructing a Knowledge System with Big Ideas in the Curriculum

The study of Big Ideas can be traced back to Bruner's discussion of the educational process. He pointed out that no matter what kind of subject the teacher teaches, he or she must make students understand the basic structure of the subject, which will help students solve various problems encountered in and out of the classroom. To grasp the basic structure of something is to understand it in a way that allows many other things to be meaningfully related to it; and to learn this basic structure is to learn how things are related to each other (Bruner, 1960). To put it simply, the curriculum thought of the big ideas is closely related to the formation of people's knowledge.

1.1 Knowledge Is Derived from Human Experience and Is a Tool for Describing and Understanding the World

As a representative of cognitive psychology, Bruner's views are deeply influenced by structuralism philosophy. From his explanation of the source of knowledge, his understanding of the nature of knowledge emerges. He believes that knowledge is a mode constructed by us that makes the regularity in experience embodies meaning and structure; and any idea of organizing a knowledge system is invented by mankind to make the experience more economical and more coherent. For example, the invention of the concept of "force" in physics, the concept of "motivation" in psychology, and the concept of "style" in the literature are all meant to help us to understand. That is, knowledge is not the reflection or simulation of external objective facts, but is created based on the materials from experience. "It is organized as a tool, not as a form of things, not as a true picture of the static world, but as a means of acquiring more knowledge within our existing knowledge to serve us" (Westbury & Wilkof, 2008). Bruner's viewpoint continues the rationalist philosophical tradition of Kant, that completing the transition between the external world and human cognition, and establishing the structure of the seemingly "objective" knowledge. Knowledge is a systematic expression formed by humans who extract laws and meanings from the

experience of understanding the world. After Knowledge is a systematic expression formed, it becomes a tool for people to further understand the world. The system of knowledge is the system of human civilization, which can be constructed and developed.

1.2 Education Is the Process of the Individual Transformation of Human Knowledge System

From the perspective of the history of the formation of human knowledge, knowledge comes from experience. For individuals, how does knowledge form, and how does learning generate? In this regard, Ausubel believes that there are two ways of meaningful learning. One is the formation of ideas in childhood, which is acquired by people's direct experience, and a knowledge symbol corresponds to a kind of thing with the same nature. The other is the assimilation of ideas, which is the main way to learn new concepts as we grow. A learner assimilates new information in a situation and explains a new concept with the original cognitive structure. The acquired new concept and new knowledge build a new cognitive structure of the learner, which determines his or her learning of newer knowledge and information. Therefore, "understanding and solving meaningful problems mainly depend on the availability of superordinate ideas and subordinate ideas in learners' cognitive structure" because "people interpret perceptual experience without any processing through some special ideas in their own cognitive structure" (Ausubel, 2018). Ideas in human mind are conditions for the solution of problems and for the understanding of new propositions. School education is a process of individual socialization. Educated people are those who can view the world with human knowledge, and those who can understand and explain phenomena and solve problems with the knowledge already formed by human beings. Learning in school is a process of constructing the knowledge structure and concept system for learners. Therefore, an obvious problem is that in the process of learning, it is very important for teachers to establish connections between new teaching contents and students' existing cognitive structures. In addition, there is an implicit problem of inference, that is, what kind of cognitive structure we intend to establish in students' mind determines what information we should provide and what knowledge we should select for learners.

1.3 Individuals with a High-Quality Knowledge Structure Can Think Like an Expert

What kind of knowledge structure do individuals need to have to better understand the world and solve problems? For this question, much research has been conducted on the cognitive structure of experts. What kind of person is an expert?

It is a person with professional qualities who can deeply and accurately explain different phenomena in nature and human society, and can solve problems based on the human civilization system. Why can experts explain and solve problems? To be sure, experts do not have any special skills. In other words, there is no particular skill that makes experts different from others. What matters is experts' accumulated knowledge and their unique form of knowledge storage. Learning theory holds that the knowledge in experts' minds is clear, relevant and structured. First, experts' knowledge is abundant. It is not isolated or cluttered but is understood, accepted and "put" by experts in an orderly structural framework. This structural framework is independently constructed by experts during the process of learning through understanding new professional knowledge rather than coping from the outside world. Because this structure is clear and orderly, it is easier for experts to select valuable and relevant parts from new information, then incorporate them into their existing cognitive structures, and memorize them long-termly. Second, experts' knowledge structures are highly correlated. In other words, experts are different from novices because not only they accumulate more knowledge but also they can master the relationship between knowledge and knowledge, as well as the relationship amongst knowledge, phenomena, and situations. As a result of mastering these associations, experts have a deeper understanding of the meaning of knowledge. Then, they can understand the situations in which knowledge can be used. When faced with new problems, experts can expertly extract the knowledge related to the specific tasks, that is, the knowledge of experts can be easily acquired, combined and applied. Third, the structured knowledge of experts is "connected and organized around important ideas" (Bransford et al., 2013). In contrast with the novice, this key concept is a more superordinate one. It can incorporate more subordinate ideas to explain more phenomena. With more superordinate ideas, experts can see "patterns, relationships, or differences that are not obvious to novices, and extract the meaning of information which is not obvious" (Bransford et al., 2013). Experts have excellent insight into problems, and thorough understanding of their own field, they can express simply and concisely. When confronting a new problem, experts will think with core ideas or important ideas; that is, they will reorganize knowledge with the core ideas rather than following the original organization of knowledge or applying ready-made formulas or answers.

1.4 The School Curriculum is to Help Students to Build a High-Quality Knowledge Structure

Is it impossible for any course to give students all the knowledge and the important knowledge? What knowledge is important? How do we know what knowledge students will use in their future work and life? Learning theory tells us that the curriculum in education should provide a knowledge framework, which should be a structured and correlated knowledge system, and be organized by important ideas.

Such knowledge structure will benefit students to learn more new knowledge and be facilitating for the extraction, transfer and application of knowledge. Therefore, the curriculum design should pay attention to the establishment of such knowledge frameworks for students. To this end, first, important and key ideas in curriculum content should be established. This key idea is the pivot of the curriculum. For students, this structural pivot is similar to a fixed point or anchor point, on which new information and knowledge in future studies are tied. The process of tying is the process in which the new information and knowledge are connected with the fixed point. The fixed point provides attributions for the new information and new knowledge. Then, they acquire meaning and are incorporated into the original conceptual framework matrix, so the original conceptual framework enhances. Relatively speaking, "since the material acquired by rote learning is not fixed to the existing conceptual system, it is more susceptible to proactive and retroactive interference and thus more likely to be forgotten, unless over reviewing it or it is particularly vivid" (Ausubel, 2018). Second, these important key ideas are correlated. The ideas subordinate to the key ideas and factual knowledge are not necessarily to be large or complete, but the superordinate and subordinate knowledge need to support and relate each other. Moreover, new knowledge needs to be extracted in the situation and have the opportunity to be comprehensively used to solve the problem. Third, he learning of key ideas is an upward spiral. The more stable this fixed point in students' minds is, the more inclusive, general and abstract it is, and the easier it is to provide a solid foundation for new learning. However, it does not mean that teaching requires students to learn general and abstract concepts first. Students still need to learn the concrete one first. The accumulation of concrete and subordinate ideas can be convenient for extracting, abstracting and understanding abstract superordinate ideas. With the spiraling of curriculum content, the understanding of key ideas is deepening and expanding, which requires curriculum designers to present the course in a way from superordinate ideas to subordinate ideas. This will make students gradually form more general, extensive and attributable ideas.

2 The Meaning, Categories, and Levels of the Big Ideas in Curriculum Design

2.1 *The Meaning of Big Ideas*

The thought of the curriculum design based on big ideas originated from Bruner's theories of pedagogy and psychology. However, it was not until the end of the twentieth century that it began to be systematically elaborated. *Understanding by Design* by Wiggins and McTighe is an early work. Since then, Erickson, Lanning, Clark, Whiteley and other scholars have systematically discussed it. In 2009, a major report, *Principles and Big Ideas of Science Education*, was produced in Scotland at an international seminar on science education in primary and secondary schools (Harlen,

2010). Harlen and other scientists put forward the big ideas system in science education. They emphasized that science education is not a pile of knowledge fragments but a structured and correlated model. This report has pushed forward the reform of the scientific curriculum structure in primary and secondary schools and brought more attention to curriculum design based on big ideas. In approximately the last decade, curriculum standards at the national or provincial (state) level issued by many countries, such as the United States, Canada and Australia, were widely used big ideas as the basic framework of each subject. Based on the views of experts, scholars and some influential curriculum standards in recent years, the author believes that the meaning of big ideas can be discussed in both broad and narrow senses. Big ideas in the broad sense refer to curriculum design guided by the idea of structuring cognition. It refers to the integration of relevant knowledge, principles, skills, activities and other curriculum content elements with core ideas in the basic structure of the subject or several abstract concepts in the core position of the curriculum to form related curriculum content blocks to avoid scattered and complicated content. Big ideas can be followed by smaller ideas or sub-ideas to form a structural content system. Big ideas in the narrow sense also target the purpose of structuring curricula. They are inferential expressions formed by understanding core ideas at different levels, and emphasize students' understanding of the essence of core ideas. That is, first, the big ideas in the narrow sense must be in the system of the core idea. Second, it is an abstraction and extraction of factual knowledge or skill rather than a specific knowledge or skill. Moreover, it is the general meaning behind specific knowledge and an important understanding that students can retain even after they forget most of the details. In addition, it is presented in the form of the description of abstract meaning. For instance, one of the core ideas in the Ontario science curriculum of Grade 3 is system and interaction in the biosystem. Two concepts are closely related to it. One is that plants are a major source of food for humans, and the other is that humans need to protect plants and their habitats (Ontario Curriculum Standards, 2000). Some Chinese scholars believe that big ideas can be discussed at two levels. One is to discuss curriculum at the middle level, such as reconstructing the content system of science education with a number of scientific big ideas. The other is at the micro-level, that is, to study the design of unit teaching or theme teaching with big ideas on the basis of curriculum standards (Cui, 2015).

What is the point of designing a curriculum based on big ideas? Some scholars have discussed the essence of big ideas from the perspective of their function; believing that big ideas have the characteristics of centrality, sustainability, network and transferability (Li & Lv, 2018). Other scholars hold those big ideas are an important way to implement the practice of core competences and values (Shao & Cui, 2017). Big ideas contribute to achieving high-road transfer and are a significant way to cultivate creativity (Liu, 2020). From the perspective of curriculum design, the significance of big ideas lies in changing the tradition that curriculum design tries to cover all knowledge. Students learn a course not to gain general knowledge but to create a lens to see the world, especially in the era of information avalanche, where knowledge is abundant and growing rapidly. The school curriculum is becoming increasingly difficult to carry ever-increasing knowledge, so designing curricula by using big ideas

appears to be more valuable. Since we cannot teach all the knowledge to students, we can let the students understand how the human sees the world with wisdom, what is the main idea, and what is the main way of thinking. Of course, this idea and way of thinking, no matter how important, cannot be directly "taught" to students. Big ideas need to be broken down into smaller ideas, which should be directly related to facts and specific problems. Students start learning from the small ideas first and then gradually deepen the core ideas and ways of thinking in terms of viewing the world. There is no need to exhaust the facts and specific problems as long as they are enough to prove small ideas. Also, there is no need to exhaust the small ideas as long as they can sufficiently infer the larger ones. Each time students acquire a big idea at a certain level, it is equivalent to establishing a fixed point (anchor point) in their mind, with which students can build a framework to absorb, focus and process information independently. Another important significance of curriculum design based on big ideas is that big ideas and deep understanding are inseparable. A big idea is not a visible and tangible fact but an abstraction and an inference based on facts and situations. The learning of big ideas also starts with factual knowledge, specific problems or specific situations. Moreover, it is necessary to abstract and infer factual knowledge into general knowledge under the guidance of teachers and understand its essence after seeing the phenomena. Therefore, students can understand more clearly when they return and look at specific facts with general knowledge. As the level of ideas increases, the student will stand higher and see farther and will travel between abstract ideas and facts, in which they can explain and prove each other. Then, on the basis of this deep understanding, ideas can be preserved by lasting memory when factual knowledge is forgotten, because what is preserved in the mind is not a particular fact or event but a relatively general understanding. Therefore, there will be a wider range of applications which can be extracted and applied flexibly when faced with new problems and situations.

2.2   The Categories of Big Ideas

Big ideas are the understandings and views of the world that are to be taught to students, and are transferable understandings based on the learning of subject facts and basic skills. However, what views are valuable? What understandings can be applied to solve problems in the future? Due to the different characteristics of disciplines or the different concerns of designers, curriculum designers have different ideas about big ideas in different countries or different courses in the same country. Thus, titles of big ideas are various. The American Science Curriculum Standards have refined 13 discipline core ideas and several crosscutting concepts. The Australian Science Curriculum has put forward a number of key ideas and regards humanities and social curriculum as concepts of disciplinary think, such as meaning, continuity, change, rights and responsibilities. There are also those who call them big ideas directly. For instance, big ideas are expressed with phrases such as "the movement of objects depends on its nature" in the curriculum of language and

science in British Columbia, Canada. The Ontario Science Curriculum encompasses not only fundamental concepts, such as matters, energies, systems and interactions, structure and function, but also big ideas, such as "plants are a basic source of food for humans". There is also someone who calls them enduring understandings. As the American Art Curriculum Standard refers to dance as a kind of experience, all personal experience, knowledge and background should be integrated to explain the meaning of dance. Therefore, it is necessary to clarify the new progress of knowledge classification to sort out the categories of big ideas.

2.2.1 Anderson's Classification of Knowledge

The history of studying the types of knowledge in psychology, philosophy and pedagogy is long. There are procedural knowledge, declarative knowledge, contextual knowledge, conditional knowledge, strategic knowledge and tacit knowledge. The value of the classification of knowledge is to analyze the characteristics of learning content in order to grasp the way and path of learners' learning process and clarify the nature of learning. The types of knowledge established by Anderson et al. in the revision of Bloom's Taxonomy of Educational Objectives in 2001 have had a great influence on curriculum research and curriculum reform in recent years. On the basis of the types of knowledge and the levels of cognition, Anderson et al. classified educational objectives in the cognitive domain. In the dimension of the types of knowledge, knowledge was classified into four types: factual knowledge, conceptual knowledge, procedural knowledge, and metacognitive knowledge. At the cognitive level, the cognitive process is divided into six levels from low to high; they are memorizing, understanding, practice, analysis, evaluation and creation. These four types of knowledge and six levels of cognitive process constitute 24 objective units. This work is a supplement and revision to Bloom's Taxonomy. It should be noted that Anderson distinguished between factual knowledge and conceptual knowledge. According to Anderson et al., factual knowledge means discrete, isolated information, while conceptual knowledge refers to more complex, organized knowledge (Anderson, 2008). He also viewed that conceptual knowledge combined with deep understanding can help individuals transfer what they have learned to new situations. That is why Anderson's knowledge classifications are important to curriculum reform. In an era that pays much attention to the development of students' quality, the international community is thinking about how to cultivate innovation ability and transfer ability through education. Anderson undoubtedly answered from the perspective of knowledge formation.

2.2.2 Different Categories of Ideas in Curriculum Design

The *Next Generation Science Standards* (NGSS) issued in 2013 are supposed to be a good way to present different types of knowledge. It describes the curriculum content and proposes the performance requirements with four types of knowledge. They are

the discipline core idea, science and engineering practices, crosscutting concepts and knowledge about the nature of science. The Organization for Economic Co-opera (OECD) Learning Framework 2030 designs the curriculum content system, which can support the formation of competences, including knowledge, skills, attitudes and values. Knowledge is also constituted by disciplinary knowledge, crosscutting knowledge, procedural knowledge and epistemic knowledge. The categories of ideas in these two curriculum frameworks are very similar to Anderson's knowledge classification. Thus, we try to classify the big ideas in the various curriculum standards into the following four types.

The first is the discipline core idea. The discipline core idea in NGSS is the main axis of the curriculum content, which is composed of 13 core ideas and 44 sub ideas extracted from the four disciplines of Physical Sciences, Life Sciences, Earth and Space Sciences, and Engineering, Technology and the Applications of Science. The construction of the system of ideas in curriculum is the most common in science and mathematics, which is the key node established in the traditional knowledge system. The system of big ideas in science constructed by Harlan and other scientists has also established core knowledge nodes and put forward the 10 most refined ideas in the way of meaning description, such as all matter in the universe is composed of very small particles (Harlan, 2016). These core ideas can aggregate concrete, basic factual knowledge, information and skills to form an interrelated, hierarchical content system that can be learned.

The second is the crosscutting concept. The crosscutting concept is more of an idea than a concept. It is a more abstract general view of nature and society formed after a certain amount of learning; and it is the synthesis, connection and re-abstraction of discipline core ideas in different disciplines and study sections. The patterns, cause and effect, scale, system and system models, structure and function, stability and change in the NGSS model, and the core ideas, such as pattern, order and organization, form and function, stability and change in Australian Science Curriculum, as well as the fundamental concepts in the Ontario Science Curriculum, such as structure and function, sustainability and management, change and continuity, are all crosscutting concepts. The learning of crosscutting concepts needs to be understood after accumulating the discipline core ideas in different grades and courses. On the other hand, if students can repeatedly use the crosscutting concepts when they understand the discipline core ideas in the exploration and experience of factual knowledge, they will also enhance the deep understanding of these discipline core ideas. Through the learning of crosscutting concepts, students can establish connections amongst disciplines without barriers and understand the complexity and integrity of the world. It helps students apply what they learned in one situation to another. Moreover, crosscutting concepts can also assist teachers in designing a meta-disciplinary learning theme to promote project-based learning.

The third is the concept of thinking and skills. They are ideas about the way of thinking and the exploration of skills with procedural knowledge as the core. In different curriculum standards, the expressions of the concept of thinking and skills are very different. Someone regards them as a core clue of curriculum content. For example, the art curriculum standard in the United States classifies art into nine parts,

such as dance, media art and music. Each part is composed of four ideas: connection process, creation process, expression process and reaction process (State Education Agency Directors of Arts Education, 2018). Someone views them as another set of idea systems that students need to learn in parallel with the discipline core ideas. The science and engineering practices in the NGSS of the United States contain two idea systems with different emphases: scientific methods and engineering thinking. There are also some national curriculum standards that take the concept of thinking and skills as competence objectives or quality objectives. For instance, scientific curriculum literacy in British Columbia includes problems and predictions, planning and implementation, process and data analysis, and evaluation, application and innovation.

The fourth is the concept related to the nature of different disciplines. Knowledge about the nature of discipline, also known as epistemic knowledge, is knowledge of the nature and function of the discipline itself. This kind of knowledge is specifically mentioned in the NGSS and OECD curriculum framework. Knowledge about the nature of discipline in NGSS includes knowledge of science, the process of scientific inquiry, and the understanding of science careers, such as scientific knowledge assumes order and coherency in the natural system, and science is a kind of human activity. This kind of knowledge needs to be supported by two dimensions: science and engineering practices, and crosscutting concepts. The OECD refers knowledge about the nature of the discipline to cognitive knowledge, that is, how to think like an expert and act like a practitioner (OECD, 2018). The content includes what I have learned in these disciplines and why, how this knowledge serves my life, how experts think about these professional questions, and what ethical standards scientists, writers, and artists will take. Therefore, knowledge about the nature of discipline helps students to understand the value and purpose of the learning content. It also enables students to use the content with a clear goal, and think about how knowledge can be applied to improve the well-being of human life from ethical and moral perspectives.

On the one hand, curriculum design based on big ideas with various types of knowledge breaks out of complicated isolated knowledge, such as facts, information and specific skills. It constructs the overall structure of the curriculum content. On the other hand, it inspires teachers that the discipline core content can be used and extended. Extending does not mean increasing the coverage of the content or increasing the degree of difficulty but adds perspectives of the problems in order to improve the understanding of them. Therefore, through the learning of the discipline core content, students can not only understand the meaning of the discipline knowledge, form a more macro world view, cultivate the way of thinking and train inquiry method, but also develop the ethical attitude of the discipline. The curriculum framework constructed by big ideas with various types of knowledge substantially connects the curriculum content with multi-dimensional objectives.

2.2.3 The Levels of Big Ideas

Erickson et al. classified ideas into five levels. First is the thematic facts. The second is the concept. Compared with facts, concepts are universal. They are abstracted from examples and facts and expressed with one or two words or phrases. The third is generalization, which is the sentence describing the relationship between two or more concepts. The fourth is the principle. Like generalizations, principles are expressions of conceptual relationships but are more stable, such as Newton's laws and mathematical axioms. The fifth is theory. It is an inference, or a set of conceptual ideas that explain phenomena or practices. Erickson believes that there is no need to distinguish between generalizations and principles in curriculum design because they are both expressions of conceptual relations and belong to big ideas (Erickson & Lanning, 2018). In fact, the classification of levels of ideas proposed by Erickson describes what big ideas are. They are not specific facts but the generalization of the fact and the expression of relations and meanings. However, from the perspective of designing a course throughout the curriculum, the levels of big ideas must be related to its level in the framework of the discipline system. This means that different levels in the discipline structure are naturally different levels of the big ideas. In addition, the crosscutting concept in curriculum design is not only a type of big idea but also a level of big ideas. Big ideas at this level are more abstract and more macro and are gradually acquired through the accumulation of learning.

Are the high-level crosscutting big ideas appropriate for organizing curriculum content? Organizing the curriculum content by using high-level crosscutting big ideas can break the original boundaries between disciplines. Also, it takes some macro ideas as the core clue of the curriculum system to contain factual knowledge and other contents. Taking the science curriculum in Singapore as an example, the theme of model includes models such as the cell model and the matter model. The theme of systems includes biological transport systems, human digestive systems, human reproductive systems, and electrical systems. In contrast, fewer science curriculum standards adopt this way of content organization. Most of them construct the framework by using the disciplinary core ideas that are abstracted from disciplinary facts. In curriculum design, should the macro high-level big ideas be presented as a hidden clue of the system of the discipline core ideas, or should they be directly used to organize the curriculum content? "Some curriculum designs use macro ideas to organize the discipline content… While the problem is that almost everything can fit any big ideas" (Erickson & Lanning, 2018). The macro high-level crosscutting big ideas can indeed break the original boundaries between disciplines, but it may also make the newly established concept system separate away from situational facts and common sense. Then do big ideas fit into organizing content? In fact, there is no definite answer to whether or not the curriculum should break the original boundaries between disciplines. Rather, it depends on the requirement of the curriculum on the systematicity of the corresponding discipline, the possibility of the curriculum capacity, and the degree to which the learning of macro ideas depends on the factual knowledge of the discipline.

   To be more precise, multidisciplinary ideas and high-level crosscutting big ideas have become a kind of thought, a way of thinking, and a profound expression of human wisdom. Therefore, the macro high-level big ideas are closer to the goal.

   For instance, the crosscutting concepts in Australia are known as the key ideas or concepts of disciplinary thinking. It can be seen systematically in many curriculum designs, such as math, science, humanities and social science. It is similar to the subject key competences proposed in the curriculum standards in high schools in China.

3 The Key Points of the Implementation of the Curriculum Design Based on Big Ideas

The curriculum design based on big ideas emphasizes the structure of the curriculum and deep understanding of the problems. How to implement such curriculum design and how to arrange classroom teaching can be considered from the following five key points.

3.1 Carriers of Big Units

Every big idea contains truth, a meaning, or a connection. When teachers guide students to learn big ideas, there must be a premise that big ideas are in the teaching system, or in other words, the teaching system provides a carrier for the learning of big ideas. A unit is the best teaching carrier that responds to the thinking of structured curriculum design. Units that carry the big ideas come in three forms: explicit, semi-implicit, and implicit. Explicit means that the discipline core ideas are clearly extracted from the curriculum standards and placed in the pivot of the curriculum system. Then, the compilation of textbooks will design the units based on this. Teachers relying on the units in the textbooks will naturally lead students to understand the big ideas. Semi-implicit refers to the fact that there is no explicit core idea used to design content blocks in curriculum standards or textbooks, so teachers need to adjust part of the content in textbooks and carry out secondary curriculum development. There must be one or a few big ideas in the big units developed by teachers, and the big ideas can be different types of knowledge. Implicit represents the situation that some big ideas will spiral or splice in different grades, different academic sections or even between different disciplines. Such units also require teachers to develop them into virtual units and then purposefully guide students to gradually understand the big ideas in different time periods or courses.

3.2   The Goal of Deep Understanding

The teaching of concept understanding requires factual knowledge because the understanding of concepts needs to be refined on the basis of factual knowledge. The key is whether or not there is a consciousness of this refinement after mastering the factual knowledge; and whether or not there is an intention to design and teach for understanding when designing the learning method of factual knowledge. Erickson and Lanning proposed three-dimensional teaching objectives, which are to distinguish what students must know at the factual level, what they must understand at the conceptual level, and what they can do through cultivate strategies and skills (Erickson & Lanning, 2018). For teachers, the greatest confusion is what students should know and what they should understand. Therefore, teachers should first examine the factual content by general and deep understanding from a high level of the nature of the discipline. Then, in the teaching process, teachers can lead students to learn from factual knowledge to general understanding.

3.3   Potential Learning Materials

Whether or not the teaching content contributes to achieving the curriculum goal of deep understanding depends on if the learning materials can establish a connection with the specified conceptual framework and the fixed point and if they can provide facts, information, and activity design for the understanding of big ideas. Some researchers regard this performance of curriculum materials as curriculum potential. The reason why it is potentially is that "teachers' daily experience tends to narrow their horizons about the potentials of curriculum materials. Teachers are accustomed to believing in obvious explanations of teaching materials, especially those they are already familiar with" (Ben-Peretz, 1975). Designers of teaching materials or other learning materials should have a clear awareness of the big ideas. Although the material does not cover all the disciplinary content, it is highly closely related to the core pivot of the discipline and the fixed point expected to be established in students' minds, and it is distinctive material that can extract meanings. Such learning materials are conducive to achieving goals, and are with potential. However, meanings cannot be expressed directly in textbooks or other learning materials. Therefore, teachers need to dig it out, that is, to determine the understandable and explainable possibilities contained in the materials and present them in teaching.

3.4   Confrontation Between Situation and Experience

The creation of a teaching situation should imply the basic elements of new knowledge and be related to students' experience. The way to connect learners with

knowledge is to directly confront individual ideas with objects, experiences, or other learners' existing ideas (Giordan, 2015). The process of confrontation is the process of deconstruction of the original idea, which is also the process of receiving new knowledge. Situations offer learners the conditions under which knowledge is produced. Different situations or complex situations can provide a deeper understanding of the conditions under which knowledge is produced. However, the situation alone is not enough. Teachers are also supposed to guide learners to abstract the essential features of ideas in the situation, then transfer the trivial and isolated information to general ideas, and store them in the conceptual framework. Such knowledge is more conducive to being extracted and flexibly applied to solve problems.

3.5 Guided Independent Construction

Teaching based on big ideas focuses on students' understanding and acquisition of the core general ideas, and it must be learner-centered teaching. It is essential to help students find the connections between the old and new knowledge, broaden their horizons, discover and understand new knowledge, and be able to transfer and understand across time, culture and situation. Teaching based on big ideas must emphasize the independent construction of students as well as the guidance of teachers. In regard to meaningful learning, Ausubel states that "rote learning doesn't have to be passive, discovery learning can also be mechanical in nature" (Ausubel, 2018). Meaningful learning may occur not only in the discovery method but also in the lecture method. The key is to provide cases and present detailed facts in the process of teaching so that students can clarify the relationship between knowledge and then guide the transition of concepts. Similarly, the discovery method also needs to monitor the process of students' concept transition; otherwise, the inquiry activity may not be a learning process but a lively scene that may not lead to valuable growth.

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Comparative Education in the Era of Globalization: Opportunities, Challenges, Missions

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Baocun Liu and Lingling Zang

Abstract Globalization is currently a mainstream topic of comparative education. In the context of globalization, comparative education embraces new opportunities for development; with the research areas extended, the research horizons broadened, and the research significance increased. Meanwhile, it faces challenges of the transformation of research paradigms and the improvement of educational services. In view of this, China's comparative education needs to develop a new image of globalization, change research areas and horizons, and improve methodological literacy to increase its influence and make more contributions to education; also, it needs to highlight and promote China's educational development by training high-quality talents and participating in global governance, and provide Chinese wisdom for global development.

Keywords Globalization · The belt and road initiative · Comparative education

1 Introduction

Globalization is an important topic in academic research, public policies and even public discourse system. Comparative education, as cross-cultural research, is deeply influenced by globalization because it always presupposes a certain world image (Kobayashi, 1994), which exactly denotes globalization in its current research. Although educational studies or comparative education studies have frequent reference to globalization and explore its influence on the development and reform of education as a setting and opportunity for research shift and paradigm transformation, they seldom delve into globalization by taking it as a self-evident concept. It must make clear that globalization is by no means a one-dimensional concept, and in effect, it is perceived differently by scholars of different backgrounds. Given this,

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it is of particular significance to analyze globalization and its meaning by putting it under diverse contexts.

The term globalization was first coined by Harvard Business School professor Theodore Levitt in "Globalization of Markets", published in the *Harvard Business Review* in 1983, to describe the changing trends in markets and economies affected by technological development. Levitt predicted that the globalization of markets is at hand, in which the global companies that see the entire world as a single entity to sell the same things in the same way everywhere would be the dominant trend of the future (Levitt, 1983). Thereafter, the term spread rapidly and became a high-frequency word. In the early days, it was often referred to in the economic field as a kind of geographical expansion and deepening of international trade. However, with its impact on social development ever increasing, globalization has extended to cover many more fields, such as politics, culture and education, concerning issues such as relationships among different civilization systems, nationality and identity, modernity and postmodernity.

After a comprehensive analysis, David Held and others divided globalization into three theoretical schools: Hyperglobalizers, Skeptics and Transformationalists. Hyperglobalizers argue that globalization is reshaping the world through markets, trade and finance, and new organizations will emerge to replace the economically and politically dominant nation-states at the present time. Skeptics suggest that globalization identifies with a fully integrated global market the extent of which has been exaggerated, as the current level of economic integration worldwide is no better than that in the late nineteenth century (the era of classical gold standard) judged from the "ideal model", and the level of interdependence that has emerged in various fields is not unprecedented. Transformationists hold that globalization is the core force driving the economic and social changes that are reshaping modern society and the world order, but the existence of a singular global system cannot herald the arrival of global convergence and singular world society (Held et al., 1999).

The above analysis of Held represents the developmental stages of globalization and its key characteristics. While Hyperglobalizers and Skeptics both view globalization as a singular, a single process exactly, underscoring the globalization of markets or economy, Transformationists call on a full consideration of how globalization behaves in different areas of society, such as politics, military matters, demographics and culture. With globalization quickening its pace and exerting more on social development, attention has been drawn to the real picture masked by it, i.e. the solidification of the "core-margin" world order. Globalization has led to a new structure of power relations, in which the "core-margin" structure is no longer geographically meaningful but becomes a global stratification in a social sense (David et al., 1999). As Samir Amin points out, globalization has not prompted political and economic ties that can accommodate emerging marginal regions such as Asia and Latin America, nor has it developed a new tie with Africa included. For developing themselves, "less developed countries" must break with the international division of labor prescribed by colonialism and build a self-sufficient society (Wang, 1995).

Globalization is an intricate, multifaceted and contradictory mix. At the technical level, globalization of the economy and the global standards, global markets and

global models it has brought about have enabled worldwide connectivity. At the value level, however, when reviewing from the world order it has shaped, the zero-sum game of Western-centric globalization has not brought about the progress and common prosperity it preaches but has resulted in a further global crisis and decline, as well as a strong opposition to globalization.

Now, it is imperative to free from Western-centric globalization and establish a new type of globalization-holistic globalization dedicated to the common development of humankind. In this regard, when examining the way to advance comparative education in the context of globalization, we need to dissect its reform of paradigms and areas of expansion at the structural and institutional levels and to explore its new missions at the value level, particularly how to highlight its value and function under the new cosmopolitanism concept advocated by the Road and Belt Initiative (BRI) of constructing a community with a shared future for mankind.

2 Opportunities for Comparative Education in the Era of Globalization

Under the globalization era in which economic integration, the rapid dissemination of information and convenient transportation have triggered the adjustment and restructuring of social order, global issues and challenges appeal for concerted efforts of the international community. Meanwhile, "global governance" has become a shared understanding of the world. China proposes that the BRI and comparative education have taken a large leap worldwide. Comparative education thus embraces its new opportunities for development.

(1) Global governance opens up new research areas for comparative education.

"Global governance" gains increasing popularity in the era of globalization for two reasons. First, the development trend of multipolarization calls for a new rule system to govern global affairs. Second, global issues such as environmental degradation, resource depletion and sustainable development must be urgently addressed through multilateral cooperation among governments, international organizations, professional associations and private institutions. In essence, "global governance" aims for good global governance - maximization of public interests, by launching a new public administration approach based on common core values.

In the sphere of "global governance", many new education issues mushroom in areas such as global governance in education, international education aid, education for international understanding, global citizenship education, and education for sustainable development. The issues are named below: What are the ideas and characteristics, the responsibilities of different actors, the models required in global governance in education? How can international education aids be implemented, monitored for effectiveness, and improved? What are the universal values of mankind across races, religions, ideologies and economic development levels, and how can

mutual understanding and reverence among civilizations and cultures be enhanced? How can violent extremism be prevented by education, a responsible global citizen, and law-based culture progress through global citizenship education? What are the components of education for sustainable development, and how can awareness and concepts of sustainable development be developed among the mass and education for sustainable development be integrated into education strategies and action plans of the states? These are marginal areas that were seldom touched in previous comparative education studies or textbooks, but now they are to be urgently studied with the rise of "global governance". It is expected that scholars in the field will fully exert their born advantages in global awareness and comparative vision to engage in the above new research areas and harvest desirable outcomes that are widely acknowledged and conducive to the common development of mankind.

(2) The era of big data entails comparative education to be a basis for national education reform.

Accompanying the rapid development of the Internet and information technology, the world has entered the era of big data. Big data are widely used in every area of the world because of their large volume, diverse types, fast generation speed and great value (Liu et al., 2015). In the case of education, international organizations, represented by the Organization for Economic Cooperation and Development (OECD), are generating big data of international education and trying to determine the so-called "best education practice" by holding large-scale education assessment and survey programs (such as Program for International Student Assessment, PISA, Teaching and Learning International Survey, TALIS, Programme for the International Assessment of Adult Competencies, PIAAC) for the purpose of influencing policy making and reform processes of national education. This directly leads to the convergence of education policies among countries.

In this big data era, educators in each country have to ponder how to analyze and use the sea of education data within reach. In the social sciences, comparative methods have become the best way to obtain scientific "evidence" other than experiments, which are only available in the natural sciences (Andy et al., 2010). Comparative analysis is thus the most powerful tool to interpret massive education data and account for various factors involved in the development of education. In this regard, it is time for comparative education, a discipline counting on a comparative approach, to play its due role in education policy making and education reform in this era. First, it needs to, depending on its traditional strengths with the view that "affairs off campus are more important than those in campus" in mind, examine education phenomena and issues in a broader space and time context and explore how politics, economy, culture and other forces behind education data and facts interact with each other by identifying, explaining and interpreting differences in the midst of convergence. Second, the full-sample research of the big data era is different from the sampling research, which reveals the causal relationship through logical reasoning, so researchers may first process all the data related to a phenomenon and then extract various factors from big data to perform correlation analysis. Research as such is

in bad need of comparative education to provide it with basic concepts and analytical frameworks for comparison and to scrutinize its rationality and validity from a comparative perspective.

(3) The BRI broadens research horizons for comparative education.

Western-centric globalization is essentially a reproduction of the "Law of the Jungle". The logic of "the winner takes all" and long-term inequitable distribution of limited resources have led to unbalanced socioeconomic development and unequal order of the world, i.e. one-dimension globalization (Wang, 2017). Such globalization has plunged the world into an unprecedented crisis: the widening gap between the rich and the poor, the predatory exploitation of resources and the international refugee problem are eroding the sustainable development of human society; the rise of racism and right-wing extremism is splitting the world apart. In this crisis, we need more than ever a new globalization that fully takes into account the common destiny of mankind and brings new paths and possibilities for human development through win–win cooperation. On March 8, 2015, the Chinese government published the BRI. With promoting policy coordination, facility connectivity, unimpeded trade, financial integration and people-to-people bonds as its five major goals, the BRI promotes practical cooperation with other countries along the Belt and Road and works to build a community of shared interests, destiny and responsibility featuring mutual political trust, economic integration and cultural inclusiveness to promote the economic prosperity and development of the countries along the Belt and Road, strengthen exchanges and mutual learning between different civilizations, promote world peace and development and contribute to cooperation with the countries along the Belt and Road (NDRC et al., 2015). The BRI goes beyond Western-centric globalization, and it is a holistic globalization committed to the common development of mankind and building a community of shared future for mankind.

The BRI's goal to build a community of shared future for mankind expands the research horizons of comparative education and brings it new opportunities for development. Assuming the main goal of comparative education is to serve the development of education of its own country by studying educational systems and experience of others, under the BRI, this goal should be changed to serve the development of education of all mankind by mutual learning. This shift requires comparative education to transform from one-dimensional learning into multidimensional learning, which means learning from others and spreading our own success story in education reform and development to the rest of the world so that all mankind may share the fruits of civilization. Among the 60 plus countries along the Belt and Road across Northeast Asia, Southeast Asia, South Asia, West Asia, North Africa, Central and Eastern Europe and Central Asia, many are developing countries and LDCs differing greatly in religious beliefs and cultural traditions. These countries, although previous studies seldom study their culture and education traditions, now become new issues and new missions of our comparative education research under the BRI.

(4) Comparative education worldwide walks toward the revival phase of great development from the plateau phase.

From 1817 onward, comparative education has developed for over 200 years, and since the 1980s, it has walked toward the revival phase of great development from the plateau phase. Primarily, the footprint of comparative education scholars expands from developed countries in Europe and America to Asia, Africa and Latin America. With peace and development becoming the theme of the world at the end of the Cold War, the quickly rising Third World countries represented by China, India, Brazil, etc. have relied on international dynamics to enhance their strength and socioeconomic development, in which comparative education apt at studying foreign culture is rebuilt and developed therein. Next, there is a growing list of societies and research teams of comparative education. As a spiritual home to comparative education scholars, comparative education societies have been successively established at the state and regional levels. For instance, China founded the Foreign Education Society in Shanghai in 1979 and changed its name to the Chinese Comparative Education Society (CCES) in 1983 and to the Comparative Education Branch of CSE (Chinese Society of Education) in 2002, with participants of the biennial academic conferences growing from a few dozen at the beginning to 500 or 600 now. Established in 1970, the World Council of Comparative Education Societies (WCCES) has its member organizations increased from five at the outset to 43 in 2019 (WCCES, 2019). The number of participants of World Congress of Comparative Education Societies has also increased from approximately 300 from 30 countries and regions in the first session held in Ottawa, Canada to almost 1,000 in recent sessions (Masemann et al,. 2007). For example, the sixteenth session held at Beijing Normal University in August 2016 received more than 1,000 experts and scholars from over 70 countries and regions (Chai, 2016). The above growing trend demonstrates the revival of comparative education and has become an unstoppable force for its great development.

The overall revival momentum of comparative education also paves the way for its development in China. Since reconstruction of the comparative education discipline by reform and opening up, China's comparative education has made great progress in terms of research teams, research results and disciplinary development, with the number of Master's Degree Programs and Doctoral Degree Programs in the specialty increased to 44 and 17, respectively, in 2019. These professionals trained strongly underpin the introduction of educational ideas, consultation of educational decision-making, and reform of educational practice. In every major education reform, comparative education will immediately stand out to make its due contributions to the development of education in China. Reviewing the past and looking ahead at the historical moment when comparative education has been founded for two hundred years and reconstructed for forty years in China, comparative education in China will take the opportunity of the globalization era to do something more and make more contributions to the development of education and society.

3 Challenges for Comparative Education in the Era of Globalization

For comparative education, the globalization era is an opportunity but also a challenge. The greatest challenges come from research paradigms and educational services.

(1) Challenge for research paradigms.

Since it was proposed by Thomas Kuhn in *The Structure of Scientific Revolutions*, the paradigm has been an essential concept in building the scientific community and defining areas and development stages of a discipline. "A paradigm is what the members of a scientific community share, and, conversely, a scientific community consists of men who share a paradigm." (Kuhn, 2012) As a collection of values and ways of behavior shared by a certain scientific research group, the paradigm is essentially a theoretical system. Naturally, the research paradigm is not static and will change with the evolution of the era and the discipline itself, thereby heralding a new phase of scientific research. The trasnformation of research paradigms is holistic and pertinent to values, perceptions and methods. In the era of globalization, the conventional research paradigms of comparative education face great challenges in the following key areas.

The first is research areas and horizons. For comparative education research, comparison is a method and an area and horizon, a perspective, a way or basic standpoint of research. Only in this sense is the comparative method unique to the discipline of comparative education. Comparative education undergoes four eras during its development: era of universalism, era of nationalism, era of internationalism, and era of globalism (Kobayashi, 1994). The research areas and horizons of comparative education scholars vary with different eras. In the era of universalism, scholars worked on the reform and development of education in Europe to perfect European education; in the era of nationalism, they examined the education of other countries with their national interests in mind, as Victor Cousin once put that "I'm studying Prussia while thinking of France" (Kobayashi, 1994); in the era of internationalism, the research areas and horizons had expanded from a single country in the previous era to a certain country and its extended world, such as the extended world under the U.S. world policy; in the era of globalism, countries around the world fall into a system that crosses national boundaries in economic, political, regional, cultural and conceptual forms; thus, a new world image of comparative education is required to distinguish from the above models and incorporate globalism. The shift of research areas and horizons, however, is a challenge for our comparative education scholars in that it has an immediate impact on the orientation of research purposes and values, the selection of research objects and contents, etc.

The second is unit of analysis. Comparative education always analyzes the national educational system with the country as the basic unit, which is highly relevant to the formation of modern European nation-states. When the early nation-states in Western Europe were founded, comparative education came into being. At the time, as an

important part of the construction of a modern national system, the construction of a national education system was on the agenda of various countries to discover the "best model" by examining different educational systems. This basic unit, however, is in question in the globalization era, which has opened up educational spaces that are neither "national" nor "institutional" (Green et al., 2010). We have to conduct comparative analysis either at the "supranational" level or the "subnational" level. The former refers to cross-regional and cross-area comparative studies conducted above the national level, with East Asia, North America, Northern Europe and developing countries as the basic units. The study by David Ashton and others on skill formation systems in East Asia and Europe pioneered the supranational level of comparative analysis of skill formation across regions (David et al., 1999). The latter points to cross-regional and cross-area comparative studies below the national level, such as Shanghai and New York, Hong Kong and Paris. Both have reasons to exist: first, the areas or regions selected for analysis have similarities in politics, economy and cultural traditions and can be combined for comparison; second, the emerging multi-education spaces in the globalization era entail a macro and micro exploration of the law of education and teaching of education. Surely, this does not mean that the validity of country as the basic unit is compromised; instead, it reminds us to expand the unit of analysis and enrich the dimensions of comparative research.

The third is research methods and methodology. Conventional comparative research relies on the literature method, which is challenged by the full-sample research data available in the big data era and the increasing demands for refined, standardized and scientific research. Although international exchanges and cooperation, as well as fieldwork in the target countries, are more viable to scholars today, they could hardly output high-quality quantitative analysis and qualitative research results in the field due to insufficient methodological training in the training system of the discipline. This phenomenon has aroused great concern from comparative education scholars, many of whom wrote for diversified and scientific research methods. Pitifully, the underlying problem behind the phenomenon has not received widespread attention in the academic community, namely, little attention and knowledge of methodology. This problem is not unique to comparative education but is common in other disciplines. The methodology is an overall concept and a theoretical system behind the method, involving categories, principles, tools, methods, etc. Dependence on one research method without any knowledge of its methodology is easily trapped in stopgap measures, dogmatism and one-sidedness. In recent years, grounded theory, for example, has been widely used in social sciences research, yet few standardized and high-quality results remain. When applying grounded theory, some researchers formally follow the coding and analysis procedure, but they virtually complete a top-down theoretical verification under a predetermined theoretical framework.

The three-level coding of grounded theory, which is a set of research procedures with internal logic, is reduced to a process of "classification-combination of like items" that ignores the logical connections between genera, and the resulting "theories" seem to be generalized from descriptions of empirical data or existing literature without having to be rigorously coded (Shen et al., 2018). Such research is a kind of

"presupposition and verification" rather than "grounded", and it simply applies the ideas of quantitative research to qualitative research. The reason is that researchers know little about the methodology behind a certain method and cannot acquire the epistemological basis and internal logic of the method in the first place. To this end, while stressing the adequacy and diversity of research methods, it is more important to enhance the methodology literacy of researchers.

(2) Challenge for comparative education services.

Over the past 40 years since reform and opening-up, China has made remarkable achievements in education, with its overall level ranking among the best in the world. According to *China's Education Modernization 2035* published in 2019, by 2020, 13th Five-Year Plan is fully achieved, overall capacity and international influence are strengthened, average years of schooling of the working-age population are increased, and education modernization is advanced; by 2035, achieving overall modernization of education, being an education power, and making China a powerhouse in terms of education, human resources and talents. The vigorous development of education in China has raised more demands for comparative education in the following services.

First, the outcomes and experience achieved by education reform in China should be disseminated. China's education has developed by leaps and bounds ranging from basic and higher education to vocational and private education, both in quantity and quality. The Chinese government and its people have imprinted "China Speed" and "China Experience" in world education. After Shanghai consecutively ranked first in reading, mathematics and science in the PISA in 2009 and 2012, many foreign officials, experts and scholars of education were curious about the secret of Shanghai's successful basic education and eager to copy Shanghai experience in their homeland. In 2014, the Sino-British mathematics teachers exchange program was launched in Shanghai, and in July 2016, the British Ministry of Education announced that it would allocate another £41 million to continue the program, sending 70 British mathematics teachers to Shanghai annually for further study and funding the same number of Shanghai counterparts to the UK for demonstration teaching, with approximately 8,000 primary and secondary schools in the UK involved in this cooperation program (Zhang, 2019). The UK named the mathematics teaching and learning method of Shanghai the "Shanghai Mastery Model for Teaching and Learning" and vigorously promoted it locally. We are experienced in how to learn advanced education concepts and practices from other countries, but we seldom explore how to disseminate our own successful experience in education reform to the rest of the world, tell our stories, articulate our voice, explain our characteristics and build a discourse system to show our achievements in education and cultural charm.

Second, it provides solutions for education reform in China. For a long time, comparative education has contributed greatly to offering educational dynamics of foreign countries and serving educational decision-making, such as providing research and consulting reports and survey materials for preparing the *National Education Plan* and *China's Education Modernization 2035* and high-quality consulting services for educational decision-making by the government. With the

deepening of China's educational reform practice, while working for macro education decisions, construction of political civilization and establishment of a great modern socialist country at the macro level, comparative education also needs to serve educational practice by deepening its understanding of the actual development of Chinese education and working out solutions to educational issues at the pragmatic level. As one scholar points out, "Research of comparative education should bring the latest educational ideas, concepts and methods to classrooms and communities, and researchers in the field should bravely reform educational practice in China and earnestly follow and instruct the changes in classrooms" (Wang, 2007). For this, comparative education scholars have to be well acquainted with educational dynamics abroad and educational issues locally. Many, however, has done better at the former, as the discipline required "looking global" since its inception, so our comparative education needs to focus more on domestic issues that were ignored in the past.

4 Missions for Comparative Education in the Era of Globalization

In view of the aforementioned opportunities and challenges, China's comparative education needs to develop a new image of globalization from two aspects. One is to change research areas and horizons, disseminate and practice the latest educational concepts, improve methodological literacy and promote the knowledge frontier of the discipline to increase its influence and make more contributions to education. The second is to highlight and promote China's educational development by aligning China's development with global changes, training high-quality talents and participating in global governance, and providing Chinese wisdom for global development.

> (1) Changing research areas and horizons, disseminating and practicing the latest educational concepts.

Throughout the history of comparative education, comparative education scholars are among the first to acquire and disseminate the latest educational ideas and practices at home and abroad even in a period when transportation and communication were not well developed, including Marc-Antoine Jullien and Victor Cousin in France, Horance Mann and Henry Barnard in the U.S. The earlier record can be dated back to travelers' observations in the prehistoric stage, when Xenophon from Ancient Greece jotted down his educational insights of the Ancient Persian Empire in *Cyropaedia* (a biography of Cyrus the Great) and compared it with his homeland (Farber, 1979). In China, educational disciplines and modern schooling systems are both established on the basis of learning from advanced educational thoughts and concepts abroad. In 1901, Luo Zhenyu founded *Education World*, China's earliest educational journal, and Wang Guowei translated the first complete

work on pedagogy - Sensaburo Tatibana's *Pedagogy*, both marking the beginning point of pedagogy in China (Qu et al., 2006).

In the globalization era, comparative education needs to change research areas and horizons by allowing for analysis frameworks and units that cover different subjects and issues and to disseminate and practice the latest educational concepts. The technological revolution enables easier access to information to such an extent that everyone may acquire the first-hand information, such as the latest educational data, action plans and reform programs released by countries, regions or international organizations. However, how to screen, interpret and present such information to perceive the essence and extract valuable and scientific expertise is never going to be easy. This calls for long-term academic training and solid professional literacy. Compared with other disciplines, comparative education is more concerned with the latest educational concepts and the frontier of the world's educational reform, and scholars of this discipline, with proficiency in history, current situation and characteristics of cross-cultural education, are more capable of scientifically and effectively disseminating and practicing these latest educational concepts. Therefore, it is more important for comparative education to fully exert its advantages and lead to the development of educational discipline as an explorer, disseminator and practitioner of the latest educational concepts.

(2) Improving methodological literacy and promoting the knowledge frontier of the discipline.

From the epistemological perspective, be the origin of knowledge is experience or reason, comparison is an important way to generate new knowledge. Any knowledge cannot be separated from comparison, now that we always recognize, accept or reject new things in comparison, either with our own experience or with our established knowledge, and that recognition is itself a comparative recognition in terms of its occurrence mechanism. For the origin of the discipline, comparative education is derived from the curiosity and desire of mankind to explore knowledge of unknown fields. In terms of the research process, before learning from others, we have to refine their characteristics of education, summarize their laws of education and discover the educational models conducive to human development, which are actually explorations of the knowledge of the education discipline. As one ever put, "there can be no generalizing scientific study of education which is not the comparative study of education" (Farrell, 1979). If the education laws of others are not refined and summarized, how and what can we learn from them? Those who mistakenly equal comparative education to a simple translation and direct coping are in fact make a groundless assumption, and they are jumping to conclusions without any knowledge of the logic of the discipline.

In this era, knowledge becomes the new growth point of the economy that drives the development of the modern economy and society. The knowledge economy emerges as a concept corresponding to the "agricultural economy" and "industrial economy", marking the advent of a new era that fuels social development mainly by human knowledge and intelligence. Comparative education, by its discipline features,

has born advantage in knowledge innovation. Scholars in this field, therefore, need to consciously improve their methodological literacy, devote themselves to knowledge innovation, and take the perspective of international comparison to examine various education issues by exploring, discovering, constructing, testing educational theories and practices and summarizing laws of educational development to define new knowledge by means of comparison, as the saying goes that "genuine knowledge comes from comparison". Additionally, they need to break the fetter of conventional research methods and paradigms and promote the frontier of disciplinary knowledge by inventing concepts, frameworks and theoretical models based on analyzing educational theories and practices of the world and of the international community in comparison to make new and original contributions to the development of the discipline.

(3) Training high-quality talents and disseminating China's experience and voice.

As a university discipline, one of the important tasks of comparative education is to train high-quality talents with international perspectives. Previously, the training focused on language proficiency and professionalism, while in the present era in quest for disseminating successful experience of China's educational reform and building an educational discourse system with Chinese characteristics, the training objective shifts to train a host of high-quality international talents who are conversant with both Chinese culture traditions & education and international rules and who may engage in international affairs and international competitions. Such talents include professionals with global competitiveness and those specializing in national and regional research, international organization, global governance in education, international education exchange and international education leadership. Given this, comparative education needs to renew its goals, contents and models.

Meanwhile, as a top-level national initiative, the implementation of the BRI is largely dependent on high-quality talents, which in turn relies on education. Education plays a fundamental, overall and guiding role in the BRI, as educational exchanges build bridges for people-to-people bonds and talent training underpins policy coordination, facility connectivity, unimpeded trade and financial integration. In addition to outputting international talents who are proficient in the languages and cultures of the countries along the Belt and Road for educational exchanges and cooperation, comparative education can also train teachers, scholars, young elites and even future leaders for the countries concerned. Comparative education needs to, relying on its training strength, expand and strengthen the pattern of educational aid for the common development of education, and help attain the BRI goals.

(4) Highlighting and promoting China's educational development and working to solve China's problems.

According to Mr. Gu Mingyuan, China's comparative education pays more attention to the education systems of other countries and less attention to curriculum reforms and talent training models (Gu, 2015). It has long focused more on the educational systems of countries abroad and the latest international reform trends to serve

educational decision-making and educational reforms at the macro level, ignoring the changes occurring in campuses and classrooms, especially educational practice in China. Over the past 40 years of reform and opening-up, China enjoys speedy development and overall level improvement in education, but many new problems surface, including efficiency and equity, scale and quality, imbalance and disorder, etc. Therefore, it is a new mission of comparative education in the globalization era to highlight and promote China's educational development, endow it with a global perspective and devote it to solving China's problems.

The problems China encounters during its educational development are pervasive in many other countries. They are not unique to China and are closely related to the country's society and national conditions. To solve these problems, comparative education researchers must determine the national and regional backgrounds and methods, effectiveness and causes of solutions. Meanwhile, they have to delve into China's education until they discover the universality and particularity of such problems in China from the perspective of Chinese cultural traditions, values and specific national conditions and provide China-featured solutions for educational reform, which will be tested and corrected in practice.

(5) Participating in global governance in education and providing Chinese wisdom for global development.

As an essential component of global governance, education plays an increasingly prominent role in the process of globalization, as it disseminates knowledge and trains talents and promotes the inclusiveness and understanding of multiple cultures to prevent wars and conflicts. For the discipline and scholars of comparative education, care for the people worldwide is a must when participating in global governance of education, and another key mission of comparative education in the globalization era in addition to exploring educational knowledge and reforming education locally. Consequently, scholars of this discipline should not "conduct research for the sake of research" and of "development of domestic educational reform" alone but also "for the sake of educational development in the rest of the world and of improved education for all mankind" (Zhang et al., 2017).

First, comparative education needs to provide theoretical support for and actively participate in the process of global governance of education. By analyzing education phenomena and educational problems across countries and regions, comparative education may discover the common problems and individual differences they face and further draw a dynamic map of global educational development based on their respective historical development, economic levels and culture traditions, with a view to providing basic data for global governance of education and theoretical reference for its concept, mechanism and model innovations. Meanwhile, as an academic community with obviously outward-looking characteristics, comparative education needs to join the process of global governance in education and become a major force therein.

Second, comparative education should work to tackle global education issues through international cooperation. The world today is not developing evenly, and

many countries and regions are still trapped in problems such as a high adult illiteracy rate, low access to education for girls and inadequate school education systems. As a responsible country, the Chinese government is taking an active part in the global governance of education, providing support for global education development in many ways, such as labor, supplies and finance. As a forum for international educational exchange, comparative education should continue its efforts to build a platform and bridge for international educational exchange and cooperation and build a knowledge system, ideology and wisdom for action jointly built and shared through policy consultation, exchanges and visits, cooperation in running schools and others to provide Chinese solutions and Chinese wisdom to global education issues.

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Situation: Essence, Characteristics and Construction—An Analysis of Distinguished Educator Li Jilin's Outlook on Situation

Canming Wang

Abstract Situation is both a logical starting point and the theoretical core of situational education. A study of the works by Li Jilin, founder of situational education, helps us clearly understand the rich and penetrating concept of situation contained in her educational ideology. Li Jilin advocated that the situation was in essence an "artificially optimized environment." Thus, the situation is a living space full of educational connotations, and a multidimensional and interactive psychological field; additionally, it is an educational field blending scenarios and a targeted situation with subjective, constructive, series-based and open features. According to Li Jilin, the situational construction follows the principles of faithfulness, growth and aesthetics: The principle of faithfulness emphasizes faithfulness to the textbook, and focuses on the goal and content of situational construction; the principle of growth stresses the real experience from children, and focuses on the approaches to situational construction; and the principle of aesthetics attaches importance to the nourishment of art, and focuses on the forms and functions of situational construction. This is a valuable treasure Li left to teachers.

Keywords Li Jilin · Situational education · Constructed situation · Situated learning

The thoughts of situational education proposed and promoted by Li Jilin, a respected children educator in China, has been included in the new curriculum standard for many subjects, such as Chinese and mathematics, in primary and middle schools. In 2014, she won the only special personal award of the First National Award for Teaching Achievement in Basic Education for "Curriculum and Practice for Children's Situational Leaning", which was also acclaimed as "the magnificent picture of education reform in the new era" (Tao, 2016). In June 2019, "emphasis on situational teaching and learning" is clearly stated in the "*Opinions on Deepening Education and Teaching Reform and Comprehensively Improving the Quality of Compulsory Education*" formulated by the Central Committee of the Communist Party of China and

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the State Council, showing new expectations and demands are attached to situational education as it is incorporated into the decision-making document of government for the first time. However, people hold different opinions on the definition of "situation", which is often confused with terms like "scene", "context", "field", "domain", or "experienced or embodied environment". What exactly is a situation? What is the feature of situation? How should it be constructed? To answer these questions, we need to review the educational thoughts of Li Jilin to clarify the origin and source of the concept of "situation" so as to forge ahead with new insights. For this purpose, the author collected Li's relevant writings and used a text reading method to splice these thought fragments together to restore and interpret Li's views of situation for further study and full promotion of Situational Education.

1   The Essence of Situation

Li Jilin's views of situation, as a profound understanding of the concept, nature and characteristics of situation, are shaped in her long-term experiments and practices of situational education. We should first sort out her concept of situation and clarify its connotation and denotation to gain an insight into her views of situation.

1.1   The Historical Evolution of Situation

As an educator growing up from practice, Li's views of situation are gradually deepened with the practice of situated learning. In 1978, when the Reform and Open-up Policy was fully implemented in China, Li, who had experienced difficulties, returned to the post of Chinese teacher at an elementary school. She found that the empty and tedious analysis and explanation of texts fragmented the teaching of Chinese, and children's lives were awash with endless and repeated exercises, transcription, and ill-understood recitation. Therefore, she started to think about the transplantation of "situated learning" widely used in the learning of English to the teaching of Chinese (Li, 2016). In the first practice of situated learning in the classroom, Li led students to compose the dialogues between a role, Xiao Hong, and her mother. To her surprise, the students quickly and vividly described Xiao Hong's expression. She realized that if some scenes of life familiar to students can be created, it will definitely promote their thinking and expression and help them better understand what they learned. During that time, she frequently used the word "context" in her papers instead of "situation", mainly referring to some stories, places of events or some parts of role-play. However, soon afterwards, she realized that the meaning of "context" in the Western context is quite different from that of "situation" in Chinese. A "context" was passive and mechanical for the lack of depth and breadth. In order to explore the local way of situated learning in line with the Chinese culture, it must be nourished from the theory of "Artistic Conception" flourished in Chinese classical literature.

Li learned from Liu Xie's "*Wen Xin Diao Long*" (in Chinese Pinyin) that "emotion is inspired by things, and words are expressed out of emotions", and then she perceived the conversion mechanism between "things" (objective things), "feelings" (emotional activities) and "words" (verbal expression), and found a new way of composition teaching where thinking is inspired by expression out of emotions that are motivated by objects. As a result, Li completed the transformation from "contextualized learning" to "situated learning", where the blending of feeling and setting characterized the distinction between "situation" and "context".

Some scholars define situation as environment. Li disagreed with this simplistic approach that ignored the interaction between humans and the environment. So she applied the Marxist principle of the dialectical unity of human beings and the environment as the philosophical basis for situational education. Marxism holds that the relationship between humans and the environment is dialectical unity. The environment restricts and dominates the development of human beings, but humans are not slaves at the discretion of the environment. She made a proposition of artificially optimized environment, where humans are the objective being of environment and the environment is the objectification of man's essential power. From the perspective of Marxist philosophy, Li believed that the "situation" in situational education is an environment that encourages children to actively move. This kind of environment, optimized according to the goal of education, full of beauty and wisdom, will resonate with children's emotions and psychology, and promote children to achieve all-around development in the unity and harmony of the interaction between the real environment and activities. In this artificially optimized environment, the unity of active activities of the subject and the real environment, the stimulation of children's potential and the shaping of children's behavior, and finally the overall improvement of children's abilities and the full development of personality can be achieved (Li, 1997). She believed that the essence of the situation is the "artificially optimized environment", and elaborated on the purpose of artificial optimization and the psychological mechanism of optimal situation to promote children's development. If it can be said that the theory of "Artistic Conception" in Chinese classical literature highlighted the humanity of situational education, then the Marxist principle of the dialectical unity about human and environment has enhanced the scientificity, and the integration of the two achieved the unity of scientificity and humanity of situational education.

1.2 The Connotation of Situation

For the "artificially optimized situation", Li has made different interpretations on many occasions, although there are differences in research horizons and expressions, its connotation is basically the same. In general, an "artificially optimized situation" is a living space full of educational significance and a psychological field of multidimensional interaction. It is also an educational field where objects and emotions are blended and a targeted situation in which idea dwells.

First of all, an "artificially optimized situation" is a living space full of educational connotations. The contemporary Western philosophy advocates the transcendence of epistemology, moving towards ontology and emphasizing returning to the living world. Li thought the reason why the dual conflicts between the abstraction of textbook content and the concretization of students' cognition, between the standardization of training mode and the individuation of students' development in contemporary education were caused is that the rationalistic examination-oriented educational model castrated educational objectives, the walls of the school and the doors and windows of the classroom blocked the connection between education and life, making children's living space smaller and more monotonous. Therefore, education must go back to life to steer out of these troubles. Li drew inspiration from E. Husserl's "life world", A. Heller's "daily life" and K. Marx's "real life world", and proposed the concept of "living space", which mainly refers to the external world that an individual can perceive and experience at a specific time. Every area where children live is a source of education. Only by combining the in-class and out-of-class activities, connecting school with society, interacting the teaching activities with social events can open more windows for students to know the world. Li proposed that efforts should be made to create a "clean, beautiful and intellectual" environment of campus, a "beautiful, intelligent and interesting" situation of teaching and an "intimate, helpful, happy" situation of interpersonal interaction, thus constituting a synchronized and coordinated artificially optimized situation. Therefore, an "artificially optimized environment" is no longer a primitively objective environment but a living space selected or optimized by teachers. It focuses on the goals of teaching and fills with virtue, wisdom and beauty, with enough uniqueness and directionality to change children's spiritual world.

Secondly, the "artificially optimized environment" is a psychological field of multidimensional interaction. If the living pace is the external environment for children's development, then the psychological field is the internal environment for their growth. Lewin proposed a famous formula for human behavior: $B = f (PE)$. where f is a function, B is behavior, P is people, and E is the environment (Lewin, 1997). According to this formula, individual's behavior depends on a specific psychological field, and is the result of the interaction between the subject's needs and the psychological environment. Situational teaching is supported by Lewin's theory and expanded by some successful experiments. Li pointed out that the psychological field constructed in situational education consists of multidimensional interactions between children, teachers and situations. The teaching situation of "beauty, intelligence and interest" inspired students' curiosity and desire for knowledge and made them actively participate in teaching while the teachers, by enjoying the happiness of teaching in the personal involvement,putting their hearts in teaching with more enthusiasm and then constructed a multidimensional interactive psychological field among students, teachers and the situation, continuously improving and optimizing the cognitive structure of students, and promoting their self-realization and self-transcendence.

Thirdly, an "artificially optimized environment" is an educational field where emotions and objects blended. A big gap lies between the concepts of "situation" in

Chinese and Western context. "Situation" is a single word in Western. However, it is a compound word in Chinese that can be divided into two words: "emotion" and "object". Based on the cultural tradition, Li believed that the "feeling" mainly refers to "emotion", "mood" or, "temperamental interest" sometimes, while the "environment" refers to the "artistic conception", "realm", "scene" or, "field" occasionally. By integrating the "emotion" and "object", the "situation" has been understood as a kind of educational field infiltrated with emotion, full of sentiment and interest. Although the word "situation" in the Western context sometimes contains emotion, it is mainly a concept of space. By contrast, "situation" in situational education sometimes points to space, but more essentially, it refers to emotion. At the beginning of the exploration of situational education, Li carried out the reform of composition teaching by transplanting the situated learning in foreign language teaching, and she often used words such as "scene" and "field". Soon she quickly got enlightenment from "Artistic Conception Theory" and realized the importance of "artistic conception" and "realm"; and "the integration of emotion and situation with priority given to the realm" becomes Li's education belief throughout her life (Li, 2007). The relentless exploration of situational education made Li pay more and more attention on emotion. At first, she thought emotion as a "motivator" for situated learning (Li, 1981). Later, she regarded it as the "link" in situated learning (Li, 1996). Ultimately, she counted it as the "lifeline" of the theory of situational education (Li, 2011). In her view, only the "scenes with emotion embodied" can be the source power (driving force) of situation. If it is purely a material existence without human emotions, such an "emotionless situation" cannot lead to the "artificially optimized environment".

Fourthly, an "artificially optimized environment" is the targeted situation in which idea resides. Situation is not an isolated system but a shared and open one. It is composed of a number of specific and interrelated scenes. Idea as the soul of situational conception runs through the whole process. "Without idea, situated learning is like an empty and colorless flower rack, having no pillars. It can't stand up and go deep" (Li, 1991). In Li's view, the pictures, music, objects, performance, language and life, on which the construction of a situation is based, are the expressed forms of the situation, and the thoughts and viewpoints shown through the text are the ideas implied by the situation. For example, the text of "Guilin Landscape" shows the magnificent mountains and rivers of the motherland, and the text of "Zhan Tianyou" expresses the author's patriotic feelings. The situation should serve the idea, the idea should be realized through the situation, and situated learning should pursue the blending of the idea and the situation. Why did Li emphasize the situation in which "the idea dwells"? Because she hoped that teachers may choose the appropriate teaching means to construct the situation according to the central idea of the text. Therefore, the teaching design should be a routine of "abstract concept—imagery situation—abstract idea". Thus, students can gain the vitalized idea through images and emotions, and they would not stop at the superficial phenomenon but explore and reveal the nature and laws of things through the phenomenon. Thus, this is a kind of targeted situation in which the idea resides.

The connotation of the "artificially optimized environment" is analyzed from the above four aspects. If we can say that the living space with rich educational significance is the optimization of objectives, the psychological field of multidimensional interaction is the optimization of subject, the educational field where emotions and objects meet is the optimization of approach, and the targeted situation in which idea dwells is the optimization of effects, then we can draw that "artificially optimized environment" is a systematic optimization from objectives, subject to approach and effects, therefore showing its obvious difference from "scene" and "environment", and demonstrating the integrity of the connotation of the situation.

1.3   The Extension of Situation

The extension of the situation refers to the specific scope of the situation, which can be reflected by the reasonable classification of the situation. According to the stimulating effect of the situation on students' sense organs, Li divided the situation into five categories: the first is the physical situation. It is a situation based on the original form of an object. Because it can be seen and touched, it gives people a real feeling and deep impression. The second is the simulated situations. It is a situation constructed in the form of models, pictures, music, and role play that reproduces a solid archetype or process of activity. Although the simulated situation is not as concrete and realistic as the physical one, it can generalize, transform, deform and artistically restore object prototypes according to teaching requirements, highlight key features, make the situation realistic, vivid and easy to understand, and even achieve better teaching results than the physical situation. The third is the verbal situation. It is a situation based on language description that requires teachers to describe specific situations vividly and accurately by means of language and stimulate children's warm emotions and rich imagination through meaningful analysis, image description, speed of speech and rhythm changes so that they can feel the meaning carried by the situation. The fourth is the imaged situation. It is, based on the experience of children, a situation formed by a new combination of the representations in their minds. Through the children's imagination, the thinking space can be extended to form a far-reaching artistic conception of the situation. The fifth is the reasoning situation. It is accompanied by the image analysis and synthesis, judgment and reasoning activities, to help children proceed from one point to another, from the outer appearance to the inner essence so as to recognize the essential properties of things (Li, 1990). It is not difficult to see that Li not only emphasized the real situation but also paid attention to the virtual object, not only the artistic intuition but also the verbal description, not only the inspiring imagination but also the logical reasoning, thus constructing a situation system that integrates subjects and objects, structures and functions. Based on the development of modern educational technology, Li in her later years proposed strengthening the study of game situations and network situations, expanding the path of situation construction

with virtual reality technology, which demonstrated the theoretical development that keeps pace with the times.

2　Characteristics of Situation

To promote the scientific nature of situational education, Li devoted herself to the study of philosophy, psychology, aesthetics and even drama and other multidisciplinary theories, absorbing academic nourishment, and through rooting in the fertile soil of education reform to perceive, reflect and integrate, and finally proposed the unique theory of situational education. First, Li actively paid attention to the language art of drama performance and has repeatedly consulted famous performing artists such as Qin Yi, Zhang Ruifang, Huang Zongying and Bai Yang on how to improve the visualization and visibility of language. She studied Stanislavsky's theory of acting and drew on his concept of "given situation" (Yan, 2002). From this, she realized that the content of the textbook is the objective basis of the situation construction, while the mental state of teachers and students is the subjective basis. Only through comprehensive consideration can a reasonable situation be created. Second, Li has followed the trend of situational psychology for a long time and paid attention to its development. She noticed that the situation in the light of behaviorism means the situation to the stimulus of the external environment, but social learning theory proposes that situational stimuli do not automatically cause behavior. Only when people's mental abilities are activated can the situation play a role (Ye, 1990). She realized that situated learning mainly depends on the interaction between children and situations. Finally, Li intensively read Dewey's works and devoted herself to his educational thought. In the history of education, Dewey took the lead in introducing the term "situation" into educational research and interpreted it as a "specially chosen environment" that stimulates children's thinking. "The materials and methods based on this choice are particularly able to promote growth in a satisfactory direction." (Dewey, 1990). Dewey's thought consolidated Li's confidence in exploring situational education. Through experiments and practices, she summarized the basic process of situated learning, and implemented the situation throughout the teaching process, and constructed a remarkable situated teaching model. Although there is some relationship between teaching situation and drama situation, psychological situation and experience situation, it is a dynamic structure constructed by teachers and students, an optimized situation of knowledge embodiment, a series of related situations, and an open system returning to life. The feature structure of the situation is shown in Fig. 1.

Fig. 1 Feature structure of
situation
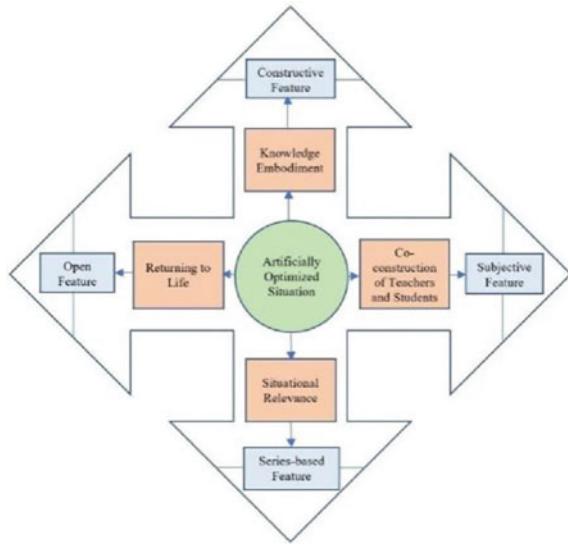
2.1 The Dynamic Structure Constructed by Teacher and Students Together

Li's view of situation is constantly developed in the experimental research, and her understanding of the situation is constantly iterative. She first proposed "situational creation", focusing on the leading role of teachers, and later she changed it to "situational design", attaching importance to the scientific nature of the situation. In her later years, she advocated "situated construction", emphasizing the construction by teachers and students together. As a matter of fact, the first practice of "situated teaching" was to simulate parent–child dialogue, in which students played the role of a daughter. This situation was jointly constructed by the teacher and students, although advanced ideas were not recognized at that time. Professor Lu Jie pointed out that situational education is the "process of constructing situations jointly by teachers and students". It is an active rather than passive process, a dynamic rather than static structure, and an interaction between the teacher and students rather than a subject-object restriction (Lu, 2011). Based on the case study, professor Wu Kangning also found that students are not only enjoying the situation but also creating the situation, "they continue to create situations with teachers, in which teachers and students work together and grow together" (Wu, 2018). The co-construction of the situation is conducive to eliminating the absolute authority of teachers. If teachers will no longer prescribe the "standard answer" and the "right way" to the standard answer, the students' unique experience and creative potential can be maximally stimulated, and their ability to question, imagine, think, and their emotions and personality can thus be fully presented in the educational scene, becoming the most dynamic factors in the situation to realize the common growth of teachers and students.

2.2 The Path Design of Knowledge Embodiment in Situation

The contemporary theory of knowledge holds that most knowledge is situation-dependent, and it is always generated in a specific situation. Knowledge generated in different situations will represent different meanings. However, schools have been imparting knowledge in isolation and abstraction, leading to the emergence of "inert knowledge". "Fresh and interesting knowledge, as it should be, becomes a simple abstract symbol, far away from life, turning unfamiliar, lonely and neglected" (Li, 2009). This knowledge can be used for "examination", but it is difficult to solve problems in reality. Only the knowledge was embodied in a specific situation can it be understood and transferred by children. The first is that the knowledge is embodied in real situations. Li not only attached importance to the selection of the real life situation but also the representation of the real situation by a simulated situation. Because the information of the real situation may be too complicated·, leading to obscuring the essence of things, the simulated situation can discard the dross and keep the finer part, remove the false and retain the true, and highlight the essential connection of things through simplification and typification of information. Therefore, she strongly emphasized that the simulated situation should be similar to the physical situation, and it should be full of authenticity. The second is that knowledge is embodied in the situation of beauty. Li put forward the idea of "introducing art to the teaching in classroom" very early, carried on aesthetic education through the construction of the situation and thus refined the "aesthetic principle of teaching" (Li, 1998). After years of experiment, she discovered that if artistic means such as pictures, music, and performances can be organically combined with the teacher's verbal description, the situation can be optimized effectively, and the knowledge can be embodied in the aesthetic situation so that the students would go to the palace of science with a pleasant aesthetic experience. The third is that the knowledge is embodied in the situation of activities. Inspired by Wang Guowei's division of "self-contained realm" and "selfless realm" in "The Notes and Comments on Ci Poetry", she actively advocated role play, field observation and situational thematic activities and promoted experiential learning, cooperative learning and research-based learning to help children master knowledge and develop their intelligence in a "self-contained environment".

2.3 A Series of Interrelated Situations

Frankly speaking, people are not unfamiliar with the situation. Many teachers use it to lead in new lessons and stimulate learning motivation. The difference is that the construction of the situation throughout the process of situated teaching. Li summed up the basic process of situated learning as "bringing students into the situation–optimizing the situation–relying on the situation– broadening the situation" (Li, 1998). The situation here is no longer a single factor but is a group of continuous situation associated with each other. For example, in a practice of situated teaching

of "Locating", Huang Jiaoyan, a teacher of Haimen Experimental Primary School, designed an interlocking "situation chain" of treasure hunting around the theme of the maritime position of the Somali pirates, the Chinese fleet and the Russian fleet. All of the knowledge in the textbook were been embodied into a problematic situation with small problems in big problems. Through the solution of challenging problems in situations, children constantly explored and used knowledge, which fully demonstrated the charm of situated learning. With the design, Huang won the first prize of the Excellent Course Competition in Jiangsu province. The seriality of situations is a major difference between Li's situated teaching and Dewey's ideas of situated teaching.

2.4   The Open Systems Returning to Life

According to the theory of dissipative structures, system does not exist alone. It includes three types: isolated system, closed system and open system. The isolated system has neither material nor energy transfer with the environment. The closed system, although it has no material transfer with the environment, has an energy transfer. Only the open system marks both material and energy transfer with the environment (Lu & Peng, 2016). From this point of view, we can find that the traditional view of "school as a special place for imparting knowledge" made the symbolic cognition cut off children's life experience, entailing knowledge increasingly abstract, and cognition increasingly difficult. Classroom has become an isolated system lacking material and energy transfer. It is easy for students trained by this isolated system to inherit knowledge, but it is difficult for them to innovate knowledge. In this regard, Li was worried. In her opinion, situational cognition and the life world are heterogeneous. The artificially-optimized situation should expand the educational space back to the life world, leading children out of the classroom and school campus, extending to the family, society and nature. Only in this way can the ever-changing social life and colorful nature directly affect their mental development, and with the expansion of their cognitive vision, they can constantly expand their thinking space.

From the above analysis, it is not difficult to find that the co-construction of situation by teachers and students demonstrates the subjectivity of situation, the embodiment of knowledge reflects the constructiveness of situation, the contextual relevance presents the seriality of situation, and returning to real life reflects the openness of situation. This is the fundamental reason that situational education has achieved remarkable results, and also the "gene code" of situational education, laying a theoretical foundation for us to reveal the basic laws of situational education.

3   The Construction of Situation

Although it is important to clarify the connotation and characteristics of the situation, the key is how to practice. The situation in situational education is not the objective environment in general sense, but an "artificially optimized environment", which should be carefully constructed by considering the authenticity of the image, the infectiousness of emotion, the pleasure of aesthetics, and the breadth of the artistic conception. Li summarized the main ways of situated construction, including physical demonstration of situations, life display of situations, reproduction of situations with pictures, rendering of situations in music, experience of situations in performance and description of situations with language. All of these are rooted in situated teaching experiments, and have been favored by frontline teachers as soon as they were proposed. In the last few years of her life, Li realized that the rapid rise of modern information technology would bring vitality to situational education. She cannot wait to put forward the situations of game competition and network development to supplement and expand situational construction (Li, 2018). (See Fig. 2).

Through combing and analyzing the literature, we can extract three key points of situation construction. Situation construction should be rooted in real experience, grasped the characteristics of teaching materials, and enhanced the aesthetic realm.

3.1   Focus on Using Children's Real Experiences

There are two results produced by the interaction between humans and the environment: for humans, the result of this interaction is "experience"; for the environment, it is "situation". The internal connection between the situation and the experience lies in that experience is formed and acquired in the situation, and the situation is constructed and extended in the experience. Since Dewey proposed "education is the transformation of experience", modern educational theories have attached
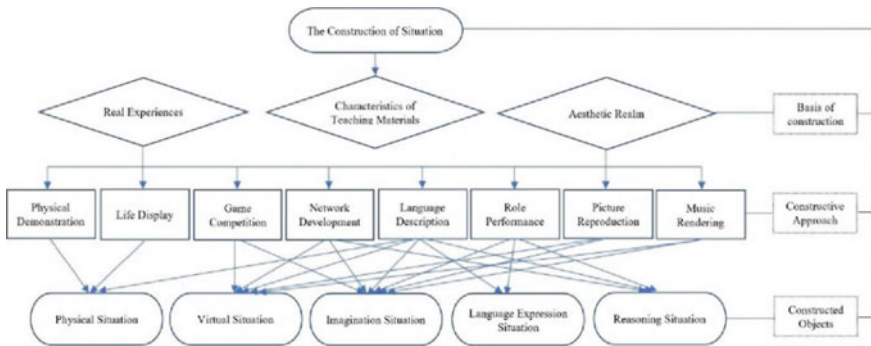
Fig. 2   Situational construction

great importance to the role of experience. In this regard, Li Jilin deeply felt that closed classroom teaching hindered children's experience, willfully cutting off the source of their cognition; therefore, situational construction must focus on children's real experience. The first thing is the life experience. Li actively sought an effective link between education and life, and made the proposition of "life reveals situation" to guide children to engage in reflection and reconstruction of meaning through dialogues in the exploration of life experience. The second is the community experience. The community is not only a bridge connecting individuals, families and society, but also a growth paradise for children, where they play, explore and socialize and expand their horizons because they go out of the house. Reasonable use of community experience is thus an effective way to promote children's development. The third is field experience. Li pointed out that nature is a must-read "encyclopedia" for children. "The abundance of their gains, the breadth of their thinking, and the depth of their understanding in the vast field can never be achieved by classroom teaching" (Li, 2008). She organized the students to carry out field activities —from a small river, a small bridge and a piece of farmland beside the school to the rippling Haohe River, the flowing Canal and the surging Yangtze River, and summarized three principles of "nearness, beauty and width" for field selection, so that nature becomes the cradle of children's dreams and happy growth. From life experience to community experience and then to field experience, all of them are the continuous expansion of children's living space and the constant extension of their psychological world. It is in this process that children can acquire "active knowledge" that they can experience, comprehend and use.

3.2 Focus on Presenting the Prescribed Situation of the Textbook

In the practice of situated teaching, some teachers paid too much attention to the form of the situation and ignored the teaching goal, overemphasized the situational technology and ignored teaching content, overstressed on the novelty of situation and neglected the teaching effect. Li pointed out that situated teaching is only a teaching method, "Whether it is necessary to set up a situation, and what kind of situation to set up, and in what form, must be based on the characteristics of the textbook and teaching requirements" (Li, 2016). Only by accurately grasping the characteristics of the teaching materials can we construct the situation. First, the situational means should be chosen based on the tone of the text. A good lesson will construct a situation with uniform tone rather than haphazardness, which is usually determined by the writer's style or the central idea of the text. For those texts with cheerful tones, performance may be applied to help students experience the situation, while for those with quiet and sad tones, pictures could be used to reproduce the situation for children. If the situational tone and the textual tone are misaligned, it will lead to counterproductive effects. Second, the form of situational construction should be

based on the understanding of the author's setting of situation. As Ye Shengtao said, "The author has a sense of situation in his mind and we can only approach to his intention by going into such a situation." The creation of each work has its own situational setting. If the students can be led to be on the scene, they can better understand the characters, ideas and inner feelings of the text (Li, 2013). Vivid simulation of the situations is required to go deep into the writer's mind for the thoughts and feelings between the lines through the reproduction. Third, the teaching situation should be optimized based on the important and difficult points of the text. The construction of situation should serve the teaching goal and the key is that teachers should carefully study the textbook, meticulously conceive and continuously improve based on the key points and difficulties of the textbook to achieve the objective of "low consumption and high efficiency" in teaching. In this regard, professor Wang Cesan gave a high praise, "Situated teaching takes the textbook as the basis and aims to the requirements of the textbook, avoiding the one-sided pursuit of perceptual and emotional activities while neglecting or even sacrificing the scientific level, and also guaranteeing the level of emotional and artistic cognitive activities." (Wang & Gu, 2011).

3.3 Focus on Promoting the Aesthetic Realm of the Situation

Our classroom teaching which was deeply affected by the traditional thought on education, emphasizing more on rationality, is more scientific than artistic, making it tedious and boring. To solve this problem, Li proposed "the artistic situated teaching". In her opinion, although teaching and art are two different categories, the beauty contained is common. She stressed the construction of the situation with various artistic forms so that students are also nurtured by beauty while mastering knowledge. The first is the visual arts. Li once invited Fan Zeng, a master of calligraphy and painting, into the classroom. When students saw the portrait of Li Bai (famous poet in ancient China) created by Fan Zeng, they could not help express their admiration from the bottom of their hearts and soon wrote a vivid composition. Li advocated "reproducing the situation with pictures" and practiced simple drawings, clip art and text illustrations to perfect, bringing students into the situation described in the textbooks quickly. The second is auditory art. If the information is embodied in music or rhythm, the recollection would be enhanced. Repeated tests of the "Mozart Effect" have also shown that almost all music can make people's attention more focused, thinking more agile, and brain functions more powerful (Campbell, 2013). The third is audiovisual art. Visual art and auditory art are both antagonistic and common, and their effectiveness is far greater than the artistic appeal produced by a single visual or auditory presentation. Situated teaching emphasizes the "experience of situation in performance" and focuses on the comprehensive application of audiovisual arts such as film and television, drama and dance. As a result, the cognitive process is simplified and deconstructed through situated teaching, and the teaching content can be restored and reconstructed with artistic techniques, which promotes the unity of

the scientific and artistic nature of teaching and makes the classroom full of aesthetic taste and artistic atmosphere. Then, the classroom would be a place where children have an insatiable desire for learning.

In short, returning to the origin of situational education, we found that Li's educational thought contains a rich treasure of situational outlook, which also provides useful enlightenment for better research and development of situational education. First, situation is not a descriptive but a normative concept. The "situation" in the situational education system points to an "immersive context" and an "artificially optimized environment". It is an educational situation with rich connotations. Some people divide situations into positive and negative situations and effective and ineffective situations. At first glance, there is no logical problem, but after careful study, we may find that it is a prejudice and misinterpretation of the situation. Second, situation is not an imported product of educational theories from Western countries but a local expression of national culture and practical wisdom. Situational education has drawn lessons from Western philosophy, psychology, aesthetics and pedagogy, but most of its theoretical nourishment is drawn from the "Artistic Conception Theory" in Chinese classical literature, which is creatively applied to the teaching reform in elementary schools to weave the teaching situation where emotions and objects are united. Finally, the construction of the situation is not a conclusion based on the partial understanding of education, just as blind men feel an elephant, but based on much evidence. Li clearly proposed the "five types" of situation and the "eight ways" of constructing a situation, which also should follow the principles of faithfulness, growth and aesthetics. By following the principle of faithfulness which emphasizes loyalty to textbook, the goal and content of constructed situation are clarified. By observing the principle of growth in which the construction should be based on children's real experience, the path and way of situation construction are pointed out. And by keeping the principle of aesthetics focusing on the nourishment of arts, the form and function of situation construction can be maintained. This provides comprehensive theoretical guidance and operating guidelines for the construction of the situation, which would be a valuable asset left by Li to the majority of teachers.

From the rise of situated teaching to the expansion of situational education, from the development of situated curriculum to the exploration of situated learning, Li created a school of situational education that is full of original flavor and spirit of the times based on wisdom from the "Artistic Conception Theory" in Chinese classical literature, making it "the original educational ideology with Chinese characteristics" (Gu, 2011). In the future, efforts should be made to continuously explore the treasure of traditional education in China to refine the thought of situational education, and to promote the research on the application of situated learning for moral and aesthetic education, and to extend the practice of situational education in middle schools and kindergartens, so as to systematically build the theoretical system and disciplinary system of situational education, and promote the innovative development of situational education from a higher starting point and on a larger scale.

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Delving into the Development of Chinese Students Based on PISA Scores

Wenjie Yang and Guorui Fan

Abstract   Since the students from Shanghai participated in the Programme for International Student Assessment (PISA) in 2009, the academic performance of Chinese students in the previous PISA has attracted increasing attention from domestic and foreign media and educational researchers. According to a comparative analysis of Chinese and high-performing students in other countries, China has a large number of high-performing students who have outstanding competencies in mathematics and science; however, problems remain to be tackled. Chinese students are good at memorizing and using knowledge but are weak in analyzing and solving problems. They spend too much time learning inside and outside the school and have a heavy burden of learning. They rank low in the happiness index and growth thinking. They lack sufficient career preparations. Finally, there is imbalance in the education between urban and rural areas and between different schools. Based on the PISA results, the authors find that the key competence-centered curriculum reform, supervision of out-of-school training, and improvement of evaluation indicators reflect China's efforts to eliminate the indoctrination of students with knowledge and reduce their burden of learning; however, problems such as the imbalance in education between urban and rural areas should be resolved. An objective and systematic analysis of the PISA results will help to scientifically evaluate China's educational quality and its position in the world education system so as to promote the healthy development of Chinese education. However, as an evaluation system and merely a frame of reference, the PISA cannot be used to measure the education quality of different areas and schools. We need to highlight the humanistic value of education rather than the standardized and quantitative educational evaluation; improve the diversified system of educational evaluation; focus more on the development of students' comprehensive competences, health, and well-being; and promote the balanced development of education quality.

Keywords PISA · Educational reform · Key competencies · Educational evaluation · Balance in education

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1 Introduction

Globalization has resulted in a rise in global issues and demand for *global governance*, in which the role of institutions in international relations has become more important; specifically, their influence on the political, economic, social, and cultural activities of nations worldwide has increased in significance. *International comparative standards* have emerged as a powerful tool for political reforms and a driver of transformation, as nations have started to reassess their *education systems* by referencing the policies (expected, implemented, and achieved) of other nations (Schleicher, 2006).

Developed by the *Organization for Economic Co-operation and Development (OECD)*, the *Program for International Student Assessment (PISA)* is an international survey for *15-year-old students,* examining the knowledge and skills required in society. Its overall goal is to measure what students can achieve with the *knowledge* acquired at school, namely, how they are able to apply the knowledge, rather than analyze how they simply memorize it. PISA, thus, provides *OECD member countries* with standards of comparison for the development of *students' knowledge and skill*s, with a profound impact on *educational, economic, and societal policies.* More accurately, the PISA aims to guide public perception of fairness and excellence in education, define benchmarks in results and accountability, and legitimize key policies, values, and "common" influences, all of which have a profound effect on the political and social structures of member states (Sellar & Lingard, 2014).

The *performance of Chinese students in mathematics, reading, and science* has attracted the attention of other nations, leading to a shift in *educational policies* that have begun to be more inclined toward referencing those in the *East* (Bogdandy & Goldmann, 2012). The impact that the PISA has on policy formulation through data and factor analysis is called "governance through data or indicators" (Kamens, 2013). During the process of *educational reform and development*, nations analyze their *students' PISA performance* to review education governance and to adjust and improve their educational policies accordingly. While Chinese students have achieved good results in previous PISAs, questions have emerged during this process, such as about the best way to accurately determine the intrinsic relationship between PISA results and educational reforms, how PISA results affect educational reforms and development, and how student development can be assessed from the perspective of PISA. Each question requires in-depth deliberation based on *systematic investigation and analysis.*

2 Literature Review

In the second half of the subsequent year after each PISA round, the OECD Secretariat provides a detailed assessment report; it comprises detailed descriptions and numerical data on the average rankings of the participating nations and the regions

in each subject and provides an analysis of the factors affecting performance. Moreover, some nations commission a detailed national analysis report for the OECD covering factors related to the student performance (e.g., family background, school, and teaching factors). These results, and the corresponding interpretations, provide an easy-to-understand format for use in education development in each nation and baseline data for adjusting educational policy. Following a review of studies related to PISA from China and other countries, it was revealed that research on PISA tends to focus on the assessment technique and methodology, *cross-national result comparison*, and explorations regarding the impact of PISA on educational reforms.

Several scholars have conducted in-depth systematic research on the techniques and methodologies used in, and the core issues of, PISA, including the theoretical framework upon which it is constructed, sampling methodologies, and data analysis methods (Bybee et al., 2006; Yang, 2008). In various papers and articles, Andreas Schleicher, the Director for the Directorate of Education and Skills, defined competency as the ability to successfully meet complex demands in various situations by mobilizing psychosocial resources (e.g., knowledge and skills, motivation, attitudes, emotions, and other social and behavioral elements) (Schleicher, 2000, 2007, 2018). Namely, the focus of PISA should be less on assessing whether students are able to reproduce the knowledge learned and more on whether they are able to refer to the knowledge learned and apply it in new situations (Schleicher, 2007).

Although PISA has received unprecedented attention, this has also led to some scholars showing increased skepticism and scrutiny of its methodologies. Prais (2003, 2004) questioned the methodology and data interpretation of PISA, arguing that a fixed age of "15 years old" is inappropriate, considering that it is common in some nations for children in this age group to have already left formal education and entered the workplace; these topics were argued to impact the representativeness of the samples. Hopfenbeck and Maul (2011) contended that the learning strategies presented in the design of PISA are problematic. Goldstein and Moss (2014) also pointed out that the published PISA analysis covers only 10% of the questions asked; hence, the assessment lacks transparency. In 2014, more than 80 senior scholars from all over the world wrote a joint letter to Schleicher, pointing out that PISA ignores any assessment of students' physical, moral, and artistic development, calling for the suspension of PISA 2015 (Meyer et al., 2014). Margaret (2014) asserted that, although PISA is based on common assumptions of the factors that lead to academic success, the connection between student background and performance that is referenced by PISA relates merely to speculation, further contending that statistics alone does not prove a causal relationship between the two variables. Furthermore, some scholars have stated that the strong orientation of PISA toward educational policies ignores the holistic relevance of educational, social, economic, and cultural factors, and that PISA has several limitations regarding its implications for policy-making (e.g., overlap and cross-influence between education policies) (Kong & Ma, 2018).

Nevertheless, it is difficult to contend that the educational data presented and accumulated by PISA have provided participating nations with standards for international education evaluation. Therefore, PISA has emerged to a prominent position

regarding global education governance, with its value orientation toward education policy having been used in the implementation and dissemination of education. Indeed, a study showed that PISA had a clear policy orientation, making it an important reference for the formulation of education policies in many nations (Wu, 2018).

For example, the results of PISA allowed *Japan* to recognize several problems in its education system and directly contributed to system-wide reforms, such as the revision of the curriculum, launch of standardized national academic tests, and shift of focus toward reading literacy (Ninomiya & Urabe, 2011). The results of PISA 2000 and 2003 allowed the Norwegian government to reflect on the quality of its school system, helping to reshape the public image of Norwegian schools and promoting school reforms (Sverre, 2004). Germany also initiated a series of quality reviews of its national education standards following PISA 2000 (Li, 2017; Wang & Liu, 2019).Scholars have also used nations such as Australia (Waldow et al., 2004; Xu, 2014) and *South Korea* (Bozkurt, 2014) as examples to investigate the impacts that PISA has on policy.

Further, studies have explored the pathways through which PISA affects educational governance. For example, Sellar and Lingard (2013a) found that there are three main channels through which PISA impacts global education governance: expanding the scope of evaluation to cover a wider range of skills and abilities, expanding the scale of evaluation to cover more nations and schools, and enhancing the explanatory ability to provide policy-makers with more convincing evidence. Grek (2009) contended that PISA has become a political mechanism, and it is used as a resource for national and transnational institutions in the EU and among OECD member states to promote data-centric governance.

As aforementioned, the high performance of Chinese students and the impressive accomplishments of East Asian countries, such as *Singapore*, in PISA 2009 has triggered a sudden interest in the education systems of the Orient. Sellar and Lingard (2013b) analyzed the strong accomplishments of *Shanghainese students* in PISA and explored the success factors behind them, suggesting to Western nations—the United States of America, the United Kingdom, and Australia—that they should "look to the east" when launching educational reforms. Scholars have also investigated the relationship between the performance of Shanghainese students in PISA and the curriculum reforms in China and Shanghai, finding that test-oriented education results in *high-performing students* largely owing to factors such as competition, examinations, and the "shadow education", all of which are prominent factors of the Asian education model (Tan, 2019).

Accordingly, both Chinese and foreign scholars have been focusing on evaluating the assessment techniques and methodologies behind PISA, the performance of some nations in the assessment, the potential causes of such performance, and the impact of PISA on educational reforms. However, there have been a much greater number of studies on the performance ranking than on the influential factors of such performance, as well as on performance than on the relationship between performance and educational reforms.

3　Methodology

Based on the objective analysis of the results of the *four rounds of PISA* that included Chinese students, this study intended to examine the performance of Chinese students, form a cross-national comparison, *review the shortcomings and weaknesses* of China's education reform and development system, and uncover the main focus and *development trend of potential future educational reforms* in the nation. Summarizing, this study aimed to explore the differences among China and other nations regarding student competencies and educational and teaching reforms and to reveal the challenges faced by China in its educational reform and development using PISA data.

Regarding sample selection, this study referred to the classification of educational systems of PISA, using PISA data published by the OECD from 2009, 2012, 2015 (with additional attention to the PISA 2015 report[1]), and 2018—all of which included Chinese students—as the primary data sources. The nations with consistent high performance in the previous PISA rounds (i.e., *Finland, Canada,* Japan, South Korea, and Singapore) were used as comparative data points to conduct a comparative analysis from various perspectives.

In terms of the method, the present authors fully utilized the aforementioned PISA data, the PISA database, and related studies published by domestic and foreign scholars. To compare the performance of Chinese students with that of students from the selected high-performing nations, the influencing factors, indices, and results of PISA were incorporated into the statistical analysis, comparative analysis, and influential factor analysis. Moreover, the PISA, its educational reform effects, and the recent policies and measures of China's basic educational reform were reviewed. Based on this, and with the overarching value orientation to promote the high-quality development of education in China, the significance of PISA to China's educational reform and the emerging trend and potential future direction of domestic educational reforms were assessed.

4　Problem and Analysis: Reflecting on the Performance of Chinese Students Participating in PISA

Following the initial participation of Shanghainese students in PISA 2009, a wider range of Chinese students from a larger sample of schools and cities have participated in the subsequent rounds. In 2012, 6,374 students from 155 schools in Shanghai participated in PISA. In 2015, more than 10,000 students from 268 schools in *Beijing,*

[1] The performance of Chinese students in PISA 2015 was the worst among all the assessments in which they participated. Owing to changes in the sampling method, the longitudinal data of the five successive years were not comparable to the PISA 2015 data; hence, to uncover problems in the Chinese education system and any gaps among China and the consistently high-performing nations, the analysis focused on the 2015 round.

Table 1 Comparison of average PISA performance among China and the selected, high-performing nations

| year | 2009 | | | 2012 | | | 2015 | | | 2018 | | |
| Subject | | | | | | | | | | | | |
Nation	R	M	S	R	M	S	R	M	S	R	M	S
China	556	600	575	570	614	580	494	531	518	555	591	591
Singapore	526	562	542	542	573	551	535	564	556	549	569	569
South Korea	539	546	538	536	554	538	517	524	516	514	526	526
Finland	536	541	554	524	519	545	526	511	531	520	507	507
Canada	524	527	529	523	518	525	527	516	528	520	512	512
Japan	520	529	539	538	536	547	516	532	538	504	527	527
OECD Average	493	496	501	496	494	501	493	490	493	487	489	489

Source Compiled by the authors based on PISA reports from 2009 to 2018

Shanghai, Jiangsu, and Guangdong (B-S-J-G) participated in the assessment. In 2018, 12,058 students from 361 schools in *Beijing, Shanghai, Jiangsu, and Zhejiang (B-S-J-Z)* participated.

Regarding *academic achievements*, Chinese students' performance in reading literacy, mathematics, and science was higher than the OECD average. The overall performance of Chinese students ranked first, with the performance in mathematics and science being far ahead of that in the other nations (Table 1)—except for PISA 2015.

R = reading; M = mathematics; S = science

Comparatively speaking, the performance of Chinese students in science and mathematics showed few differences over the years; however, the performance in reading literacy had noticeable differences. Moreover, the proportion of Chinese students who achieved Level 5 results[2] was among the largest in all three subjects, far exceeding the OECD average. Particularly, in PISA 2018, the proportion of Chinese students who achieved Level 5 and higher results in reading literacy, mathematics, and science was 16.2%, 30.7%, and 31.6% larger than the OECD average, respectively (Table 2).

1. Chinese students showed greater competency in memorizing and applying knowledge than in higher-order thinking and analyzing and solving complex problems

Reading literacy performance measures students' capacity to fully participate in a knowledge-based society and examines their ability to understand, apply, and reflect on written texts; as an index, it surpasses the traditional notion of interpretation of words and information decoding.

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[2] PISA uses levels to describe students' proficiency in a given subject. Level 2 is the "baseline level," indicating the minimum skills required to participate in social activities; students at Levels 5 and 6 are considered outstanding performers of the corresponding competency.

Table 2 Percentage comparison of students who achieved level 5 and 6 results in PISA in China and the selected, high-performing nations

Year	Reading literacy		Mathematics		Science	
	China (%)	OECD (%)	China (%)	OECD (%)	China (%)	OECD (%)
2009	19.0	8.0	54.0	12.7	24.3	8.5
2012	28.9	9.5	33.0	15.9	31.4	9.6
2015	11.0	9.3	25.0	13.0	10.0	8.8
2018	26.2	10.0	44.0	13.3	39.0	7.4

Source Compiled by the authors based on PISA reports from 2009 to 2018

The results of PISA 2000 showed that a limited proportion of the students who achieved lower than Level 2 results in reading literacy were able to enter higher education, with most potentially entering the low-wage labor market (OECD, 2001). For PISA 2015, the framework of the reading literacy test aimed to investigate students' ability to access and retrieve, integrate and interpret, and reflect and evaluate information; it also emphasized the interactivity of reading literacy and the constructiveness of understanding. In PISA 2015, compared with Singapore (88.8%), Canada (89.3%), and Finland (89.9%), the proportion of B-S-J-G students who achieved a Level 2 and above score was only 78.1%, lower than the OECD average (80%). Additionally, the proportion of students with reading literacy proficiency lower than Level 2 accounted for 21.8%, which was higher than that of Singapore, Canada, South Korea, Finland, Japan, and the OECD average (20.1%). Namely, approximately one out of every five Chinese students failed to meet the minimum reading literacy standard, while the proportion of Canadian students was less than 11%. Further, the proportion of Chinese students with a Level 1b or lower proficiency was 8.3%, a number approximately three times that of Singapore, Canada, and Japan and 1.8% higher than the OECD average. Meanwhile, the proportion of Chinese students with Level 3 and 4 reading literacy proficiency was lower than that of South Korea, Finland, and Singapore and lower than the OECD average (Table 3).

Compared to Level 4, students with Level 3 proficiency in reading literacy could only identify the connection between the information that is visibly clear, rather than also interpreting the embedded information (access and retrieval); hence, they were unable to extend their understanding of the text by considering the information present in it as a whole, nor understand and apply information to unfamiliar contexts (integration and interpretation). This limits their clear understanding of text to familiar ones, not being fully able to critically analyze most texts (reflect and evaluate). That is to say, most B-S-J-G students who partook in PISA 2015 may have lacked a more holistic understanding of textual information and have had a generally poor understanding of the embedded information in the text; these characteristics may have constrained their comparison and analysis skills to familiar information, as well as limited their reflection and critical thinking.

Table 3 Proportion of students by reading literacy proficiency levels in PISA 2015 (%)

Level	Students							
Nation	< Level 1b (< 262)	Level 1b (262–335)	Level 1a (335–407)	Level 2 (407–480)	Level 3 (480–553)	Level 4 (553–626)	Level 5 (626–698)	Level 6 (> 698)
B-S-J-G	2.1	6.2	13.5	20.9	25.4	20.9	9.1	1.8
Singapore	0.3	2.5	8.3	16.9	26.2	27.4	14.7	3.6
Canada	0.4	2.1	8.2	19.0	29.7	26.6	11.6	2.4
South Korea	0.5	0.6	3.4	19.9	30.1	33.4	6.5	1.1
Finland	0.6	2.6	7.8	18.6	29.7	27.9	11.7	2.0
Japan	0.6	2.0	8.4	21.0	31.0	29.0	7.0	1.0
OECD Average	1.3	5.2	13.6	23.2	27.9	20.5	7.2	1.1

Sources OECD. (2016). *PISA 2015 results (volume I): Excellence and equity in education.* OECD publishing

The Problem-Solving Competency framework of PISA 2012 emphasized that students develop their cognitive processing when understanding and resolving problems. This framework was based on four aspects: exploring and understanding, representing and formulating, planning and executing, and monitoring and reflecting. The overall mean score of Shanghainese students in 2012 was 536, which was lower than that of the students in Singapore (562), South Korea (561), and Japan (552). Nonetheless, their mean score for the exploring and understanding subsection was higher than the OECD average, implying that the Shanghainese students performed sufficiently well at exploring problem situations and unknown contexts. Meanwhile, the mean score for the planning and executing subsection was comparatively low, suggesting that Shanghainese students lacked capabilities to transform abstract knowledge into concrete execution.

PISA 2015, however, emphasized the collaborative problem-solving competence. In this round, 52 nations and regions participated, and the Singaporean students were considered the most competent in collaborative problem-solving, with more than 20% of them reaching the highest proficiency level (Level 4). Hence, the Singaporean students were able to use highly complex collaboration to solve difficult problems, maintain the general team activity goals, and take initiative to develop measures for overcoming obstacles and resolving conflicts. Their outstanding performance on this competency (i.e., 20%, the highest proportion in PISA, 2015) may have been closely associated with their single-subject proficiency. Meanwhile, among the B-S-J-G students, approximately only 7% received the highest score in the same category, ranking 26th; this was lower than the proportion of students in the highest level from Japan, South Korea, Singapore, Finland, and Canada, especially in Singapore, more than 20% students reach this level. Nevertheless, the proportion of B-S-J-G students below Level 1 was lower than the OECD average (OECD, 2017a). These findings

show that some Chinese students in PISA 2015 were only able to complete low-difficulty collaborative tasks and lacked basic competencies in solving problems that required higher-level collaboration.

2. Chinese students had long learning hours inside and outside of school and faced substantial burdens from schoolwork, limited social ability, and a low sense of belonging at school

In PISA 2009, Shanghainese students ranked first place in reading literacy, mathematics, and science. In Shanghai, the weekly school time was 34.8 h in 2009 (OECD, 2010). According to the PISA 2012 survey, the teaching hours in Shanghainese schools were generally the same as those of the other nations (or regions), while the burden that Shanghainese students felt was mainly concentrated in after-school assignments. In Shanghai, students spent an average of 13.8 h doing homework per week (the OECD average was 4.9 h/week) and 3.3 h of additional study per week in private tutoring and extra classes, resulting in 17.1 extracurricular learning hours per week (OECD, 2014). In 2014, 48.9%–58.1% of primary school students and 66.8%–74.4% of junior high school students had private tutoring in Shanghai. In 2015, 60.5% of the students in Grade 5 and 58.4% in Grade 8 had private tutoring in Beijing (Li, 2019b). It was common for students to get up at 7:00 in the morning and stay up as late as 10:00 in the evening to complete all their assigned homework (Tan, 2012).

A comparison of the weekly study time between nations participating in PISA 2015 showed that the OECD average was 26 h and 56 min, with 3 h and 30 min dedicated to science courses, 3 h and 36 min to language-related courses, and 3 h and 39 min to mathematics courses (OECD, 2016). In Finland, the average study time was approximately 24 h per week, with the time spent on science, mathematics, and reading literacy courses being the shortest among all nations. Meanwhile, B-S-J-G students were found to have the longest study time (approximately averaging at 33 h per week), almost 9 h longer than that of Finnish students and significantly longer than the OECD average. Moreover, B-S-J-G students spent more than 25 h per week on extracurricular study, while the study time of students in Finland, Japan, and Canada did not exceed 16 h. According to PISA 2018, B-S-J-Z students studied for as long as 57 h per week, while Finnish students' maximum was less than 40 h per week. Additionally, although students in South Korea (51 h) and Japan (42 h) were also found to have long study hours, the duration was still at least 6 h shorter than that of Chinese students (OECD, 2019a).

The factors that affect academic performance are complex; still, students' sense of belonging at school was described as a key influencing factor. Students who perceive a high sense of belonging at school were shown to have higher learning motivation, self-esteem, and overall academic performance (Goodenow & Grady, 1993). PISA evaluates students' sense of belonging at school through self-reported surveys, in which students were asked to rate their agreement (strongly disagree, disagree, agree, and strongly agree) with a range of statements, such as the following: "I make friends easily at school" (A), "I feel like I belong at school" (B), "Other students seem to

like me" (C), "I feel like an outsider (or left out of things) at school" (D), "I feel awkward and out of place at my school" (E), and "I feel lonely at school" (F).

The results showed that D and E were highly associated with performance in reading literacy. The data analysis further suggested that, with full consideration of the socioeconomic status of students and schools, each unit of increase in sense of belonging at school resulted in an increase of 21 points in the reading literacy score. Moreover, B-S-J-Z students' sense of belonging at school ranked 51st and 61st among the participating nations, respectively, while only 70% of these students had a high sense of belonging, a number slightly lower than the OECD average (76%).

Specifically, only 65% of the B-S-J-Z students perceived that making friends at school was easy, a number lower than that in Singapore (73%), South Korea (78%), and the OECD average (70%). Further, 80% of the B-S-J-Z students did not perceive that they feel lonely in school, which was slightly higher than the OECD average (82%) and yet lower than that in Japan and South Korea (>88%). Therefore, although having a similar study workload, students from South Korea and Japan had a higher sense of belonging at school than those from China. (Table 4).

The mean perceived happiness among the B-S-J-Z students was only 6.83, a number lower than the OECD average of 7.31. Additionally, only 26.9% of the students reported a high sense of happiness, although no specific information was available regarding the reason for such low happiness scores. Accordingly, in happiness, B-S-J-Z students ranked 41st among the 72 participating nations and regions in PISA 2018 (OECD, 2019b). Although different social groups have varied expectations for academic achievements (Bishop et al., 2004; Fuller & Doan, 2010), schools are a place to develop not only academic knowledge and skills but also the social and emotional skills needed for survival in society (OECD, 2017b). Although a sense of belonging at school and feelings of happiness may differ owing to cultural factors, it could be deduced that Chinese students spent a substantial time in learning activities and did not receive sufficient developmental initiatives targeted at their social and communication skills as well as at participation in social activities. Therefore, their social skill proficiency, sense of belonging, and happiness were comparatively low.

Table 4 Percentage comparison of students' sense of belonging at school for PISA 2018 among China and the selected, high-performing nations

	A	B	C	D	E	F
B-S-J-G	79	65	66	81	83	80
Singapore	78	73	82	77	76	83
Japan	69	80	74	87	80	88
Finland	75	75	78	85	78	86
Canada	74	67	86	74	74	80
South Korea	77	78	81	89	87	90
OECD Average	78	70	80	80	80	82

Sources OECD (2019). *PISA 2018 Results (Volume III): What School Life Means for Students' Lives.* Paris: OECD Publishing

3. Chinese students lacked a subjective consciousness and a growth mindset, and their self-efficacy requires improvement

After 40 years of research, Dweck, a professor of behavioral psychology at Stanford University, categorized thinking styles into "fixed" and "growth" mindsets. Individuals with a fixed mindset believe that their talents are innate and do not change with experience, whereas individuals with a growth mindset believe that their talents can be developed. The growth mindset is more significant for human development and is conducive to the behavior and learning outcomes of all students (Dweck, 2016), albeit its value to students in disadvantaged situations and facing academic difficulties is even greater (Caniäls et al., 2018). Research has found that training students to develop a growth mindset promotes knowledge learning and improves academic performance (Blackwell et al., 2007; Claro et al., 2016). The results of PISA 2018 showed that students who disagreed and strongly disagreed with the following statement, "your intelligence is a part of you that you cannot change very much," had an average reading literacy score that was 41 points higher than those who agreed and strongly agreed with the statement. While considering the socioeconomic conditions of students and schools, the performance of the students high in growth mindset was shown to be 32 points higher than that of the students high in fixed mindset. In Australia, Brazil, Colombia, Iceland, New Zealand, the United Arab Emirates, and the United States of America, students who did not agree that their intelligence was unchangeable scored at least 50 points higher than those who agreed with the statement. However, only 56% of the B-S-J-Z students were high in growth mindset, a number lower than the same percentage for Finland (66%), Canada (67%), and Japan (66%) and slightly lower than the OECD average (63%); their growth mindset was also found to be negatively correlated with reading literacy performance. Additionally, students high in growth mindset were less fearful of failure compared with students high in fixed mindset. Of the B-S-J-Z students, 78% were concerned about what others might think of them when they fail, a number substantially higher than the OECD average (56%) (OECD, 2019b).

Self-efficacy refers to the degree to which individuals believe that they can engage in certain activities and perform specific tasks, especially when faced with unfavorable environmental conditions (Bandura, 1977). While controlling for the socioeconomic conditions of the students and schools, students who performed well in mathematics were found to have a strong sense of self-efficacy, in turn having a relatively higher reading literacy score (Schunk & Pajares, 2009). In PISA 2015, 84% of the students in the OECD member states agreed and strongly agreed that they were usually able to find a way out of challenging predicaments, while only 77% of the B-S-J-G students agreed with this notion (OECD, 2017b); namely, some B-S-J-G students lacked self-efficacy. Students with low self-efficacy are less likely to adjust their achievement behavior and motivation to learn (Klassen & Usher, 2010). Specifically, if students do not believe that they can complete a specific task, they are less likely to make the effort required to successfully complete it. Although there are other potential influencing factors of motivation, students with low self-efficacy may indeed require greater self-control and motivation to succeed.

4. Chinese students were not well prepared for their future careers, and their will-
    ingness to engage in future professional work related to science, engineering,
    and healthcare was low

Although there are other factors that affect students' career expectations—similar
to the other variables in this study—these are directly associated with their under-
standing of their academic advantage. Both PISA 2015 and 2018 explored students'
future career aspirations; however, the methods used were different. PISA 2015
investigated students' willingness to engage in future science-related careers, while
PISA 2018 investigated their expected occupations at age 30. According to the PISA
2015 report, only 16.8% of the Chinese students were willing to engage in future
science-related jobs, a number far lower than the OECD average (24.5%) (OECD,
2017b).

In PISA 2018, for the high-performing nations, 7% of the female and 15% of
the male students who achieved Level 2 and above results in the three subjects
expressed their willingness to engage in future science and engineering professions.
Meanwhile, 14% of the female and 26% of the male students who achieved Level 5
and 6 in science or mathematics expressed willingness to engage in future science
and engineering professions. In B-S-J-Z students, although the proportion of those
who performed well in mathematics and science was 48.4%, a number far higher
than that for Singapore (40.2%), South Korea (23.6%), and Japan (21.7%), only 8%
of the female and 16% of the male students expressed interest in engaging in future
professions related to science and engineering, which was significantly lower than
the OECD average.

Among the top ten most aspired occupations by the 15-year-olds, female students
were more inclined toward healthcare- and education-related occupations; 23% of
the female students expressed their intention to work in healthcare in the future.
Meanwhile, only 11% of the female B-S-J-Z students were willing to engage in such
occupations (OECD, 2019c). Further analysis revealed that this discrepancy was
directly associated with insufficient understanding of future career choices caused by
a lack of vocational education in Chinese primary and secondary schools. Therefore,
Chinese students had outstanding performance in science and mathematics; however,
their willingness to engage in science, engineering, and healthcare occupations was
much lower than the OECD average, indicating that there is a need for strengthening
education in professional values in China.

5. Education development was not balanced across the Chinese regions, with an
    exceptionally prominent imbalance between urban and rural areas

Owing to scientific requirements in sampling distribution, China selected approx-
imately 145,000 students who qualified for the study from 9,178 schools in Beijing,
Shanghai, Jiangsu, and Guangdong to form the potential participant pool for PISA
2015; the sampling data were collected in strict accordance with uniform interna-
tional standards. The geographical locations of the selected schools covered cities,
rural areas, counties, and towns; schools dedicated to both general and vocational
education and those that involved junior high, senior high, and both junior and senior
high were also included in the list.

Table 5 Comparison of average PISA 2015 performance in science by student residential location among China and the Selected, high-performing nations

	B-S-J-G	Japan	South Korea	Singapore	Finland	Canada
Rural Areas (< 3,000)	465	483	463	/	/	528
Villages/Towns (3,000–15,000)	476	483	559	/	526	530
Counties (15,000–100,000)	520	526	506	/	530	532
Cities (100,000–1,000,000)	542	539	514	/	532	536
Large Cities (> 1,000,000)	588	551	518	556	535	553

Source Calculated by the present authors based on the data in the OECD PISA database

Eventually, 10,682 students from 268 schools were included for screening, covering all types of schools at multiple levels. The total population of the B-S-J-G areas was 230 million, ten times the population of Shanghai. Therefore, differences in student academic performance and reading literacy could be greater than expected. The results of PISA 2015 showed that only 8% of the B-S-J-G students ranked in the top quarter of the economic, social, and cultural status index (ESCS index),[3] while students at the bottom of the ESCS index accounted for 52%. Hence, more than half of the B-S-J-G students came from families with a low socioeconomic status, most of whom lived in areas with underdeveloped economies, such as rural areas and small towns.

A comparison of the performance in science across the B-S-J-G areas and the selected, high-performing nations showed that the mean score of students from large cities (with a population > 1 million) in the B-S-J-G regions was 588, 8 points higher than the average score achieved by the Shanghainese students in PISA 2012. Thus, regarding compulsory education, the quality of science education in large Chinese cities was in a leading position from the perspective of PISA. However, the results of the B-S-J-G students from rural areas, small towns, and other counties were lower than those of their counterparts in Japan, South Korea, Finland, and Canada (Table 5).

A domestic comparison showed that the gap in science scores between students from large cities and rural areas was of approximately 123 points, 110 points for mathematics, and as high as 135 points for reading literacy.[4] These findings confirmed the conclusions of PISA 2015, that the ESCS index was correlated with academic performance. Specifically, the science score (549) of advantaged OECD students (i.e., top 25% in the ESCS index) was 154 points higher on average than that of disadvantaged students (395); the score of advantaged B-S-J-G students (620 points) was 170 points

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[3] The ESCS index includes the economic, social, and cultural statuses. PISA applied this index to measure the socioeconomic status of students'family, comprising three equally weighted components: parents' education (PARED), parents' occupation (HISEI), and home possessions.

[4] Calculated by the present authors based on the data of OECD PISA 2015.

higher than that of disadvantaged students (448 points), greatly exceeding the OECD average.

Furthermore, the results of PISA 2015 also included the differences in science proficiency between and within schools. The differences within and between schools accounted for 69 and 30% of the variations in science proficiency, respectively. In Singapore, Japan, Finland, South Korea, and Canada, the differences between schools were less than that within schools. Namely, the regional differences in these nations were relatively small. Although such a result could be attributed to local economic development, it is more likely to have been associated with education investment and policies that ensure balanced development in the field. The results for B-S-J-G students, however, were the opposite: differences between schools were greater than those within schools.

The results of PISA 2018 revealed a huge gap between the B-S-J-Z advantaged and disadvantaged schools regarding teacher-student ratio, class size, and teachers' educational background. Regarding teachers' educational background, the proportions of teachers with a master's degree in advantaged and disadvantaged OECD schools were 54 and 37%, respectively; this same proportion was less than 20% in advantaged B-S-J-Z schools and less than 5% in disadvantaged schools (OECD, 2019c). Hence, basic education in China lacked sufficient development and remained imbalanced, and the quality gap for education and teaching between urban and rural areas and across schools remained significant. This implies that ensuring high-quality and a balanced development of education remained a big challenge as of 2018.

5 Discussion: PISA and the Future Reform of China's Basic Education

PISA provides the participating nations and regions with systematic data to measure the academic performance and competency development of 15-year-old students. It also indirectly reflects the quality of basic education in the corresponding nations and regions, providing stakeholders in the development of education (e.g., educational leaders, schoolteachers, and civilians) with empirical materials to conduct horizontal comparisons and analyses. Through PISA, decision-makers in education can evaluate the knowledge and skill development of domestic students, compare their academic performance and the education quality with those of other participating nations, and learn from the experience and practice of high-performing nations. This allows stakeholders to formulate developmental and strategic goals, policy frameworks, and pragmatic and efficient measures to incite educational reforms based on their own cultures, traditions, and realities, all while remaining aligned with the development of global educational reforms (Lingard & Shaun, 2011).

The Chinese educational reform aims to promote the holistic development of students' personalities and healthy development of the education system. Focusing on resolving major educational issues that are closely related to society's direct and

pragmatic interests, the Chinese reform combines national policy, education system design (top-down), and active exploration of local governments and schools (bottom up) to define the developmental path for a socialist education with Chinese characteristics. Recently, the Chinese government issued a series of measures to actively promote students' core competencies, such as curriculum and teaching methodology reforms, the diversification of the education system, a reduction in class size, restrictions in off-campus tutoring, initiatives to reduce overall student burden, integration of urban and rural education, and interventions to alleviate poverty through education. These measures have demonstrated the governmental efforts and achievements in breaking away from the traditional teaching model of knowledge transfer and training, promoting competency development, strengthening the allocation of educational resources, facilitating a balanced development of regional education, and ensuring students' general development; all these enhancements are direct and indirect responses to the problems described in the various PISA rounds. This assessment, thus, indeed serves as a mirror for international education reforms and development. PISA data, in addition to presenting the advantages of domestic student development and educational reforms, also reveals the national shortcomings and deficiencies. A rational review of the problems exposed by PISA highlights the necessity to focus on the following topics as subsequent attitudes to further China's educational reforms, promote a healthy development of education, and advance the comprehensive development of students: consolidating the foundations of education, fully exerting students' strengths, and compensating for shortcomings while strengthening weaknesses.

1. The need to deepen the reforms related to curriculum development, teaching, and improving students' comprehensive reading literacy, placing additional focus on critical thinking and creativity

From the onset of the twenty-first century, global education reforms have led to an increased focus on soft skills and transversal competencies (Care, 2017). Indeed, the rise of smart technology has greatly altered the skills required by the labor market, shifting from the traditional application of procedural skills toward the ability to analyze and solve complex problems using higher-order, critical, creative, and strategic thinking skills. These changes have profoundly affected what students learn and master in school (OECD, 2015). Accordingly, to deepen the classroom teaching reforms in China, the government should give full play to its existing advantages while paying more attention to the cultivation of advanced abilities (e.g., critical thinking and complex problem-solving). In fact, since 2013, China has been researching the development of students' core competencies. In September 2016, based on cultural foundations, independent development, social participation, and the "18 key points, 6 competencies, 3 dimensions" framework, the government issued a more general document, "Core Competencies and Values for Chinese Students' Development." This document was aimed to serve as the starting point for the scientific design of domestic school curriculum and the revision of curriculum plans and standards for primary and secondary schools. Revisions to the highlighted core competencies should serve to clarify their values and define the necessary learning

outcomes (i.e., qualities and key abilities that students should form) for each subject, which can then be applied to reorganize teaching content, activities, and evaluation methods.

PISA is not a simple assessment of knowledge groupings but a multi-disciplinary and interdisciplinary competency assessment that includes knowledge, skills, and factors other than academic ability. At the beginning of 2020, the World Economic Forum released the "Schools of the Future: Defining New Models of Education for the Fourth Industrial Revolution," proposing the "Education 4.0" global framework and asserting that education should prepare students for the future; specifically, it should ensure that they become not only contributors to future economic productivity but also responsible citizens of future societies. To realize this vision, nations are required to strive to equip students with key skills, such as global citizenship, innovation, and creativity, as well as technological and interpersonal skills (World Economic Forum, 2019).

Considering the issues revealed by PISA and these requirements of future society, it may be necessary to deepen the basic educational reform in China; improve curriculum and teaching quality; optimize the curriculum system; and strengthen the connection among the curriculum, social production, and daily life. This may ensure that students enhance their social and professional understanding and awareness, the disruption of traditional teaching and learning methods, and stimulation of positive attitudes and enthusiasm for learning. It may also help to promote student self-confidence, self-efficacy, personal learning, self-paced learning, accessible and inclusive learning, problem-based and collaborative learning, applied learning, and the organization of social practice activities. The goal should be to help students understand and participate in society through a comprehensive, contextual, and interactive learning process; cultivate a teamwork spirit; develop a sense of collective honor; improve their critical analysis skills, complex problem-solving abilities, creativity, and other core competencies; and develop a lifelong learning ability from a holistic perspective.

2. The need to improve the multi-evaluation system, reduce the burdens of education, and promote a healthy development

Previous PISA rounds revealed that the extensive time spent on homework and off-campus tutoring is a long-lasting issue among Chinese students. This issue is closely associated with schools emphasizing knowledge instruction and homework and off-campus tutoring institutions emphasizing an exam-orientated approach (i.e., involving repetitive practice), all of which further increase the burden placed on students. To fundamentally resolve this problem, in addition to changing the traditional mentality of always expecting high achievements from students, the education evaluation and enrollment examination systems should be further reformed.

Since the issuance of the "Implementation Opinions in Deepening Reform on Examination & Recruitment System" in 2014, the Chinese government selected Shanghai and Zhejiang as pilot areas for a comprehensive reform of the college entrance examination; this reform led to the development of an academic performance examination system, a comprehensive quality evaluation system, and a

recruitment model "characterized by classified examination, comprehensive evaluation, and multiple admissions." Furthermore, cities such as Shanghai have actively explored comprehensive evaluation systems using green indicators of academic quality, extending the education evaluation to 10 major dimensions: academic performance, learning motivation, academic burden, teacher-student relationships, teaching methods, school curriculum leadership, the impact of socioeconomic backgrounds on academic performance, moral behavior, physical and mental health, and year-on-year progress. The goal of this system was to attempt to reverse the "excessive focus on academic performance, excessive reliance on paper and pen tests, and excessive use of horizontal comparisons." The state government has continued to apply special governance to institutions that deliver off-campus tutoring, having standardized their operations and issued a series of regulations for homework, subject proficiency tests, and competition rankings.

However, issues such as exam-score priorities, advancement orientation, and diploma-focused mentalities remain deeply embedded in the basic education system. Even in Shanghai, where the green evaluation system has been implemented, the time for physical activities and independent learning remains limited, with only 43.4% of primary school students having reported that they participated in off-campus tuition related to subjects involved in examinations (The State Council of the PRC, 2016). In future reforms, to eliminate evaluation systems that focus on exams, enrollment rates, and graduation diplomas, it is necessary to further improve education standards. Specifically, the government should ensure that the fundamental evaluation criteria is related to the fostering of integrity and promotion of holistic student development. For this, the multi-evaluation system should be enhanced, centered on the moral, intellectual, physical, and aesthetic aspects, and focus on a hard-working attitude as an essential value. Moreover, a comprehensive evaluation system for primary and secondary schools should be developed. It is also necessary to guide schools and teachers toward cultivating talent and helping students to continuously improve their sense of social responsibility, innovativeness, and practical skills when learning; this may help them achieve comprehensive development and healthy growth. The score-based admission examination system should be, thus, reformed, and the "classified examination, comprehensive evaluation, and multiple admission" enrollment system should be further refined. To this end, establishing a diversified exam and enrollment evaluation system that integrates academic testing and comprehensive competencies seems essential. Moreover, social selection and employment selection mechanisms based on school grades and diplomas should be reformed; to stimulate an in-depth reform of the education evaluation system, the social and employment selection mechanisms should be, preferably, based on moral integrity, practical knowledge, soft skills, and professional capabilities.

3. The need to promote a high-quality, balanced development of education, as well as guarantee and facilitate the holistic development of student competencies

In PISA 2009 and 2012, Shanghainese students' outstanding performance attracted the world's attention. Such achievements were due to sound educational foundations and a well-developed economic, social, and cultural environment.

Furthermore, Shanghai was one of the first regions to reform its basic education curriculum. In 1988, under the general background of essential-quality-based education and to improve student development and individual performance, Shanghai focused on the "cultivation of four qualities and a healthy personality," leading to the onset of curriculum reform in kindergartens and primary and secondary schools. The city government also explored the implementation of a curriculum structure that incorporates compulsory and elective courses and activities.

In 1998, facing the challenges of the new century, Shanghai re-initiated its curriculum reform, promoting the construction of basic, extended, and research-based curriculums in primary and secondary schools and thus turning its focus toward cultivating innovation, practical skills, and lifelong sustainable development (Xu, 2018).Accordingly, the student development requirements in Shanghai were highly consistent with the PISA competencies. After more than a decade of curriculum and teaching reforms, not only does Shanghai have an overall advantage in basic education quality but Shanghainese students have also developed a unique advantage in achieving the PISA requirements.

However, the quality of basic education in Shanghai does not fully represent that of the nation. In 2015, the Chinese participation in the PISA was expanded to four regions, reducing the national performance compared with when the evaluation was focused on Shanghai. One of the key reasons for this is the imbalanced educational development between domestic regions and between urban and rural areas. Still, to reduce the urban–rural gap in education, China has been actively promoting a more balanced educational development and integrating the advancements in urban and rural education. Specifically, to direct educational resources to the central and western regions, especially for rural areas, the government has adopted various measures, such as dedicated teacher training plans, dedicated construction plans, financial payments, and counterpart assistance. In 2012, the State Council issued the "Opinions on Further Promoting the Basic and Balanced Development of Compulsory Education," requesting the establishment of unified, national-level standards for school management and the balanced allocation of educational resources (The State Council of the PRC, 2012). However, owing to China's vast territory and large cross-regional economic and cultural differences, achieving a balanced development of the national education system remains a huge challenge. The inadequate and imbalanced allocation of educational resources, especially in teaching, is a key factor leading to gaps in learning performance and overall competencies. Therefore, future reforms should continue to prioritize education development and target poverty alleviation in education, while establishing and improving a scientific and dynamic allocation mechanism of educational resources as well as promoting in-depth integration of urban and rural education. It is also important to coordinate and rationally allocate compulsory educational resources between urban and rural areas, further pushing the high-quality education capital toward the central and western regions, poverty-stricken areas, and rural areas. These initiatives may help promote the equal allocation of basic public education services and the continued expansion of the coverage of high-quality educational resources.

Furthermore, it remains necessary to continue to improve the conditions of school management in disadvantaged areas; that is, these regions need to improve the long-term linkages between public school teachers and local public servants, improve teacher salaries (i.e., to attract talent to participate in education), establish public service platforms for the professional development of primary and secondary school teachers, and improve the teacher training system. This should be accompanied by the continued improvement of the overall academic capabilities of in-service primary and secondary school teachers and by the professional development of teachers and their teaching capabilities.

6   Conclusion

Friedman (2013) pointed out that Shanghai's secret is simply its ability to execute more of these fundamentals in more of its schools more of the time. Although Shanghainese students' continuous high performance in PISA assessments have impressed other nations, a rational interpretation of these results is needed. Nevertheless, the "Shanghai Teaching for Mastery Program" has been recognized by foreign nations (Boylan, 2016), providing a glimpse of the extended efforts required to sustain such high performance, namely, the time students spend on study and homework and the continually mounting pressures they experience. Moreover, the performance differences among Shanghainese, B-S-J-G, and B-S-J-Z students, as well as students from central and western regions exposed the regional gaps in education and the imbalanced development of basic education in China. The PISA results are, hence, a mirror of the domestic education. Continuous participation in PISA and the scientific, objective, and systematic analysis of PISA data are likely to be conducive to the scientific evaluation of China's education system quality, status quo, and inherent problems, as well as the evaluation of China's position in the global ranking of education. In that sense, the innovative initiatives of high-performing nations may help to promote the healthy development of education in China.

However, as an assessment system, the results of PISA should serve as a general reference only. Namely, the direct use of these data as a measure of the quality of education in regions and schools is not recommended, and the emerging "governance through data" effect, which has been triggered by PISA, should be avoided. Instead, a system that goes beyond standardization and quantitative education evaluations should be implemented (Yang & Fan, 2019); namely, it should focus on the humanistic value of education, the development of a comprehensive set of competencies, and the health and happiness of students.

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The Career Pattern and Dilemma of Middle-Aged Faculty

Guangcai Yan

Abstract The midlife crisis has become popular in recent years. The relevant life course studies have either denied or confirmed the existence of this phenomenon. In terms of academic productivity, this study obtains similar conclusions as other related studies through data analysis, that is, the midlife or mid-career of faculty is often the peak of academic vitality. Based on burnout measurements and observations, however, midlife is a period of malaise. This study uncovers that institutional design related to academic recognition, teaching burden, family and work conflict and physical health stress is the main cause of midlife burnout.

Keywords Faculty · Midlife · Academic vitality · Burnout

In the eyes of Max Weber, the academic career is a calling. The calling of secular work stems from Calvinism and Lutheranism during the religion reform era in Europe. That is, the profession of man is not merely an ascetic practice, it is a gift from God, which is God's mission for human beings in the secular world. Occupation is not a job for a living but an honor to follow God's calling and to glorify God's will. In this interpretation with a strong theological preference, the work, especially academic activities, was not only sacred as a kind of spiritual and life salvation but also became an internal drive and psychological longings for early scientific inquirers to be obsessed with opening the "Book of Nature". It is this spirit and value of academic work, compared to other professions, that is often considered to be nobler. In today's academic world, this perception of seeing the academic career as a calling has faded out, but its inertia still imbues the profession with some special spiritual meaning. Therefore, as we have observed in the real world, for individuals, academic life may be pleasant, but it is more likely to be a continuous spiritual drill. The ups and downs of emotions as well as the ups and downs of vitality constitute certain characteristics that distinguish the life course of academics from other professionals. This article focuses on a special group of middle-aged faculties in universities, from

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a unique perspective, to give an empirical analysis and meaningful interpretation of the essentials of academic professional life.

1 Is Middle Age a Low Point in the Life Course?

It is well known that in terms of either physiological or social aspects, human vitality in the life course generally follows the pattern of an inverted U-shaped curve, such as the five-stage and three-stage division of the life course in academia. Super (1980) believes that a human being from birth to the end of life generally experiences five stages: growth (0–14 years old), exploration (15–24 years old), establishment (25–44 years old), maintenance (45–64 years old) and decline (over 65 years old). Baltes and others (2006) divided the life course into three phases based on the gain-and-loss functions of life resources, namely, the growth phase that mainly occurs in children and early adulthood; the maintenance and recovery phase mainly in the middle and late stages of adulthood; and the loss-adjustment phase that mainly occurs in the late years with declining physical functions and withdrawal from professional roles. Regardless of whether it is a five-stage or three-stage theory, middle age, as the stage of maintenance and recovery, is naturally regarded as the most resourceful peak stage of human vitality and social experience.

However, in the daily context, there is a saying about the "midlife crisis" well known in society. Does this statement have a scientific basis or is it purely a joke or tease? Obviously, if there is a scientific basis, it means that there will be a period of decline in human life in middle age, that is, there seems to be a special stage of loneliness, anxiety, and frustration during human life. This happens exactly in the abovementioned peak period of mid-age. Tracing the origin of this statement, it is indeed not groundless. Setiya (2017) recently summarized the ins and outs of the midlife crisis in the United States in his monograph named *Midlife: A Philosophical Guide*. He believed that the first scholar who had proposed the concept of midlife crisis in academia was psychoanalyst Elliot Jacques. In 1965, Jacques vividly described the midlife crisis in his book as follows: human life is like an uphill road with no end in sight. When a human being finally reaches the top of the mountain, he or she will find that there is a downhill road in front, which leads all the way to death. This top of the mountain is a turning point, which is the midlife crisis. Setia argued that Jaques's concept about midlife crises did not come from his clinical practice but from a personal experience, so the concept lacks enough evidence. For this reason, this subsequently attracted special attention from many scholars, such as psychologist Daniel Levinson and psychoanalyst Roger Gould. In 1978, they each published their own research results based on the survey and interview materials to confirm the existence of the phenomenon of a midlife crisis. Their results were excavated and by a deliberate journalist Gail Sheehy. As a loose concept or rather a buzzword, the midlife crisis in the United States and the world became widely popular after 1980 (Setiya, 2017).

However, it is so popular that it has even become a symbolic consumption about the unpredictable life, which inevitably arouses serious scholars' doubts. In 1989, Orville G. Brim organized a team of scholars from different fields, such as psychology, sociology, anthropology, and medicine, and launched a "Midlife in the U.S. (MIDUS)" project for more than ten years. In the MIDUS project, a sample follow-up survey found that the so-called midlife crisis is completely fictional. The team argued that there is no crisis in middle age but the golden age of life. Later, sociologist Elaine Wethington, psychologist Marge Lachman, and other scholars also provided evidence for this argument denying the existence of the phenomenon of midlife crisis from different disciplinary perspectives (Setiya, 2017).

In 2001, Lachman organized scholars from many disciplines, including psychology, sociology, anthropology, behavioral sciences, economics, biology, medicine, etc., and collectively compiled an abundant and comprehensive book named the Handbook of Midlife Development. In the handbook, the researchers defined middle age as roughly between 40 and 60 years old based on the characteristics of the population distribution in the United States, but they thought that middle age is not a strict and objective expression because for some individuals, even by the age of 70, they do not identify themselves with old age. In the age range suggested by the handbook, the idea is that human health is generally good. For most people, even the natural aging of some organs does not affect their movement and lifestyle. Therefore, if middle age shows some characteristics that are different from other stages, the cause is mainly due to the social roles for mid-age, such as educating children, supporting the elderly, caring for widows and patients, acting as the pillar of the family income, and various life events, such as unemployment, children leaving home, parents' aging and death, marriage status changing, etc., related to multiple roles at this particular stage. From this perspective, Lachman argued that facing the pressure of multiple roles in middle age, despite various personalities, different individuals have their own coping and control strategies for physical change and social pressure. Therefore, she disagreed with the idea that multiple roles will truly bring about the so-called mid-life crisis (Lachman, 2001).

However, the above research has not reached a conclusion. In 2008, economist David G. Blanchflower & Oswald (2008) used big data to conduct a statistical analysis on a large sample of 72 countries worldwide. By controlling different birth cohorts, he found that the happiness index as a subjective feeling in the course of Human life is generally a U-shaped curve distribution. Despite the variations between countries, for example, the minimum happiness index is distributed in the age range of 40–55 years old, but overall, the average age at the lowest happiness index is 46.1 years. Blanchflower & Oswald (2008) also argued that the distribution is basically in line with the conclusions of a large-scale survey conducted by the United Kingdom on its national working population from 2004 to 2007. He found that the age curve distribution of the global happiness index and the age distribution of the U.K. working population regarding the depression probability are roughly inversely correlated, which appears as an inverted U-shaped curve (see Fig. 1).

The results of Blanchflower's big data analysis clearly confirmed the existence of the midlife crisis again, and this transnational research demonstrated to some
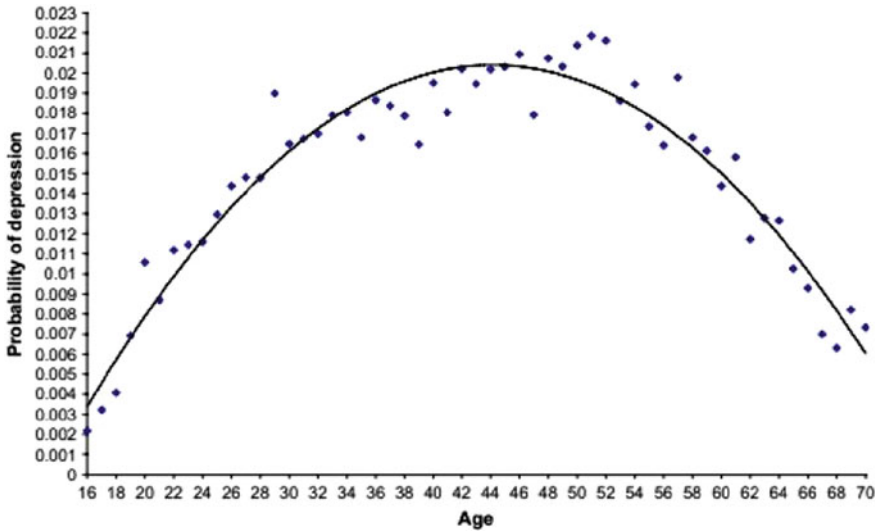
Fig. 1 Depression probability, LFS 2004Q2–2007Q1 (*Source* Blanchflower & Oswald, 2008, p. 1744)

extent that it can be generalized to different countries, ethnic groups and cultural backgrounds and that it implies a close relationship between happiness and depression, especially for middle-aged people because of the overwhelming family and social stress, leading to an inevitable crisis. However, Lachman (2015) regarded Blanchflower's conclusion as lacking evidence. She agreed that middle age is indeed a special period of rising responsibility, overwhelming stress and aging cognition, but high stress does not represent a crisis. She even argued that this popular crisis theory is dangerous because it constitutes a self-fulfilling prophecy effect, which has a negative impact on the physical and mental health as well as social behavior of middle-aged people. She pointed out that middle age is a critical period in life, as a bridge connecting young and old individuals, as well as the intersection of the rising and falling trajectories of human vitality. However, the knowledge and life experience that increase with age will continue to make up or modify the declining trajectory of new information processing and other capacities. To this end, she sketched a model different from the U-shaped curve. This distribution shows that from middle age to old age, human vitality and subjective happiness experience have a slow decrease overall, but the comprehensive effect from all aspects of middle age is at the peak, which is the culmination of life (see Fig. 2).

In short, as far as the current research is concerned, the mid-age crisis or the golden period, the academic debate is still inconclusive. However, as Lachman pointed out, the controversial issue demonstrates the necessity to pursue the inquiry in the critical period. This is not only because there are few studies on middle age, in her view, but also because it is helpful to provide the optimal path for the overall development of an individual life by understanding the multiple role conditions and characteristics
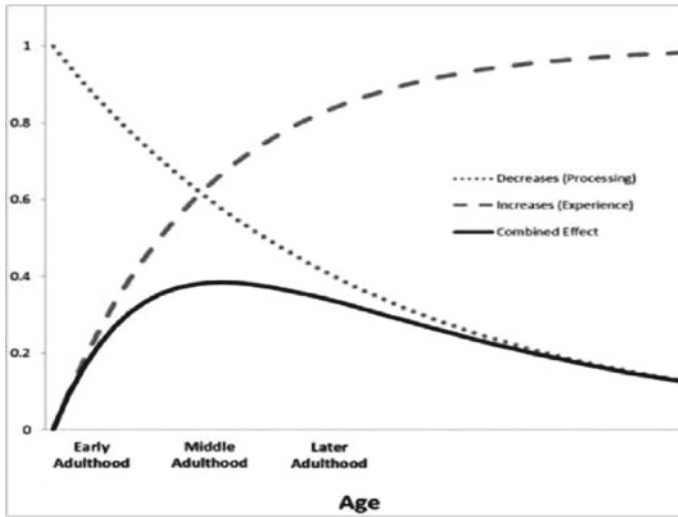
Fig. 2 Midlife at the intersection of growth and decline: a double exponential function shows a peak in midlife (*Source* Lachman, 2015, p. 332)

(Lachman, 2015). From the perspective of the current article, the research is more meaningful by focusing on the middle-aged group of a certain occupation, which is valuable to investigate the interactive evolution trajectory between the life course of a specific occupation and the individual's embedded environment. Other new discoveries are highly likely to occur, such as whether the life course of academics conforms to the trajectory of the general population or is it unique?

2 Is There a Middle-Aged Crisis Among Faculty in Higher Education Institutions?

In academia, either policy or special issue research is rare to study faculty in different career periods. For example, young scholars in the early career stages have always attracted special attention. There is a wealth of literature on improving their adaptability at the beginning of their employment and the early socialization of their academic careers. Due to the association with retirement and other sensitive policies, studies outside China on the academic vitality of older scholars in later career stages are relatively abundant, while research on middle-aged faculty groups is obviously insufficient. Perhaps the reason is that people often think that middle-aged groups are in the middle of their careers. In view of the unique long-term employment or tenure of colleges and universities, this is a relatively stable and mature period with secure jobs and independence to face work challenges. Therefore, the middle age of the academic profession is naturally regarded as a stage where there

is no need to pay attention or even no problem at all. However, in recent years, in view of the impact of changes in the academic labor market on employment policies, such as the sharp reduction in the proportion of tenure-track and tenured faculty in the United States, the increasing difficulty of obtaining tenured positions, and the slightly negative perception of the performance of tenured faculty, people suddenly realized that in the academic world, although it is not yet to be called a crisis, there are indeed a certain middle-aged dilemma or confusion.

In terms of research on job satisfaction among middle-aged faculty, Kiernan Mathews analyzed three consecutive years of faculty survey data from COACHE and found a U-shaped curve distribution among faculty in public research universities like other professional fields. The overall faculty satisfaction with occupation is lowest roughly between 40 and 60 years old, which kind of proves the existence of a middle-aged crisis. However, based on the variation analysis within the group, Mathews (2014) found that the most noteworthy group is tenure-track associate professors because they are significantly less satisfied with the university environment, the nature of work, individual and family well-being, and interpersonal relationships than assistant professors or full professors, especially those who have been in the position of associate professor for more than 6 years. Mathews' conclusion implies the relationship between professional life satisfaction and the promotion system and that the system may ignore some middle-aged groups in the higher education institutional context. Therefore, he tends to attribute the middle-aged dilemma in the academic profession to the internal organizational system and environment of higher education institutions. Similarly, Dutch Scholar Judith T. Bos and his colleagues (2009), through a faculty member in their home country, found that despite the slight difference between different age groups, the satisfaction of the 35–44 and 45–54 age groups was relatively lower. He argued that the major factors include insufficient support from the administrators as well as interpersonal relationships within those two age groups.

Roger G. Baldwin has long been concerned about the career development of faculty in colleges and universities. He once analyzed the large sample data of the 1999 NSOPE, including 10,315 full-time professors in four-year colleges and universities. The analysis found that although the academic output and innovations of the middle age are outstanding compared to other stages, in terms of work burden, the proportion of dissatisfaction is highest in the early middle age (40–49 years old), followed by the late middle age (50–59 years old); Regarding overall job satisfaction, the dissatisfaction rate is also highest in the early middle age. If divided by teaching experience, faculty who have worked for 12–20 years, that is, in the middle of their careers, have a significantly higher proportion of dissatisfaction than in the early and late stages (Baldwin et al., 2005). For this relatively low period of middle age, Baldwin speculated that part of the reason may be the heavy administrative burden of faculty at this stage, but he felt that the explanation was not accurate and emphasized the need to pay special attention to academic middle age and carry out related research.

It may be questionable whether job satisfaction can be used as a symptom of the phenomenon of mid-life crisis in academia because it reflects the working experience of middle-aged scholars rather than their overall life experience. However, the academic profession is special because the work and daily life of faculty are often inseparable in terms of time and space, and there is no clear boundary between the two. Especially at a certain stage, this kind of life structure with multiple roles embedded and overlapping inside and outside the organization often endows faculty with a more complex spiritual experience, core value and meaning of life. For example, the re-understanding of the meaning of academic work, the revision of goals, the relationship between family and work, and other issues will frequently intrude the individual's daily life. Meanwhile, the individual's social role at a certain stage, such as the impact of various trivial or major events in the family, is often brought into the workplace. Therefore, in addition to job satisfaction, if we can focus on certain physical and mental representations that reflect the comprehensive effects of various factors inside and outside the organization and integrate the feelings of middle-aged scholars into the life course and the broader cluster of social roles to examine, we may obtain more perspectives and a more comprehensive understanding of the life state of this special group. It may also help us to identify the existence and causes of the mid-life crisis in academic professional groups.

As in other fields, in academia, the main symptom to judge life crises or dilemmas is related to individual physical, mental and spiritual representations, such as long-term fatigue syndrome and burnout by Nicoleen Coetzee et al. (2019) and other scholars. The former is medically represented as continuous fatigue that lasts more than six months and has nothing to do with exercise, with physical discomfort, drowsiness, headache, and a series of other physical and mental symptoms. The latter represents emotional exhaustion, depersonalization, low desire for achievement and other psychological symptoms. Among these symptoms, burnout is a more commonly used concept to monitor individual occupational dilemmas, survival status, and life crises. The current literature includes much academic career research surrounding burnout. Despite the few results specifically related to the phenomenon of the mid-life crisis, there may be some inspiration from it. For example, James R. Lackritz (2004) found that compared with elderly faculty, young faculty score higher on the emotional exhaustion dimension, but the overall burnout level of tenured and tenure-track faculty is higher than that of other faculty groups, such as lecturers. This conclusion does not directly point to middle-aged faculty, but the relationship between professional identity, level, and age implies a tendency that the burnout level of older faculty may be higher.

In academia, the more influential impact on the phenomenon of the midlife crisis comes from *a higher education chronicle*, a well-known professional newspaper in the United States. In July 2008, Jeffrey J. Selingo, a senior editor and writer of the *Chronicle* as well as a university professor, analyzed the data of a large sample (more than 15,000) of faculty surveyed by the *Chronicle* by nonrandom sampling. Selingo (2008) found that there is a relatively low phenomenon in the 45- to 49-year-old faculty group in American universities. The self-reported scores of faculty members in this age group are lower than other age groups in terms of job satisfaction, fairness,

academic passion, and life perception. To report this finding, Selingo (2008) used a somewhat sensational title, A Midlife Crisis Hits College Campuses, which caused a great response in the American higher education community at the time. The *Chronicle* followed the specific topic in the long term and subsequently published numerous articles on this topic, including personal essays. Midcareer blues, midlife burnout, midcareer malaise and similar words frequently appear in newspapers as hot issues today. The conclusion of the *Chronicle* provides an empirical judgment. This implies the possibility that the academic community is difficult to be immune to the midlife crisis, or at least it denies the long-term misunderstanding that university faculty enter a relatively relaxed, free, and even joyful Golden Age of academic life after securing the stability of tenure. In the implementation of the up-or-out system, tenure becomes rare, the stress of being eliminated is extremely high, and early competition in American academia is brutal. This conclusion about tenured faculty is indeed slightly unexpected.

3   The Representation of the Faculty Career in China's Higher Education Institutions

In recent years, the term of a middle-aged crisis has been quite popular in China. Compared to other countries, Chinese people rarely regard the middle-aged crisis as an empirical fact worth exploring. They prefer understanding it as a cultural phenomenon. For example, when talking about middle-aged people, the narrative is often full of various ridicules, which associate middle-aged people with negative vocabulary, such as greasy and worldly, thus giving middle-aged people a certain unbearable image. In fact, this kind of rhetoric and expression is not in line with the middle-aged image in Chinese traditions and customs. Traditionally, Chinese people who are not confused are regarded as the backbone of society and family. Middle age is identified as a life stage dedicated to strong will power, established career, cognitive and emotional maturity. In ancient China, this idealized and demanding role of middle-aged people put considerable pressure on intellectuals who are in their prime of life. Since ancient times, there has been no lack of sentimental and expressive thoughts about middle-aged Chinese poems and lyrics, such as a poet in the Tang Dynasty, Gu Zheng, whose poem *The Middle-aged* said that "The uncountable sentiment resents the silence of flower, the unbearable sorrow surrenders the reign of wine … The self-pity of old and late by adding poetic skills, revising previous topics again and again". Another poet in the Yuan Dynasty, Zhihan Zhang, wrote the following: "Since middle age, I feel the years, flowing so fast. Gradually, I lose my hairs, sabotage relationships, and see through all things". As for "Poverty is good for itself while attainment is good for the world", it better interprets the complexes of ancient Chinese intellectuals who suffer from unfulfilling aspirations after reaching nearly half of their lives.

With this historical and cultural background, to mention the current rapid social change, rushed work pace and hasty daily life, the middle-aged group in China should have a different feeling. However, it is slightly regretful that there are few studies on the living conditions of middle-aged people in China so far. Most literature related to the midlife crisis spontaneously reflects on rare events in subgroups such as engineers, entrepreneurs, scientists, and teachers. These reflections are not evidence-based empirical studies. For example, in recent years, early deaths have been frequent among young and middle-aged scholars in academia. This phenomenon has attracted much attention and even much blame in academic ecology. However, the spontaneous response triggered by the event is after all not a mirror image of reality. Whether it reflects reality still needs to be tested by adequate empirical evidence. This article is based on the sample data of a faculty survey ($N = 3,813$) from 35 universities (most of the *985 project* universities and a few of the *211 project* universities) across China obtained in 2018. Using the method of statistical analysis, this article aims to present the living condition of middle-aged faculty in elite universities, which highlights the condition of this special group and the current academic career.

3.1 The Age Distribution Curve of Vitality, Passion and Burnout in Academia

To investigate whether there is a midlife crisis phenomenon in China's academia, that is, whether the work and life condition of faculty at different career stages have certain patterns, this article observes five dimensions of indicators here. First, the objective indicator of academic vitality, based on the number of papers published in SCI, SSCI, or CSSCI journals in the past three years; second, the subjective indicator of academic vitality, borrowed from M. R. Kunter's faculty work passion scale, which mainly examines faculty's preferences and priorities between teaching and research, with 10 items in total and calculating the average from the sum of each item; third, harmonious passion of work, which refers to the harmonious passion in the passion scale designed by R. J. Vallerand (different from compulsive passion, harmonious passion can better reflect individual spiritual satisfaction and work-and-life balance); fourth, career stress, including five stress sources from student guidance, life burden, academic competition, work load, administrative affairs, interpersonal relationship and international communication; fifth, job burnout, adapted from Maslach Burnout Inventory-Educators Survey (MBI-ES), whose structure and items are not due to the limited space.

Given that the sample size is smaller for the age group under 28 years old or above 60 years old, the mean of each age cohort is provided only between 28 and 60 years old ($N = 3,726$). The distribution of each age cohort is shown in Table 1, which shows that most age cohorts have a sample size larger than 100.

To explore the changing trend of the abovementioned indicators by the age distribution, the current study uses Excel for simple data processing, sketches the curve of

Table 1 Distribution of survey samples by age

Age	28	29	30	31	32	33	34	35	36
N	33	47	93	80	135	128	133	195	214
Age	37	38	39	40	41	42	43	44	45
N	193	208	139	211	130	199	107	100	187
Age	46	47	48	49	50	51	52	53	54
N	114	102	128	88	130	61	88	92	88
Age	55	56	57	58	59	60			
N	108	58	64	18	19	36		Sum	3726

each indicator by age, selects multiple regression according to the degree of fitness, and draws the trend line of each indicator (see Figs. 3, 4, and 5).

Figure 3 shows that in terms of the number of academic publications, the overall trend has been increasing with age. The 45-year-old entered the peak period, and the overall trend remained relatively stable until the 59-year-old. It is worth noting that this conclusion is like the abovementioned conclusion of Baldwin's earlier NSOPF survey, but it is different from the conclusion of Anita G. Welch and others (2019) on the recent NSOPF survey data analysis. The latter found that in the number of papers or monographs published, after entering middle age, the short-term output decreases with age.

Figure 4 shows that in the subjective report of academic vitality, there is a relatively low period between 32 and 50 years old, and the lowest period is between
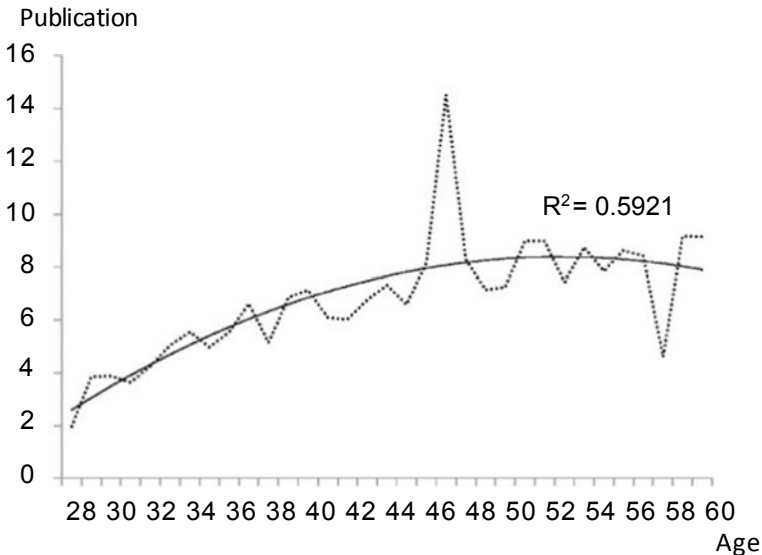
Fig. 3 Distribution of faculty academic publications by age
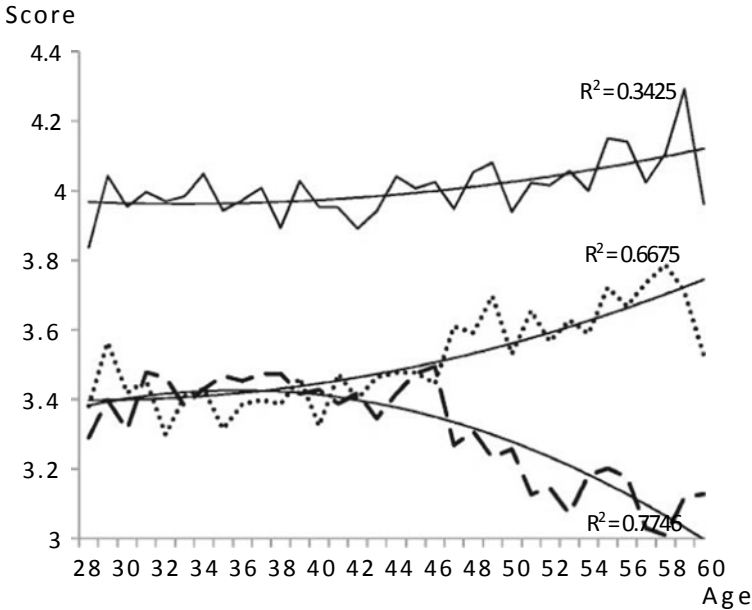
Fig. 4 The age distribution of faculty harmonious passion, subjective vitality and overall stress (*Note* The dotted line shows harmonious passion, the solid line shows subjective vitality, and the dashed line shows the combined stress)

35 and 42 years old. As far as the harmonious passion of faculty is concerned, it is interesting that the self-report score is lowest between 30 and 40 years old, but the curve of faculty harmonious passion rises significantly starting from approximately 40 years old. Correspondingly, the overall stress began to show a downward trend. The subjective perceptions of academic vitality and harmonious passion are often highly correlated with job satisfaction. This conclusion is close to the results of related faculty satisfaction research in Chinese universities. For example, Bochen Pan and his colleague (2015) surveyed faculty in Northeast China and found that faculty between 30 and 40 years old have the lowest job satisfaction.

However, the most noteworthy indicator is the changing trend of job burnout. Figure 5 shows that there is an obvious peak period of burnout between 37 and 50 years old. This inverted U-shaped curve distribution is a reverse correspondence with the abovementioned U-shaped population happiness curve. Although this study is unable to conclude that a mid-life crisis phenomenon must exist in academia, at least from the perspective of the changing trend of the burnout level, middle-aged scholars are not glamorous compared with other life stages. Especially when the changing trends of academic output and occupational stress are used as a reference, faculty burnout is aggravated at the same time as academic output blooms, academic vitality and harmonious passion rise, and professional stress drops sharply. This conclusion is same as the conclusion of Changhui Shi and her colleagues'
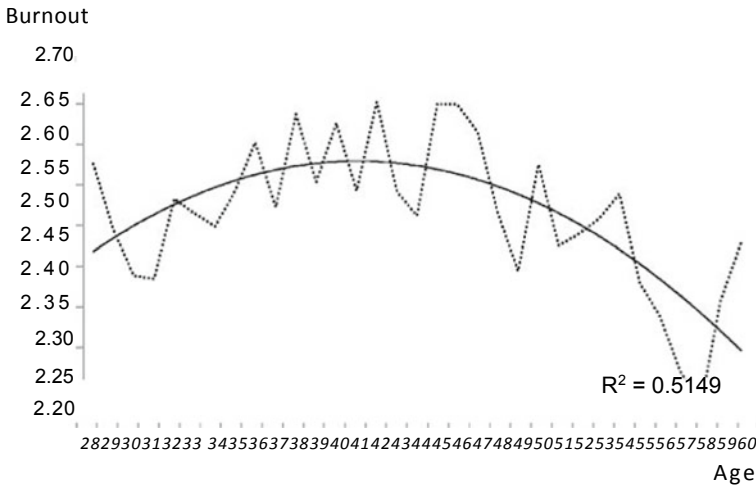
Burnout

Fig. 5 The distribution trend of faculty burnout level by age

study ([2013](#)) that 36- to 45-year-old science and technology professionals (covering research institutes, industry, and universities) have the highest score of emotional exhaustion. This conclusion is also consistent with the abovementioned results from Baldwin's survey of American universities. Which mechanism operates behind this seemingly contradictory phenomenon is worthy of further investigation.

This study believes that there are two ways to understand the mechanism behind the phenomenon. First, consider the relationship between work and life stress and burnout, which is to conduct a variation analysis between the middle age and other age groups to understand the main influencing factors that affect their daily living status; Second, do an independent sample analysis of the middle-aged group to explore the internal variation within the special group, which is likely to clarify some factors and their influencing mechanisms.

3.2 Variations in Burnout and Stress Between the Middle-Aged Faculty and Other Age Groups

This study intends to conduct a one-way analysis of variance on the overall burnout level and then three dimensions (emotional exhaustion, depersonalization, and low achievement desire) of faculty burnout in different age groups. The analysis shows that except for the low achievement desire, different age groups have statistically significant variations in terms of other burnout dimensions. The post hoc comparison demonstrates that the burnout level of the 40–49 age group was higher than that of the other age groups in all three dimensions (see Table 2).

Table 2 Mean values of burnout at different ages in the survey sample

		N	Mean	SD	95% CI		Min	Max	F	Sig
					Lower	Upper				
Emotional exhaustion	30 and below	128	2.482	0.880	2.329	2.636	1.00	5.00	5.281	0.000
	30–39	1518	2.537	0.904	2.492	2.583	1.00	5.00		
	40–49	1366	2.597	0.964	2.546	2.648	1.00	5.00		
	50–59	726	2.412	0.947	2.343	2.481	1.00	5.00		
	60 and above	75	2.377	0.902	2.169	2.584	1.00	5.00		
Depersonalization	30 and below	128	2.145	0.830	1.999	2.290	1.00	5.00	3.637	0.006
	30–39	1518	2.187	0.888	2.143	2.232	1.00	5.00		
	40–49	1366	2.301	0.906	2.253	2.349	1.00	5.00		
	50–59	726	2.214	0.880	2.150	2.278	1.00	5.00		
	60 and above	75	2.133	0.773	1.956	2.311	1.00	5.00		
Burnout (mean)	30 and below	128	2.537	0.550	2.441	2.634	1.22	3.67	5.715	0.000
	30–39	1518	2.543	0.586	2.514	2.573	1.00	5.00		
	40–49	1366	2.589	0.596	2.557	2.621	1.00	4.56		
	50–59	726	2.473	0.592	2.430	2.516	1.00	4.22		
	60 and above	75	2.403	0.559	2.274	2.532	1.00	3.78		

Meanwhile, the same method was used to analyze the variations in the stress level of different age groups. The post hoc comparison shows that middle-aged faculty have significant variations in several stress dimensions from other age groups. Specifically, the stress of teaching guidance was higher for the middle-aged group than for the other age groups. The stress of living burden, academic competition, and workload of the middle-aged group are all lower than that of the younger faculty group but higher than that of the older faculty group. The stress of administrative affairs and social relationships of the middle-aged group are like that of the younger group but higher than that of the older faculty group. Intuitively, except teaching guidance (including both undergraduate instruction and graduate tutorials), the multiple stress sources do not seem to be the main factor of midlife burnout, especially using the younger faculty (30–39 years old), whose work and life are much more stressful, as a reference. Because stress perception is often related to an individual's financial status, work competence, adjustment to work intensity and living environment, an inference is that the ability of the middle-aged group itself is not an influencing factor of burnout. What is the problem then? If career stress cannot provide a plausible explanation, it is worth further investigation whether the midlife dilemma is destined to be a natural and inescapable fate in human life.

3.3 Analysis of Internal Variations Within Middle-Aged Faculty

Focusing on a specific group (40–49 years old) and examining the internal variations in the burnout impact of variables contribute more to identifying the internal mechanism of the midlife dilemma. Despite being in the same age range and having similar social roles, individual variations in social identity, work input, economic income, physical health, and family stress within the group may bring different perceptions and attitudes toward work and life. It also provides inspiration on how to support faculty to escape the life dilemma at the organizational level. This current study aims to reflect the internal mechanism of the midlife dilemma of faculty based on a two-time-space, four-dimensional framework. The two time-space are work and life domains. For academic professionals, the two are often difficult to separate completely, and intertwined role conflict may cause tension and a sense of loss of control in work and life. The four dimensions include major events in the career (tenure promotion, frequency of job turnover, government fellowship), time spent (classroom teaching, graduate tutorial), recent achievements (number of papers published and number of government-funded projects in the past three years), family life or health stress and other variables (see Table 3). For subject fields, considering the unbalanced sample distribution, the current study performed a simple pre hoc one-way analysis of variance, followed by multiple comparisons and posttests. The analysis shows that the faculty in science, engineering, agriculture, medicine, humanities and social sciences had no significant difference in burnout level ($p > 0.05$), so the subject field was not included as a control variable in the regression analysis.

Based on the regression analysis from models 1 to 5, the current study shows that middle-aged female faculty are more likely to burn out than male faculty. Stress mainly comes from the conflict between family and work. Tenure has a statistically significant impact on faculty burnout, which means that tenure-track faculty have a higher burnout level than tenured faculty. Income is another significant factor influencing the international variations in burnout within the middle-aged faculty group. The lower the annual income is, the larger its marginal effect on faculty burnout. Promotion, job turnover, fellowship or other honors are milestones in the academic career. The interaction between associate professor and teaching experience shows that the more years spent in teaching (before being promoted to a full professor), the higher burnout level reported by associate professors. The number of job turnovers is also positively associated with the level of burnout, which may be attributed to some family relocation issues. The honorary recognition of being selected as national or provincial fellows relieves the burnout level. The data analysis demonstrates that time spent teaching classrooms, administrative trivial tasks, and physical health are statistically significantly associated with the burnout level of middle-aged faculty, while the stress of taking care of parents is barely significant ($p = 0.06$). Another pattern worthy of attention is that more government-funded projects relieve faculty burnout, while more publications increase the burnout level instead (see Table 4).

Table 3 The sample distribution of the 40–49 age group

	Category	N	%		Category	N	%
Gender	男	821	60.1	National or provincial fellowship	Yes	350	25.6
	女	545	39.9		No	1016	74.4
Teaching experience (years)	5 and below	46	3.4	Job turnovers	0	811	59.4
	6–10	256	18.7		1	327	23.9
	11–15	535	39.2		2	114	8.3
	16–20	326	23.8		3 次及以上	114	8.3
	20 and above	203	14.9	Before-tax annual income (10,000 rmb)	10 and below	163	11.2
Administrative positions	University	15	1.1		11–15	580	42.5
	College or department	302	22.1		16–20	357	26.1
	NA	1049	76.8		21–25	138	10.1
Tenure	Professor/research fellow	555	40.61		26–30	68	5.0
	Associate professor/associate research fellow	672	49.2		30 and above	70	5.1
	Lecturer/research assistant	139	10.2		Total	1366	100

4 Reflection on the Career Dilemma of Middle-Aged Faculty in Higher Education Institutions

The human life course has stages, but this does not mean that life is an intermittent process, but at any moment, there is a flow that connects the past and extends to the future. A young person has more expectations and visions for the future to inspire the passion of life from time to time, who will grow into a relatively peaceful status by accepting reality and rejoicing in memory when he or she gets old. Only in middle age, as Setiya (2017) wrote, is it indeed a period of loss during the whole life. The middle age is looking back at the past as well as facing the future, which is the gate to determine whether a life trajectory goes upward or downward as well as the crossroad to determine the life-long victory or defeat (Lachman, 2015). The difficult climb in the first half of life, smooth or failed, is hard to finish what has been started. Once into the middle age, passion and freshness faded, and the monotonous pace of daily life and work often drove numbness and birth, as A. Camus called ridiculous and meaningless life, which probably unpacks the puzzle about the existence of a midlife crisis in the general population. As far as the academia is concerned, most scholars may find it difficult to escape such an undercurrent coming at a certain life stage. Compared to many other professional careers, the academic career not only has a more distinctive

Table 4 Linear regression of university faculty in the 40–49 age range ($N = 1366$)

	Model 1	Model 2	Model 3	Model 4	Model 5
(Constant)	3.144(.256)***	3.240 (0.259)***	3.102 (0.261)***	3.148 (0.263)***	1.849 (0.255)***
Gender (Female = 0)	−0.073 (0.033) *	−0.067 (0.033)*	−0.072 (0.033)*	−0.074 (0.033)*	−0.041 (0.030)
Age	−0.010 (0.006)	−0.011 (0.006)	−0.010 (0.006)	−0.010 (0.006)	−0.002 (0.006)
Teaching years	0.071 (0.017)***	0.034 (0.023)	0.026 (0.023)	0.024 (0.023)	0.015 (0.020)
Tenure (Lecturer = 0)	−0.169 (0.060)**	−0.111 (0.062)	−0.042 (0.065)	−0.024 (0.069)	−0.004 (0.062)
Associate professor	−0.020 (0.054)	−0.225 (0.107)*	−0.166 (0.108)	−0.160 (0.109)	−0.0124 (0.098)
University leaders (NA = 0)	0.331 (0.150) *	0.357 (0.150)*	0.276 (0.150)	0.289 (0.149)	0.227 (0.135)
College/department heads	−0.030 (0.039)	−0.024 (0.039)	−0.088 (0.040)*	−0.088 (0.040)*	−0.067 (0.036)
Before-tax annual income	−0.079 (0.014)***	−0.073 (0.014)***	−0.068 (0.014)***	−0.070 (0.014)***	−0.050 (0.013)***
Associate professor × Teaching years		0.071 (0.030)*	0.064 (0.030)*	0.066 (0.030)*	−0.058 (0.027)*
Job turnovers		0.030 (0.016)	0.027 (0.016)	0.027 (0.016)	0.029 (0.015)*
Fellowship (No = 0)		−0.118 (0.040)**	−0.105 (0.040)**	−0.101 (0.040)*	−0.094 (0.036)**
Time spent on classroom teaching			0.026 (0.010)*	0.026 (0.010)*	0.018 (0.009)*
Time spent on graduate			−0.021 (0.012)	−0.022 (0.012)	−0.016 (0.011)
Time spent on academic writing			−0.018 (0.009)	−0.017 (0.009)	−0.014 (0.008)
Time spent on administrative trivial tasks			0.044 (0.011)***	0.043 (0.011)***	0.024 (0.010)*

(continued)

Table 4 (continued)

	Model 1	Model 2	Model 3	Model 4	Model 5
Time spent on weekend working			0.003 (0.005)	0.003 (0.005)	−0.004 (0.004)
Publications				0.002 (0.001)*	0.001 (0.001)
Government-funded				−0.017 (0.017)	−0.033 (0.016)*
Stress of taking care of children					0.001 (0.018)
Stress of taking care of parents					0.040 (0.021)
Family-work conflict					0.045 (0.021)*
Stress of physical health					0.192 (0.018)***
Adjusted-R^2	0.081	0.090	0.108	0.111	0.279

Note ***$p < 0.001$, **$p < 0.01$, *$p < 0.0$

feature of the institutionalized life course, as the overall structure of the life course is mainly constructed by various related institutions established by a system of rules (Zheng & Hu, 2018), but also relies on the necessary emotional resource such as curiosity of inquiry, passion of exploration, mobilization of classroom enthusiasm and creation of learning atmosphere, to maintain and implement of daily activities, which is more likely to trigger depression by self-denial or inconsistency.

4.1   Institutionalization of the Academic Life Course and Loss of Goals

In academia, the institutionalized process of tenure promotion and status recognition has the tragic meaning of Sisyphus pushing the rocks up the mountain. After years of struggling for career stability and having no spare time to appreciate the meaning of work and life, faculty members' work-life stress may be relieved to some extent, but they are more likely to encounter a period of confusion by losing their goals. This is similar to the dilemma of tenured faculty constantly mentioned by numerous articles in the *Chronicle*. It is also close to the question raised by Nancy Mills when talking about the vitality of middle-aged faculty, as her article title asks "Now that I'm tenured, where do I go from here". Otherwise, once career survival is guaranteed, the drive to improve ability and skills to meet the requirements of teaching and research gradually fades away. Most middle-aged people are likely to experience a gray period for routine work and life, which is a status like "barely okay", "neither good nor bad", or "being stuck" (West, 2012). The longer being stuck, the worse job burnout, and the more boring and tasteless the daily work will be. As Baldwin (2008) noticed, much middle-aged academic staff began to turn their energy to nonacademic ones. Affairs. The academic environment in China may be different from that in other countries, but the dilemma encountered by middle-aged faculty is roughly the same. Moreover, there are now goals set by various institutions, such as promotion from an associate professor to a full professor, as well as honors, such as government-funded fellowships in China, but the chance is slim, which inevitably wears out faculty's willpower and patience. This is also the underlying reason behind the abovementioned empirical conclusions, such as associate professors with more teaching experience having worse burnout and government fellowship winners facing lower burnout.

4.2   Frustration Caused by Conflict Between Work and Family

Family culture is obviously different between China and the United States. Even if the children are already grown-ups, the strong parent-child bond in Chinese families entrusts the middle-aged with the responsibility of parenting and even financial support. Children's schooling and then starting their own families as well as parents'

aging and sickness make it difficult for middle-aged faculty to pace themselves. Even facing heavy mental stress, financial burden and family issues, faculty must treat students and colleagues with a forced upbeat spirit. The special feature of social interaction in academic work often covers the depression buried in the deep heart of middle-aged faculty, which not only increases burnout in daily life but also may bring frustration or even mental damage when encountering certain major life events. The current study on the associations between income, taking care of parents, family-work conflict and burnout highlights midlife helplessness, especially for middle-aged female faculty, who are the most vulnerable group and often give up the pursuit of long-term goals because of the difficulty of achieving recognition at the academic workplace.

4.3 The Constraints of Academic Autonomy and Normative Constraints

Either research, teaching, or other academic work, the nature of its brain activity requires individuals to have continuous enthusiasm and passion, while it extremely avoids all kinds of excitement and noise, too much mandatory intervention of seductive stimulation from organizations, and especially distractions from overwhelming monotonous, repetitive, mechanical, and tedious daily administrative trivial tasks. For most aspiring middle-aged faculty, after reaching the midlife of their careers, although they have yet to see through academic life, they have insights into the distractions correlated or uncorrelated with academic issues. On the one hand, they admire the autonomy of teaching and research; on the other hand, they desire recognition and support from the organization and peers. It is therefore inevitable to bring internal resistance and anxiety by the overwhelming administrative trivial tasks, normative constraints, and other requirements. The workload of classroom teaching, especially repetitive teaching, also leaves faculty little spare time to explore new frontiers and even leads to a sense of boring. In addition, even accomplished faculty in the mid-career stage still must deal with frequent assessments and evaluations embedded in the context of higher education institutions in China, which continuously exhausts the mental and emotional resources for this age group. The empirical evidence from this study shows that classroom teaching and administrative trivial tasks are statistically significantly associated with the burnout of middle-aged faculty. This finding not only reveals a certain internal mechanism of the midlife crisis but also reflects the current internal organizational ecosystem and the operational status of the entire academic system in China.

4.4 The Causality Between Physical and Mental Health and Job Burnout

To analyze the phenomenon of midlife crisis, one key factor that cannot be ignored is the individual's physical health. In the general population, the middle-aged group, especially those in the late middle age group (45 years old and above), inevitably suffers muscle loss, gray hairs, porous bones, stiff joints, and a decline in multiple internal organs and systems. As Susan K. Whitbourne pointed out, large variations exist in terms of physical health within the middle-aged group. She argued that the key for the within-group variations is the individual psychological, social, and cultural factors (Lachman, 2001). That is, even if the physical age is the same, mental status, occupation, class, lifestyle and other social identities may have positive or negative impacts on physical health. The current study, however, found a reverse association rather than a one-way causality between physical and mental status such as health and burnout.

The data analysis shows that stress from physical health has a significant impact on the level of burnout. In particular, the further analysis of variance between different age groups demonstrates that the difference between two age groups (30–39 and 40–49 years old) is not statistically significant, but the stress from their physical health is obviously higher than other age groups (the post-doc comparison against those below 30 or above 50 years old is significant, $p < 0.01$). A total of 42.7% of faculty in the 40–49 age group thought that the stress from physical health was very high or extremely high, which was 2.6 times the percentage of very low or no stress (which was 16.4%, while 41% of faculty in that age group regarded the stress of physical health as somewhat). There is no statistically significant difference between fellowship winners and other middle-aged faculty. This indicates that physical health issues are common among the middle-aged faculty group. If a midlife crisis does exist in academia in China, such a crisis should be strongly associated with physical health. In fact, domestic empirical studies recently conducted in China may arouse vigilance. For example, a faculty survey conducted at four universities in Urumqi found that 81% of middle-aged faculty (46 years old and above) suffer from a subhealth status (Jia & Xiao, 2019). Another study on the faculty medical examination data of the 40–49 age group in a university of Lanzhou concluded that such middle-aged faculty face a high risk of physical health because more than 30% of male faculty are reported to be abnormal in terms of four health indicators, including body composition, bone density, vascular stiffness, and blood pressure (Xia & Zhang, 2019). Surely, health stress does not merely appear in the mid-career stage but exists as an accumulation effect of long working hours and mental overloads since entering the academic career. In other words, the middle-aged group is the explosive node of the entire career, which covers the entire process and a wide range. The current survey data highlight that except for the age group over 60 years old, other groups all report stress in physical health exceeding the average level (the reported scores range from 3.10 to 3.39 on a scale with *1* for no stress, *3* for average, and *5* for extremely stressful). Another domestic study in China found that in their faculty sample covering all age groups,

the percentages of faculty suffering from headache, stomach pain, rapid heartbeat, and appetite loss at least twice a week were 55%, 64%, 60%, and 57%, respectively (He et al., 2020), which shows the severity and prevalence of the physical health issues of faculty.

In short, faculty in the mid-career stage demonstrate rising academic vitality in both subjective and objective indicators, but they indeed show some representations not so promising. Whether this can be called a crisis needs further discussion, while based on this study, we believe that there is a low period in both physical and mental status of the middle-aged group. The low period may be due to the decline of some physiological functions, but this is secondary; otherwise, it is hard to explain why the level of burnout has decreased significantly in the late middle age group. Furthermore, the midlife dilemma is derived more from the internal institutional environment of organizations and the conflicts between organizational roles and family responsibilities. It may also be considered the aggregation or accumulation effect produced by multiple factors from life, organization and social culture after people enter a special life stage. It combines the common characteristics of the general population and the representations of the academic profession itself. From the perspective of human resource management, it is therefore necessary to focus and to provide support targeting middle-aged faculty who have long been neglected.

In fact, to target the midlife dilemma or crisis among faculty, an increasing number of American universities have included such support in the important issues of faculty development. For example, the Teacher Career Development Team (FCD) of Rochester Institute of Technology published a report on mid-career teacher support in 2013. The report systematically analyzed and summarized the cases of many universities in the United States, such as workshops for middle-aged faculty, publication grants, research and teaching support programs, to promote strategies and frameworks raising the vitality of middle-aged faculty at different levels. For example, there are advanced designs for careers, relief grants for special groups or individuals, projects to enhance happiness and work-life balance, family-friendly policies, and so on (Canale et al., 2013). Baldwin, who has long been concerned about the career development of faculty, proposed six measures at the institutional level to implement: hosting workshops, providing financial support, clarifying promotion standards, adjusting the sabbatical pattern, recognizing teaching achievements, providing funding before applying for external research grants, etc. He also listed the effective supportive framework at the department and individual levels (Baldwin, 2008).

The abovementioned suggestions are somewhat of guidelines, or they are more like the cure for an old wound, which may have a healing effect but is unrelated to the cause of the injury. The midlife crisis in both the general population and the special faculty group has roots grounded not only in the institutionalization of the longitudinal life course but also in the specific culture of the social context where they are embedded. The midlife crisis then stems from the tension between the initiative of individual life and the life course structure endowed by culture and shaped by institutions, especially when the tension is between the culture and the institutions. U. Menon conducted a subtle analysis of the life outlook of middle-aged people in Anglo-Saxon countries, Japan and India. He argued that there is a conceptual divide

between the East and the West; for example, the age concept is relatively fuzzy for the middle-aged group in Anglo-Saxon culture, where people tend to fight the fate as well as to deny the aging, while Japan has a natural viewpoint to obey the fate and to follow the heart (Lachman, 2001). The Japanese tradition has a shared source and similarity with that in China. For example, the saying that forty is not confused and 50 knows the destiny reflects the viewpoint of knowing and recognizing fate at a certain life stage in traditional Chinese culture.

The paradox is that in current academia, the entire competitive system design for faculty careers in China not only has traces of imitation and borrowing from the American tenure promotion system but also has an age threshold, which could be considered discrimination in the U.S. in the application process for research projects and fellowships. This institutional design is doomed to antagonize and conflict with the traditional viewpoint of following fate in China, which leads to a spiritual dilemma to understand the meaning of careers and lives and then manifests as an abnormal representation in sociology. Obeying the fate but still feeling regretful, moving forward but lacking goals and confidence, pursing inner peace and curious pleasure but constantly being disturbed by various punishments, awards and other institutional stimulations. The specific representation of this psychological symptom is as described above: the objective academic output of faculty in Chinese universities is rising with age, but it costs physical health on the one hand, and on the other hand, it increases the long-term burnout of middle-aged faculty instead of relieving their inner struggles. In other words, middle-aged faculty in China have yet to enter a moderately comfortable zone. to bear the risk of exploration and to resist various external distractions in their golden age with a peak of life vitality and a relatively stable career. For the academic profession that admires the spirit of intellectual originality, the existence of the midlife low period is a huge loss.

Finally, it is necessary to note that this article did not take the subject field as a background variable for faculty in the analysis process. The reason is that the pre hoc test found no statistically significant variations between subject fields in terms of harmonious passion, stress and burnout, except the number of publications (for which the faculty in science and engineering is higher than that in humanities) and subjective vitality (for which the faculty in science is slightly lower than those in other subject fields). The background of subject fields is therefore not a main influencing factor in this article, which indicates the common representation of the life course shared by faculty in China. In short, in terms of essence, the midlife dilemma both in the academic profession and in the general population is the product of socialization and institutionalization of the life course of an individual. It reflects the interaction between the professional institution, cultural structure and the individual autonomous willpower in academia. The middle-aged situation could be regarded as an epitome of the diachronic life course and the synchronic life status of this professional group. To deal with the relationship between the two is a hard question to answer as well as a wicked problem to solve in the current apparently irreversible era dominated by acceleration and in a society full of competition. This is probably the reason why current academia in the U.S. emphasizes more sympathetic and relief support for middle-aged faculty without shaking the institutional foundation of the entire system.

Even though this is a remedial action, it is still worth learning by academia in China. How to create an ideal institutional environment to inspire academic vitality while being life-friendly so that the original vitality and passion of scholars can always be full is another topic with higher expectations and more complicated discussion.

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From Equal Rights and Equal Opportunities to Equal Development: An Analysis of China's Preferential Policies for Higher Education Institution Admissions

Liguo Li and Qiuxiang Wu

Abstract Since the founding of the People's Republic of China, educational equity has always been the value-oriented cornerstone of China's educational policy formulation and implementation. With the robust development of higher education over the past 70 years, the Chinese government has launched preferential policies for higher education institution admissions, transforming the policy-making logic from equal rights and opportunities to equal development. In particular, since the National Preferential Admission Policy, the Elite University Preferential Admission Policy and the Local Preferential Admission Policy were successively launched in 2012, a fair system of policies has been established for elite higher education institutions to recruit more students from rural and poverty-stricken regions, marking a new era when the Chinese government highlights the development of fairer and higher-quality education. Compared with the previous preferential admission policies, these new programs evolve from a concessionary policy to an inclusive policy, from a score-based policy to a policy for centralized admissions by universities with high-quality higher education resources, and from a policy for admission of certain individuals to a policy for collective admission on a large scale. In the future, to make such policies better benefit the recipient group, it is necessary to target specific groups of students, increase the number of colleges and universities authorized to implement special programs, strictly carry relevant policies out, and care about the development of students from disadvantaged backgrounds according to these admission programs.

Keywords Educational equity · National college entrance examination · Admission policies · Preferential admission policies

For a long period of time in China, entering a university has been a luxury.[1] With the robust development of China's higher education and the rapid expansion of higher

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[1] University (universities) in China hereafter refer to public higher education institutions, including four-year universities and colleges.

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education institution (HEI) enrollment, an increased number of people have realized their dreams of going to university. In 2019, the gross enrollment rate of higher education reached 51.6%, which means that more than half of the people of the right age gain access to higher education. However, competition remains fierce in the National College Entrance Examination (NCEE), and people's expectations are rising; people are no longer just contented with "going to a university" but wish to "go to a great university". Nevertheless, China has uneven regional development and underdeveloped higher education, and the insufficient supply of educational opportunities remains an acute problem. Many people still need to win fierce competition to gain an educational opportunity. Therefore, it is particularly important to ensure the social significance and institutional value of educational equity.

During the course of reforming the college entrance examination and admission system, the Chinese government adopted different admission policies for various groups of students in line with the fundamental objective of educational equity. These policies gradually form three policy-making logics—equal rights, equal opportunities and equal development—at differentiated development stages. These three logics are not clearly divided by time but are intertwined within the entire process of the college entrance examination and admission system. Furthermore, in light of the situations in different periods, the government has adopted a variety of preferential admission policies. These policies are epitomes of the times, reflecting the problems encountered in specific periods and the subsequent government guidance and solutions. In this regard, this paper combs through China's preferential admission policies in maintaining higher educational equity and explores the theoretical basis and logics behind the policies. In addition, the paper focuses on the role of the current preferential admission policies in promoting educational equity and puts forward recommendations for policy improvement.

1 Three Policy-Making Logics of Promoting Educational Equity

1.1 The "Equal Rights" Logic That Ensures Everyone's Participation in the Examination

The term "equal rights" means that everyone is equally eligible for higher education institution selection and can participate in the examination. Specifically, the term means that regardless of family background, gender, ethnicity, social class and other factors, students should not lose the opportunity to sit for the NCEE. Equal rights are a prerequisite for ensuring every citizen's equal right to education, which means that both institutional and noninstitutional arrangements should present each and every individual equal access to the examination (Wang et al., 2012). The equal right is undoubtedly a fundamental principle because only when people have equal

eligibility to sit for examinations can they participate in competitions, and follow-up issues such as examination rules and admission policies can then be discussed.

In the early years of the People's Republic of China (PRC), under the influence of the political environment, educational policies emphasized intraclass equity and affirmed that children of workers and farmers should be given priority in receiving education. Consequently, in the college entrance examination and admission system, children of workers and farmers received favors, such as fixed quotas for the worker and farmer class and admissions with exemption from the entrance examination or based on recommendations. This resulted in a sharp increase in the proportion of children of workers and farmers in higher education institution admissions. In 1952, only 20.46% of the new students in HEIs were children of workers and farmers, while the proportion reached 50% in 1958 and exceeded 70% six years later. The policy produced remarkable results in a short period of time. However, this kind of educational policy granted examination opportunities based on class and failed to ensure that every citizen had an equal right to education; in particular, it put children of the "non-working people" at a serious disadvantage. Following the resumption of the NCEE in 1977, the national policy removed class-based restrictions and established an equal and unified examination and admission system, ushering in the "equal rights" logic and gradually easing the restrictive eligibility requirements on NCEE applicants. On the other hand, the previous generous admissions of children of workers and farmers underwent a substantial change; the government abolished the examination exemption and recommendation policy, which was inclined towards the abuse of power; instead, it started to give priority to workers and farmers and their children when moral, intellectual and physical were equal, replacing the previous practice of lowering the cutoff score for admission.

Furthermore, in the years following the resumption of the NCEE in 1977, the resources of higher education across the nation remained tight. The *Opinions of the Ministry of Education (MOE) on the Admission Work of Higher Education Institutions for 1977* explicitly set the upper age limit for candidates at 25 and stipulated that candidates must be unmarried, except for high school graduates of the classes of 1966 and 1967 (the upper age limit was increased to 30, and married candidates were allowed) (Yang, 2003b). In 1982, the related relaxed eligibility requirements were all abolished, and the previous requirements for candidates to be unmarried and no more than 25 years old were reinstituted (the upper age limit for students with an outstanding academic record was set at 28). These requirements remained in effect until 2001, when all marital status and age restrictions were abolished. From that year, regardless of age and marital status, any candidate could receive higher education if they met the relevant eligibility requirements, possessed basic learning skills and passed the entrance examination. The *Regulations on the Participation of People with Disabilities in Unified National College Entrance Examinations*, released in 2018, supported and facilitated persons with disabilities to sit for the NCEE on an equal footing, ensuring their rights to receive higher education. It was not until this point that HEI admissions had fulfilled equal rights in the full sense of the term. Although the elimination of the upper age limit and the celibacy requirement and the permission for persons with disabilities to sit for the NCEE did not receive a

very enthusiastic response from the public, they had far-reaching institutional significance, marking the start of the real implementation of equality of rights at the policy level.

1.2   The "Equal Opportunities" Logic That Ensures Everyone's Equality in the Examination

The term "equal opportunities" means that all people are equal before the selection rules of HEIs. When resources such as educational or professional opportunities are allocated, people with the same level of talent are given the same level of opportunities; that is, everyone has an equal chance of progress. In the case of the NCEE, it means that "all people are equal before the test scores". Government administers a unified examination and sets unified cutoff scores, and all candidates receive equal treatment in admissions based on their NCEE scores. This is what equal opportunities mean in the sense of institutional design. Following the resumption of the NCEE, China abolished the examination exemption and recommendation system and formed a fair competition model with the examination as the core and students' ability as the criterion. In the process, the theme of educational equity shifted from equal rights to equal opportunities, with "equality before the scores" coming to the fore. With this new model in place, the previous educational discrimination based on the family background was quickly eliminated, giving everyone equal opportunities to get ahead and allowing students to obtain the opportunity to receive higher education by virtue of their own talents. The merit-based admission system that emphasizes the tenet that "all people are equal before the test scores" also fully embodies the principle of efficiency and helps to improve the quality of recruited students. It has become the basic form of talent selection for the NCEE and continues to this day.

However, the merit-based principle of equal opportunities has gradually given rise to the value of "putting test scores above all else", resulting in obsession with scores. Therefore, to better select talent while maintaining unified examinations, China has in turn implemented the bonus point policy and independent recruitment policy for the NCEE, giving bonus points in various forms to selected candidates to compensate for the deficiency of putting scores above all else. In addition to giving preference to candidates who are minorities, children of overseas Chinese, veterans and martyrs, the government awards bonus points to exceptional students in academics, arts and sports. For example, in 1986, the National Education Commission stipulated that candidates who had been conferred the title of a national Class II athlete could be granted 20 bonus points. The *Interim Regulations on Admissions to Regular Higher Education Institutions* released in 1987 prescribed the items that carried bonus points and the number of bonus points that candidates could earn. However, many problems arose due to the fiercely competitive nature of the NCEE, as well as the less than vigorous design of the bonus point policy and the lack of effective supervision. Therefore, in 2010, the Ministry of Education and other departments jointly

issued the *Announcement on Adjusting Certain Bonus Point Items for the NCEE and Further Strengthening the Management Work* explicitly requiring all local governments to adjust the bonus point criteria for academic competitions and for athletically gifted candidates. In 2018, China completely abolished bonus point items for athletically gifted students, for top scorers in national school-subject Olympiads and science contests for mid-and-high school students, for provincial-level outstanding students, and for students demonstrating exceptional moral characters. This helped to advance equal opportunities and ensure the fairness, impartiality, regularity and order of admissions to universities and colleges.

Another policy related to equal opportunities is the independent admission policy, which allows universities to independently select exceptionally talented students by awarding a certain number of bonus points on top of students' NCEE scores (or lowering the cutoff score for admission). The independent admission policy was introduced in 2003 and overhauled in 2015, with admissions postponed until after the NCEE and strictly regulated. However, for a long time, the general public was skeptical about the policy. In terms of admission results, far more urban students benefited from the policy than rural students (Xun & Wang, 2011). Furthermore, the fairness of the independent admission procedures was questionable—the admission process was not transparent enough and might be rigged, undermining the principle of equal opportunities (Li, 2012). Therefore, starting in 2019, the overall scale of independent admissions was greatly reduced, bonus points were scaled back, and athletic tests were added. The government also imposed "ten strict requirements" on universities' independent admissions in terms of policy, procedure and supervision. In 2020, the independent admission policy was abolished and replaced with pilot admission programs in basic subjects undertaken by selected universities. The purpose was to overcome new challenges and problems in independent admissions, further enhance the fairness of higher education admissions, and uphold the principle of equal opportunities by ensuring that "all people are equal before the test scores".

1.3 The "Equal Development" Logic That Focuses on the Whole Process of Everyone's Growth

In the historic reforms of the college entrance examination and admission system, the first policy-making logic implemented was to ensure everyone's equal right to participate in competition, while the most influential policy-making logic was to ensure that the screening mechanism of the NCEE presented equal opportunities to people with the same level of talent. Equal rights and equal opportunities strongly promoted nondiscriminatory higher education. However, we must admit that these two equality logics were designed with the NCEE in mind. The basis was to determine who had the right to sit for the examination, and the process was to screen candidates. But how about the admission results? In the seemingly fair examination system, the differences in examination scores resulting from external factors,

such as social circumstances and natural endowments, were conveniently ignored. Certain groups of students were at a disadvantage due to their social-class origins, social circumstances and natural endowment conditions. For a long time, they lacked learning opportunities, and many of them had been redirected at various educational stages prior to the NCEE (especially dropping out during the transition from middle school to high school). Students who could participate in NCEE had to work harder if they wanted to achieve the same outcomes as those from privileged backgrounds. In fact, students' abilities to acquire knowledge and skills are premised on the supply of sufficient learning opportunities by education. Equal education should be that students' academic success depends on personal factors, such as individual efforts, intelligence, learning motivation and learning attitudes, rather than the availability of learning opportunities (Xin et al., 2018). This also suggests that the principles of equal rights and equal opportunities do not respond to social conditions, natural endowments, individual efforts and other factors and that institutions and policies are not designed with "people" as the core. As such, there is a need for a new equality logic—equal development—to design educational policies that consider everyone's entire life and guarantee equal treatment to all. This policy-making logic is based on the "people-centered" value and reflects full consideration of everyone's growth trajectory. This logic, combined with appropriate policy preference, is a precise and humanistic policy tool designed to adapt to people's future development opportunities. It pursues the equality in everyone's outcomes. Therefore, if the screening rules (NCEE) are maintained, it is necessary to compensate the inherently disadvantaged groups and slightly move forward their "starting line". In fact, this also accords with the "compensatory principle" after the "principle of equality" in John Rawls' *A Theory of Justice.*

International experiences suggest that there are two ways to realize the "equal development" logic. The first one, typified by Japan, seeks to ensure equal educational opportunities for individuals through expansionary policies that improve the overall development and popularization of education and thereby expand the total scale of education. The second one, typified by the U.S., involves the adoption of government regulation and preferential policies. In the 1960s, based on the *Equality of Educational Opportunity (Coleman) Study*, the U.S. government enacted affirmative action and other preferential policies (Yang, 2006). In modern state governance, such policies are often adopted to promote the rights and development opportunities of disadvantaged groups (Wang, 2017). In the case of China, a combination of expansionary policies and compensatory preferential policies is introduced. In terms of time sequence, a large-scale expansion of educational opportunities is followed by preferential admissions targeting certain groups of students. Since the expansion of admission to higher education institutions in 1999, the path of extensional educational development, characterized by an expansion of the scale of education, has satisfied the basic wish of "going to a university" among the public, but it fails to cope with the aspirations of "going to a great university" in the new era (Cheng, 2019). Opportunities to receive higher education show differences in quality, and quality higher education resources are inclined towards children from families with strong economic, social and cultural capital (Ding & Liang, 2010; Wang, 2013).

Clearly, a policy that simply relies on the expansion of access to ensure educational equity is limited. Today, given the uneven regional development, the relative scarcity of educational resources in the countryside and the large number of people still living in undeveloped regions, it is imperative to formulate compensatory preferential admission policies for students from disadvantaged backgrounds and from economically underdeveloped regions. Without such policies, educational equity for these students and in these regions will not be achieved.

Since 2012, the reform of the college entrance examination and admission system has been focused on the adoption of preferential policies based on the "equal development" logic. The most representative and most important policies are the preferential admission programs that encourage elite colleges and universities to admit students from rural and poverty-stricken regions, and they are classified as the National Preferential Admission Policy, the Elite University Preferential Admission Policy and the Local Preferential Admission Policy. Through these programs, universities under the ministries and commissions of the State Council and key universities affiliated with provinces and municipalities offer special admission quotas to students in rural and poverty-stricken regions, thereby increasing the proportion of such students at elite HEIs and compensating for their original educational disadvantages. The preferential admission policies fully take into account the situation of students who are inferior due to differences in social-class backgrounds, social conditions or in natural endowments; they embody a policy proposal to develop the potential of individuals equally.

2 Types and Characteristics of Preferential Admission Policies

Preferential admission policies are targeted at specific groups of students in specific situations. Some policies are in the form of rewards for students who excel academically or athletically and for winners of school-subject contests, while others are compensatory in nature, such as the National Preferential Admission Policy. By and large, China implements preferential admission policies that are essentially compensatory, reflecting the government's commitment to educational equity. In terms of the examination and admission process, educational opportunities for individuals are doubly impacted by the "distribution" of higher education opportunities and the "matching" of students' talents. The former is determined by the scale of higher education admissions and the quotas allocated to students in each province; it is the initial distribution of higher education opportunities. The latter is a secondary dynamic match based on individual candidates' talents (NCEE scores) and HEI admission plans. Therefore, these two factors also determine the two types of important interventions that the government can take when implementing preferential admission policies. The first type is macrocontrol based on distributionism, which seeks to realize the equality of educational opportunities for different

groups of students, while the second is based on score compensation for individual students, which seeks to optimize and enhance their examination scores and admission outcomes. As a result, distinctive and complex preferential admission policies have been formed in China.

Preferential admission policies can be divided into three types: quota-based policies, score-based policies, and score-and-quota combined policies. Quota-based policies involve the allocation of a certain percentage or number of admission opportunities to a specific group of students. In a certain sense, this group of students can compete within each other and can be independently admitted. Score-based policies involve awarding bonus points to a special group of students in the NCEE without guaranteeing admissions; students in this group still need to compete with other groups of students for admission opportunities. Quota-based policies guarantee eligible students a relatively large degree of competition advantages for university seats, which are beyond the reach of the ineligible. Score-based policies endow eligible students with a certain but not absolute superiority over ineligible students. Therefore, in general, score-based rules and regulations are of little significance in quota-based policies; for example, in quota-based policies, the lowering of the cutoff score for admission is only intended to complete the quota admission allotment.

In terms of the targeted groups, preferential admission policies fall into three categories: regional attributes, demographic attributes, and demographic and regional compound attributes. Regional attributes refer to students' living environmental factors, including province, region (remote region, ethnic minority region or rural region) and industry. Demographic attributes refer to students' specific characteristics, such as personal and family factors, as well as long-term attributes, such as household registration, gender, ethnicity, income and social stratum. Demographic attributes are more individual-specific and transcend spatial boundaries, whereas regional attributes have more prominent spatial and environmental characteristics and may include different groups of people over a certain spatial extent. As such, by type and orientation, this study classifies some of the historically implemented preferential admission policies into nine categories and illustrates the specific policies (see Table 1).

Quota-based preferential policies aligning with regional attributes often involve the allocation of a certain percentage or number of slots to groups of students living in specific provinces and regions. For example, in the *Report of the Ministry of Education on the Work Conference on Admission to Higher Education Institutions in 1979*, a document approved by the State Council, it was proposed for the first time that "for counties with a relatively weak educational foundation (those with no candidates above the minimum score for admission), the minimum score for admission may be lowered for a certain number of students selected based on merit" (Yang, 2003b). This was tantamount to allocating a certain admission quota to these counties. Similarly, the Targeted Admission and Employment Allotment Program, the Collaborative Admission Program in Support of the Central and Western Regions and the National Preferential Admission Policy all allocate quotas to students from specific regions. For instance, the National Preferential Admission Policy is implemented for counties with special difficulties that geographically form a cluster, national-level key

Table 1 Classification of preferential admission policies[2]

Policy type	Policy target		
	Regional attributes	Regional compound attributes	Demographic attributes
Quota-based	Concessionary Policy for Counties with Weak Basic Education (1979) Targeted Admission and Employment Allotment (1983) Collaborative Admission Program in Support of Central and Western Regions (2008) National Preferential Admission Policy (2012)	Ethnic Minority Classes in Colleges/Universities (1980) Local Preferential Admission Policy (2014)	Quota for Workers and Farmers Class (1951) Admission of Workers and Farmers Class with Exemption from Examinations and Based on Recommendations (1955) Admission of Winners of School Subject Competitions with Exemption from Examinations (1978)
Score-and-quota combined		Elite University Preferential Admission Policy (2014)	
Score-based		Bonus Points (Lower the Cutoff Score for Admission) for Ethnic-Minority Students (1978)	Priority Admission of Workers and Farmers Class (Ranking with Bonus Points) (1954) Bonus Points for Athletically Gifted Students (1982) Independent Admission Policy (2003)

counties for poverty alleviation and development assistance, and underdeveloped minority regions. Under these programs, eligible students only need to compete within the region. Such preferential admission policies have extensive coverage, significant macrocontrol effects and straightforward operating procedures.

Preferential policies based on demographic attributes often take the form of single quota policies or score-based policies. During the period when higher education in China was oriented towards workers and farmers, a quota system that guaranteed and recommended admissions for the working class and the farmer was implemented. For example, the *Regulations of the Ministry of Education on the Admissions of*

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[2] We cannot wrap up all preferential admission policies into one article. Therefore, the study selects some representative policies and does not place relevant policies for children of overseas Chinese, veterans and martyrs and artistically gifted students into discussion. However, similar policies can also be found in this paper for comparison and reference.

Freshmen in the Summer of 1951 and the Summary of Higher Education Admissions in 1950 stated that the proportion of worker and farmer cadres, intellectual cadres and industrial cadres in HEI admissions must reach a certain level (Yang, 2003a). Another kind of preferential policy based on demographic attributes involves favor scores, including priority admission of the worker and farmer class (ranking with bonus points), bonus points for athletically gifted students, and the independent admission policy. Similarly, students eligible for independent admission are granted varying numbers of bonus points, although they still need to sit for the NCEE and compete with their peers based on their actual NCEE scores plus the bonus points. This means that even if they obtain policy-based bonus points, their admission is not guaranteed. Admittedly, these policies can be refined based on the specific characteristics of different groups of students, but the obstacle lies in matching the demographic characteristics and individual abilities with HEIs' admission criteria. Furthermore, scientific determination and hierarchical grading of the numbers of bonus points to be granted prove to be another difficult task. All these factors increase universities' student recruitment costs.

The combination of demographic attributes and regional attributes makes the demographic orientation of the policies more accurate, and the policies are inclined towards groups of students in specific regions who possess specific characteristics, such as ethnic minority students in frontier regions and students in the countryside. Therefore, based on these specific attributes, preferential policies tend to be more diverse, giving rise to three types: quota, score, and quota and score combined. Quota-based policies, such as the Ethnic Minority Class in Colleges/Universities launched in 1980 and the Local Preferential Admission Policy introduced in 2014, allocate an appropriate percentage of higher education admission seats to NCEE candidates in frontier, mountainous and pastoral regions and rural students in eligible areas (autonomous regions and municipalities). Score-based policies are the policies in place since 1978 that award scores to ethnic minority students or lower the cutoff score of admission for such students. Quota and score combined policies, which possess both demographic and regional attributes, are the most complex preferential policies, typified by the Elite University Preferential Admission Policy introduced in 2014. First, this policy is oriented towards rural students from high schools below the county (county-level city) level in remote, poverty-stricken and ethnic-minority regions. It defines not only the scope of applicability but also the characteristics and attributes of students. Second, the policy is implemented by universities directly affiliated with the Ministry of Education and pilot universities for the independent admission policy. They are carried out with reference to the measures for independent admission. At present, universities implementing the policy not only award bonus points to eligible rural students or lower the cutoff score of admission for them through independent admission but also admit qualified students province by province to fulfill the quotas. This gives rise to a tandem implementation of score-based and quota-based measures under the same policy system; it emphasizes the orientation of the policy objects, the complexity of the policy design, the autonomy of universities in implementing policies, and the accuracy of compensation for students. As one of the main measures in the reform of the current examination and admission

system, preferential admission programs have significantly raised the proportion of students from rural and poverty-stricken regions in elite HEIs and increased their access to high-quality higher education resources; they signify China's strides from the pursuit of quantitative equity to the pursuit of qualitative equity (Li & Wu, 2018).

3 The Significance of Preferential Admission Policies in Promoting Educational Equity in the New Era

The NCEE admission system implemented in China ensures that everyone has an equal right to receive higher education and thereby safeguards fundamental fairness under the "equal opportunities" principle that "all people are equal before the test scores." During the admission selection process, all students are treated equally in terms of NCEE scores so that every student has an equal opportunity for a bright future. This means that the systematic design ensures equal opportunities in form, but the traditional NCEE does not consider those students who are at a disadvantage because of their social class or differences in social conditions or natural endowments. Therefore, preferential admission policies emphasize the redistribution mechanism of educational opportunities and rematch the disadvantaged groups of students through government macro-control and HEIs' awarding of bonus points. It reflects the idea of equal development in which all individuals are able to develop their potential equally. This policy design is not oriented at temporary compensation but focuses on the whole process of personal growth and development, ensuring that students in rural and poverty-stricken regions have opportunities to receive quality higher education through appropriate educational compensation and through their own talents and efforts. Compared with the original policies, the special admission programs delivered three major changes (see Table 2).

First, there has been a shift from concessionary policies to inclusive policies. With the transformation and development of the NCEE admission system, the original concessionary policy for workers and farmers and for counties with weak basic education has been gradually phased out. Since the expansion of admission in 1999, the government has not introduced any definitive preferential policy for students from poverty-stricken and rural regions. In comparison, the concessionary policy for ethnic minorities, which has remained in effect to this day, retains the practice of admitting ethnic minority students based on merit while setting a specific percentage and giving appropriate concessions to such students. This is an important part of national ethnic policy. It has played a significant role in promoting ethnic equality and increasing ethnic minority students' access to higher education. With socioeconomic development, especially the development of higher education, it is necessary to formulate inclusive fair policies for rural and poverty-stricken regions at the national level to better improve the access of students in such regions to higher education, especially quality higher education. Compared with concessionary policies in the traditional sense, inclusive policies are typified by wider coverage, more pertinent measures,

Table 2 Comparison of preferential admission policies after 2012[3]

	National Preferential Admission Policy	Elite University Preferential Admission Policy	Local Preferential Admission Policy
Year launched	2012	2014	2014
HEIs implemented	HEIs affiliated with the central government and key HEIs affiliated with the provincial government (autonomous regions and municipalities)	MOE-affiliated universities and other pilot universities for the independent admission policy (97% are universities on 985 and 211 Projects)	Key HEIs affiliated with the provincial government (autonomous regions and municipalities)
Targeted students	Students in poverty-stricken areas in counties with special difficulties which geographically form a cluster, national-level key counties for poverty alleviation and development assistance, and underdeveloped minority regions	Diligent and high-achieving rural students in high schools below the county (county-level city) level in remote, poor and ethnic-minority regions	Rural students in eligible areas of provinces (autonomous regions and municipalities)
Policy orientation	Regional attributes	Demographic and regional compound attributes	Demographic and regional compound attributes
Policy type	Quota-based	Score-and-quota combined	Quota-based
Responsible entity for admission allocation	MOE	Guided by MOE and autonomy of HEIs	Guidance by MOE and autonomy of provinces
Scale of admission	In 2017, the plan involved the admission of 63,000 students, with 28,600 students for HEIs affiliated with the central government, accounting for 45% of the total	At least 2% of the relevant universities' annual undergraduate admissions; 9,505 students admitted in 2017	At least 3%[a] of relevant HEIs' annual undergraduate admissions; 27,000 students admitted in 2017
Method of selection	Students who meet application requirements and have registered for NCEE can simply submit college choices	Based on independent admission methods (30% of the universities require reexams)	Students who meet application requirements and have registered for NCEE can simply submit college choices

(continued)

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[3] For the specific policy text and data, see the version published in 2017.

Table 2 (continued)

	National Preferential Admission Policy	Elite University Preferential Admission Policy	Local Preferential Admission Policy
Method of admission	Admission based on merit by province	Admission by lowering the cutoff score (10–60 points and maximum 100 points) Admission by exceeding the minimum cutoff score (20–90 points); or minimum the cutoff score for first-tier universities Admission based on merit by province (adopted by 75% of the universities) Exceptive admission	Determined by individual provinces; admitted based on merit

[a]Three percent of the required admissions were based on the 2016 Local Preferential Admission Policy. Admissions under the 2017 policy were 10% higher than those under the 2016 policy

and more intensified implementation (Li, 2019). Since the rollout of the National, Elite University and Local Preferential Admission Policies, key HEIs have steadily increased the admission of students from rural and poverty-stricken regions. The cumulative total number of students admitted through three preferential admission programs reached 370,000, with 103,800 in 2018. Our studies indicate that at key universities, students admitted through the National and Elite University Preferential Admission Policies consistently account for approximately 10% of the university's annual undergraduate admissions. Take the Elite University Program as an example. The number of rural students qualified for the program stood at merely 26,409 in 2015 but surged to 76,382 in 2016, 192,586 in 2017, and 187,120 in 2018, with a rather stable scale of participation, and the number of students finally admitted through these programs remained steady at approximately 9,500. As a result, a stable long-term mechanism has taken hold for students from rural and poverty-stricken regions to attend key universities.

Second, there has been a shift from the score-based policy offering bonus points to the policy of centralized admission and cultivation at universities with high-quality educational resources. In terms of the evolution of preferential policies, single quota-based policies were mostly implemented prior to 1998, and the subsequent policies were largely of the score type, such as the policy that awards bonus points to the NCEE scores of ethnic-minority students meeting the relevant criteria. This policy is often targeted at individual students, and what kind of university qualified

students can get into is not a concern of the policy design. Under the current preferential admission policies, the government pools the nation's best higher education resources (key universities affiliated with the Central Government's ministries and with provinces), allocates a certain number of university seats to students in rural and poverty-stricken regions, and admits students based on merit plus preferential treatment. These programs are designed from the perspective of HEIs, which are tasked with talent cultivation; they are intended to give qualified students access to superior educational resources. The two kinds of policies are obviously designed under different premises. Therefore, as a kind of preferential policy, the National, Elite University and Local Preferential Admission Policies are a characteristic method to solve the current imbalance in educational development. They play a positive role in increasing the chances of students in specific regions entering HEIs where quality higher education resources are concentrated. In particular, these three admission programs form a preferential admission system with a regional orientation (towards poverty-stricken regions), a demographic orientation (towards rural students), and an educational resource quality orientation (towards ministry- and province-affiliated key universities). In terms of specific policies, the National Preferential Admission Policy is implemented for counties with special difficulties that geographically form a cluster, national-level key counties for poverty alleviation and development assistance, and underdeveloped minority regions. It emphasizes admission opportunities for students in poverty-stricken regions; it is quota-based preferential policies aligning with regional attributes and focusing on areal imbalances. The Local Preferential Admission Policy aims to close the gap in educational opportunities between urban and rural students within a province; it is quota-based policies subject to combined demographic and regional attributes. The Elite University Preferential Admission Policy is targeted at diligent and prominent rural students in high schools below the county (including county-level cities) level in remote, poverty-stricken and ethnic-minority regions. It is intended to narrow the urban–rural gap (on the national level) and are combined policies based on not only demographic and regional attributes but also scores and quotas. It has clear policy orientation, pertinent concessions for students, and complex policy designs. Therefore, these three preferential admission policies are a method for HEIs across the country to take collective responsibility for students in poverty-stricken regions and to admit rural students according to different levels of HEIs and regions. Meanwhile, ministry-affiliated universities are oriented towards the whole country, while province-affiliated universities serve their home regions. These practices highlight the differences in policies and the centralized admission and cultivation of HEIs.

Third, there has been a shift from the individual admission mechanism to a large-scale, centralized preferential admission model. Although preferential admission programs are inclusive fairness policies with the attribute of fair distribution, they are different from the policy of even distribution in compulsory education, and students still need to compete for education opportunities through the NCEE. Admissions under preferential admission policies take place before the regular batch of undergraduate admissions; thus, students covered by preferential admission policies have an additional chance of admission (or even two chances in the case of rural students

from poverty-stricken regions as they meet the application requirements of both the National and Elite University Preferential Admission Policies). Therefore, they are endowed to choose their own competitors, competing first with candidates from similar "disadvantaged backgrounds" in the batch of admissions for preferential admission programs and then with other candidates in the regular batch of undergraduate admissions. The design of such rules has both fairness and efficiency in mind, and it also shows that preferential admission policies are not simple, bottomless compensation and that even if the government allocates some quotas to the relevant groups to alleviate poverty and support the development of education in rural and poverty-stricken regions, candidates covered by the policy still need to earn enrollment through the NCEE. Evidently, this kind of policy is not only based on the principle of distributive fairness in social redistribution but is also characterized by the principle of due fairness by competing for opportunities. It embodies the concept of equal development on top of equal rights and equal opportunities. This series of policies not only compensates for the deficiency of the original basic education for students in rural and poverty-stricken areas but also benefits them with future possibilities and opportunities. They help talented children of poverty-stricken families achieve social mobility and climb up to a higher social class, thereby effectively blocking the intergenerational transmission of the lack of educational resources.

4 Policy Recommendations

With the steady progress of poverty alleviation and the deepening reform of the examination and admission system, preferential admission policies based on the "equal development" concept need to be further reformed and improved so that the policies can deliver benefits to students in rural and poverty-stricken areas more fairly and effectively and thereby promote educational equity.

First, accurately identify the targeted groups of students. Who belongs to the disadvantaged group that deserves assistance? There are no universally applicable standards, and there are different theories and generalizations in different periods and on different occasions. Being disadvantaged is a relative concept. For urban areas and developed regions, people living in rural and poverty-stricken regions are relatively disadvantaged; they are in a relatively disadvantageous position in terms of access to and possession of resources and opportunities. However, among the people living in rural and poverty-stricken regions, many belong to the advantaged group economically, socially and even culturally. The current preferential admission policies are only targeted at rural and poverty-stricken regions or rural households, thus giving extra admission opportunities to children of the advantaged group in rural and poverty-stricken regions while denying benefits to families and students in need. For example, according to a study of preferential admission policies at an elite university, more than half of the high school students under the National Preferential Admission Policy have urban household registration, and among the eligible

ethnic-minority students, more than 80% have urban household registration. There-
fore, those preferential admission programs appear to have benefited only eligible
students from advantaged backgrounds who have received decent basic education,
which runs counter to the original intention of the policy (Wen et al., 2018). Further-
more, with the completion of the task of eradicating poverty across the country in
2020, national-level key counties for poverty relief will all be lifted out of poverty.
As such, will the National Preferential Admission Policy continue? How will their
admission orientation with regional attributes change? Elite University and Regional
Preferential Admission Policies face similar problems. With the reform of China's
household registration system, new household registration will replace the original
classification of households, and rural household registration will become history.
Then, can students who hold residential household registration but reside in rural
regions still be beneficiaries of the policy? This series of changes are the issues that
must be confronted with, making it imperative to design and identify new standards.
We suggest that both the standards and objects of preferential admission policies
should target needy groups of people. To make these policies more pertinent and
precise, it is necessary to formulate standards that safeguard socially disadvantaged
individuals and address their specific issues rather than simply enacting extensive
policies for an entire region and the whole countryside. Specifically, when identifying
the recipients of support, the family's annual income and the educational level of the
student's locality should be taken as criteria. The coverage of the policy may also
be expanded from the countryside to cities and from poverty-stricken regions to all
regions. This will help transform indiscriminate and extensive educational conces-
sions into sound policies that genuinely provide support for children from socially
disadvantaged backgrounds.

Second, increase the number of HEIs enrolment. Although the gross enrollment
rate of higher education in China has reached 51.6% and "going to university" is
no longer luxury, competition for places at key universities remains fierce. The key
universities (e.g., "Double First-Class" Project supported by the Chinese Govern-
ment) account for approximately 4.7% of the nation's total HEI admissions, while
approximately 37,000 students are admitted to key universities through preferen-
tial admission policies, making up 10% of the total admissions of elite universi-
ties. Undoubtedly, preferential admission policies provide favorable conditions for
students from poverty-stricken and rural regions to gain entrance to key universities,
greatly promoting educational equity. However, our research team found significant
disparities in the scores of students admitted to "Double First Class" universities
through preferential admission policies. The score gap between preferential students
and those in the regular admission batch reaches 20 points within the National Pref-
erential Admission Policy and even greater within the Elite University Preferential
Admission Policy. Some "Double First Class" universities are still unable to recruit
students in certain western provinces after multiple rounds of enrolment. On the
other hand, for some province-affiliated HEIs, the admission score under the pref-
erential admission programs is even higher than that of their regular undergraduate
recruitment batches. The reason is that many students from rural and poverty-stricken
regions tend to opt for key universities in their own province, which may lead to an

elevated cutoff score for admission. For these students, provincial key HEIs are their fancy best choices. Therefore, in light of the policy orientation, the similarity of their admission rules and the partial overlapping of policy objects, the three types of preferential admission policies can be integrated with unified system design, admission rules and talent selection and further consolidate and streamline the admission procedures. However, HEIs at different levels should have different admission policies. In particular, HEIs implementing preferential policies should be expanded from national elite universities to provincial key HEIs. By expanding the coverage of HEIs, the pressure on some elite universities for admission can be eased. Furthermore, HEIs should be allowed to raise the admission requirements on the basis of national regulations according to their talent cultivation goals and set an appropriate score protection mechanism in addition to preferential admissions. The current practice of indiscriminately applying the lowest admission scores of first-tier universities to all elite universities leaves room for improvement. HEIs should be allowed to raise admission criteria on the basis of national regulations and to set an appropriate percentage as a score protection. For example, they may require candidates not only to reach the lowest admission score for the regular enrolment batch but also to rank among the top 30%, 40% or 50%; they may also require that candidates' NCEE scores should not be lower than their regular admission score by over 20, 30 or 50 points. This grants HEIs' autonomy and refines admission rules on the one hand and eases the study and mental maladaptation in students, which may be caused by the large score gap after entering the university (Li & Wu, 2019).

Third, ensure thorough policy implementation. Preferential admission policies are not only inclusive programs but also selective examinations for outstanding students and are designed to recruit outstanding candidates from specific regions and groups of students. Since they involve selecting candidates for admission, it is crucial to ensure policy fairness and especially process fairness, impose strict candidate information requirements, set due admission quotas, and implement standard examination and admission procedures to prevent such fair policies from creating new unfairness. In particular, it is also important to prevent preferential admission policies from becoming concentrated in "super high schools", which are different from the renowned schools in the traditional meaning. Benefiting from preferential admission policies, these schools are growing rapidly by holding targeted classes for top students and concentrating on outstanding local students. The available data show that under the 2017 Elite University Preferential Admission Policy, 108 high schools each had more than 20 students admitted to elite universities. These high schools made up 0.7% of high schools across the country but accounted for 35% of the year's university admissions under the preferential admission program. Admittedly, this phenomenon exists for a reason, but will it grow more serious, eventually leading the preferential policy to the other extreme? Should the allocation of admission quotas be optimized in terms of the scheme design? Additionally, should an equalized recommendation mechanism based on high schools be introduced to curb the phenomenon of "super high schools"? On the other hand, adequate publicity of admission policies and effective application service support should be provided to prevent students from suffering from new unfairness in information access, and this

requires educational administrative departments at all levels and schools to do a good job in information release. In particular, educational administrative departments at the county level and high schools should clearly designate responsible personnel for policy publicity. Information should be released in a manner that facilitates access by students in rural and poverty-stricken regions; for example, a dedicated policy briefing can be organized to transmit admission policies to students beforehand. Guidance and administrative services for examination applications at high schools should be strengthened to ensure that all students covered by the policy are well informed. Students with application plans should be given support in terms of time, administration and facilities, thereby smoothing the "last mile" of the targeted "policy implementation running".

Fourth, care about students' growth. Whether under the National Preferential Admission Policy or the Elite University Preferential Admission Policy, the admitted students fall behind in NCEE scores and in learning skills, and they may struggle in their academic studies, a problem that is acute in science and engineering programs (Wang et al., 2017). As such, we should not only give students in rural and poverty-stricken regions the opportunity to study in elite universities but also provide care and specific guidance for their cultivation and arrange pertinent academic instruction from tutors after they enter the university, thereby ensuring that they will be able to successfully complete their academic studies. International comparative studies indicate that it is never a problem for preferentially admitted students to complete their studies as long as they are properly educated (Bowen & Bok, 1998; Niu & Tienda, 2010). However, according to our surveys of eight elite universities implementing preferential admission programs, none of these universities has any assistance and support for students admitted through preferential admission programs other than financial aid, and these universities do not integrate recruitment with talent cultivation. Due to their disadvantaged backgrounds and inadequate preparations for academic studies, students admitted through preferential admission programs are likely to turn into financially or academically disadvantaged students. This requires HEIs to provide these students with additional assistance and support. Some frontline student counselors even have no idea which students in the class are admitted through preferential admission programs. Therefore, HEIs should integrate their talent cultivation and student recruitment processes and devote more attention to the growth and development of students admitted through preferential admission programs. In particular, HEIs should draw up appropriate adaptation plans and cultivation plans for these students to help them get through the most critical period in the first and second academic years. In addition to academic studies, higher education educators should pay attention to the noncognitive development of students admitted through preferential admission programs, encourage them to actively participate in campus events, and ensure positive interaction and mutual assistance among students from different family backgrounds and with different personality traits and abilities. This will help them better assimilate into the campus environment.

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The Current Status of Active Expression Behavior in Class of Chinese College Students and Its Impact on Learning Gains

Huafeng Zhang, Fei Guo, and Jinghuan Shi

Abstract Class reticence is a stereotype about the characteristics of Chinese college students' classroom participation. This study explores the current situation of Chinese college students' active expression behavior in class and whether it could facilitate their learning under the background of social modernization and China's higher education reforming. This paper examines the problem with descriptive statistics and multiple regression analysis methods based on the China College Student Survey (CCSS) dataset 2016–2017. The results show that, first, most Chinese college students express their views in class to a certain extent, and such explicit expression is always based on implicit deep-thinking engagement. Second, students who are more active in in-class expression have better learning gains, particularly those with a relatively lower level of deep-thinking engagement. The findings suggest that both traditional and modern culture should be considered when exploring Chinese college student learning features. It is also worth changing teachers' and students' traditional ideas about active expression to encourage students to express more in class.

1 Introduction

Reticence in class is a long-term stereotype about the characteristics of Chinese college students' classroom participation. Researchers (e.g., Samuelowicz, 1987)

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label them passive mechanical learners before the 1990s and suggest that Chinese students could only acquire knowledge but lack thinking. In the modern context of cultivating innovative talent in Chinese higher education institutions, several scholars have criticized this phenomenon and called on students to be bold in asking questions, expressing themselves, and questioning teachers' authority in class (Zhao, 2018; Zhou, 2019). China education authorities have also called for reforming the traditional one-way taught class into an interactive pattern. However, after encountering *The Paradox of the Chinese learner*,[1] some studies (e.g., Cortazzi, 2001; Inagaki, 1998) also give another explanation for classroom silence considering Confucius cultural traditions (e.g., emphasis on *actions speak louder than words*). They suggest that it may be *silent participation* or *listen-oriented learning*, meaning that although Chinese students have little external expressive behavior, there is a high level of thought behind it; therefore, they can achieve higher quality learning outcomes.

Regardless of critical *mechanical learning* or defensive *silent participation*, all judgments of whether external expressive behavior reflects different levels of deeper thinking. The calls of some scholars and Chinese educational authorities believe that active expression in the classroom can reflect students' engagement in thinking, but this has not been sufficiently verified. Whether an active expression can positively impact students' learning outcomes needs to be clarified as well. In particular, many Chinese professors suggest that if students express their opinions without thinking deeply, the questions raised are of low value, and their statements lack depth. It will waste valuable class teaching time and is unnecessary to encourage.

Compared with passive listening and answering teacher questions passively, actively asking questions, participating in discussions, and even questioning the teacher's viewpoints are more encouraged in China college classrooms. We sum them up and call it *active expression in class*. This study focuses on the following two questions: (1) what is the overall level of active expression behavior in the classroom and what is the state of deep-thinking input behind it; (2) what is the impact of active expression behavior in the classroom on students' learning gains, and whether this impact varies according to students' level of deep-thinking input. Exploring the above questions can, to some extent, respond to stereotypes of silence in Chinese college classrooms and can also provide insights into whether to encourage students to be more orally active in class.

2   Literature Review

There are some studies concerning the current situation of active classroom expressions among college students in China. Several studies (e.g., Hao, 2007) believed that

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[1] John Biggs proposed the Paradox of the Chinese Learner at an international conference in the 1990s. It refers to the phenomenon that Chinese students' passive and root learning unexpectedly obtained excellent academic achievement in various international tests, which is much better than that of Western learners.

Chinese college students seldom ask questions to their teachers in class, and fewer of them take the initiative to discuss or comment on their teachers' opinions by observation. Lv and Zhang (2015) explored data from a student survey at Hunan University, Nanjing University, and Xi'an Jiaotong University found that the percentages of students choosing "often" and "frequently" asking insightful and knowledgeable questions in class were 6%, 5%, and 4%, respectively. Although the above studies seem to have confirmed class reticence among Chinese college students, it needs to vary with more representative data in China. In addition, most studies did not conduct an analysis integrating external active expression and internal thinking engagement.

Only a few empirical studies have explored the impact of active expressive behavior in the classroom on students' learning and have not reached a consensus. Day (2006) found a significant positive relationship between active expression in the classroom and children's language learning scores based on a study of Asian students in Honolulu. Similarly, Liu (2012) discovered that English debate courses that require students to initiate discussion have a significant and positive impact on students' information evaluation, inference, inductive reasoning, and deductive reasoning skills. In comparison, Seliger (1977) indicated no positive correlation between active classroom discussion and foreign language learning performance with a sample of students from Algerian universities. He suggests that it might be that high foreign language proficiency promotes active participation in classroom interactions. Lv (2018) found that compared with silent thinkers, orally active thinkers did not show advantages in goal achievement and learning satisfaction, as expected. Overall, these empirical studies with different samples, different survey instruments, and different concerns failed to reach consistent conclusions. It is necessary to explore the impact of active expressive behavior on Chinese students' learning gains with a more representative sample.

3 Analytical Framework

We constructed an analytical framework to explore the current status of active expression behavior in class and its impact on learning gains (Fig. 1). Active expression behavior is an essential part of class participation. Through the analysis of relevant research (e.g., Millis, 2002; Allen & Tanner, 2005; Kong, 2003; Allwright, 1991), college students' classroom participation includes explicit behavioral engagement and implicit thinking input. External explicit behavioral engagement refers to students' observable behaviors in the classroom, including receptive engagement behaviors such as listening to lectures and taking notes and active expressive behaviors such as asking questions and engaging in discussions with teachers and classmates. Implicit thinking engagement refers to students' thinking activities for digesting and absorbing knowledge in the course, including both superficial thinking engagement such as memorization and deep-thinking engagement such as reflective and integrative thinking about the course content. To address the research questions in this study, this paper focuses on two elements, active expressive behavior and

Fig. 1 An analytical framework of active expression behavior in the classroom and its impact on students' learning

implicit thinking engagement, and analyzes students' thinking engagement behind the classroom's external expressive behavior by depicting both types of classroom participation.

The College Impact Model demonstrates the impact of student input/engagement, the school environment, and other teachers and students' influence on individuals' learning. Learning gains refers to the improvement in knowledge, competencies, and values that students gain through learning. This study focuses on students' knowledge gains, a direct result of course learning, and creative quality improvement, an important goal of talent training in China's higher education institutions today. The College Impact Model and related research suggest that students' background characteristics (demographics, precollege learning characteristics) (Kuh, 2006), motivational factors (Kuh, 2006), classroom learning behaviors (Braxton, 2000), extracurricular learning behaviors represented by participation in high-impact educational activities (Kuh, 2008), extracurricular academic interactions (Weidman, 1987), and the multiple resources and support provided by campuses (interpersonal support, developmental support) (Kuh, 2006) can all have a significant impact on students' learning. Orally active expression in class is an essential component of in-class learning behaviors, and exploring its impact on student learning outcomes requires the control of other influential factors.

4 Methodology

4.1 Data Source

We use the data from the China College Student Survey (CCSS). CCSS is a national survey project on college student experience and college engagement led by Tsinghua

University since 2009 in China. The questionnaire mainly focuses on student learning experience, motivations, assessment for teaching quality and college support, and perceived learning outcomes. It also asks student background and demographic information, including gender, ethnicity, parental education level, household income, high school performance, and National College Entrance Exam (NCEE)-related experience. The survey is usually conducted at the end of each academic year in June. Invitations are sent to universities and colleges in March, and participation is voluntary. A random sample of about 3,000 students is selected using a stratified random sampling strategy based on each participating institution's grades. The universities can decide whether to distribute print questionnaires or use CCSS's online survey platform. According to the research framework in this study, we construct variables by selecting relevant questions in the database.

The sample concerns 40 different types of higher education institutions across China who voluntarily participated in 2016 and 2017. The total return rate is 67.37%. Invalid samples will be deleted according to the following conditions: (1) the missing data in part A of the questionnaire reaches 1/5 (30 questions), or the same answer is selected for 30 consecutive questions; (2) the difference between the answers selected in the lie detector questions is larger than or equal to 2[2]; (3) the information filled in and the sampling information (students' gender, year of enrollment, and grade level) are inconsistent; (4) international students in China. The final valid sample consists of 111,852 students, and the valid sample return rate is 53.89%. Sampling weights are used in the analysis to correct the structure between the sample and the population. (Table 1).

4.2 Research Design

To answer the first question, we construct the variable of *active classroom expression* and describe the overall performance of students' active in-class expression behavior through descriptive analysis. Furthermore, we construct another variable called *deep thought input* and cross it with *active classroom expression.* In this way, this study reveals the types of classroom participation of students to demonstrate the deep thought input behind students' external expressive behaviors.

For the second question, multiple regression analysis is used to analyze the effect of active classroom expression on student learning gains after controlling for other classroom participation and campus factors. The measurement model is as follows:

$$SLO_i = \beta 0 + \beta 1 AE_i + \beta 2 DT_i + \beta 3 X_i + \beta 4 SD_i + \varepsilon_i \qquad \text{(Model 1)}$$

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[2] The questionnaire has set the same questions with the same content in two locations; both are 4-point Likert scales. If the difference between the answers in two locations is greater than or equal to 2, we believe the respondent does not answer the question seriously; thus, it will be deleted.

Table 1 Sample distribution

	Type Sample Size		Proportion (weighted)
Institution type	*Project 985* institutions[3]	22,893	3.07
	Project 211 institutions	23,084	7.99
	Local universities	51,693	36.89
	Local colleges	14,182	52.04
Discipline	Humanity and social science	40,047	43.02
	Science and engineering	71,745	56.98
Gender	Male	57,256	52.02
	Female	54,596	47.98
Ethnicity groups	Han	97,641	91.72
	Minorities	11,272	8.28
Grade	Lower grade (first and second grade)	63,416	49.10
	Higher grade (third and fourth grade)	48,414	50.90
Parental education level	Senior high school and below	70,768	69.75
	Junior college and above	38,285	30.25

The dependent variable of the model, *SLOi*, refers to students' learning gains. We use knowledge gains and creative quality improvement as representatives in this study. Knowledge gains are measured by grade point average (GPA) and self-reported knowledge gains; students' self-reported creativity-related ability (e.g., curiosity, solving problems in different ways) improvement measures creative quality improvement. Self-reported learning gains reflect students' perceptions and judgments of their own growth from a subjective perspective and provide a more comprehensive picture of students' learning outcomes when combined with objective credit scores. However, the self-reported results are easily influenced by the respondents' social desirability tendency (Guo et al., 2018), so we add individual social desirability (*SDi*) into the model as a control variable. Among the model's independent variables, *AEi* refers to active expression in class, and *DTi* refers to deep thinking engagement. *Xi* represents other variables that may influence students' learning outcomes, including receptive learning behavior in class, extracurricular academic interaction, high-impact educational activity participation, student motivation, campus support, and student background characteristics. The descriptive statistics of key variables are shown in Table 2, and the definitions, measurement and descriptive statistics of other control variables are shown in the Appendix.

Furthermore, to test whether active in-class expression behavior has different effects on learning gains for students with different levels of thinking engagement,

[3] China started its world-class university construction projects in the mid-1990s. The most influential and well-known projects are "Project 211" and "Project 985" (more selective). The 110 universities in these projects were widely considered elite universities by Chinese society.

Table 2 Measurement and descriptive statistics of key variables (weighted)

Variables		items	Cronbach's α	Mean(SD)
Core independent variables	Active classroom expression	During the current school year, how often have you done the following? Asked questions or contributed to course discussions in other ways Challenge teachers' opinion in class Options:1–4:never, sometimes, frequently, always	0.72	2.25 (0.66)
	Deep thinking engagement	During the current school year, how often have you done the following? Change conception of particular question or concept through learning Understand others by trans-positional consideration Combined ideas from different courses when completing assignments Reflects the merits and limitations of own viewpoint Connected your learning to societal problems or issues Connected ideas from your courses to your prior experiences and knowledge Options:1–4:never, sometimes, frequently, always	0.88	2.85 (0.57)

(continued)

we construct Model 2. Compared to Model 1, the interaction term between the deep-thinking engagement level grouping and the *active in-class expression* is included. Among them, *DTLi* refers to the high-, medium-, and low-level groups of deep-thinking input. The meaning of other variables is the same as Model 1. The coefficient */J1* of the interaction term refers to the effect of active classroom expression on

Table 2 (continued)

Variables		items	Cronbach's α	Mean(SD)
Dependent variables (student learning outcomes)	Self-reported learning outcomes	How much has your experience at this institution contributed to your knowledge, skills, and personal development in the following areas? Extensively involved in various areas of knowledge Deep expertise Options:1–4:never, sometimes, frequently, always	0.75	2.86 (0.65)
	GPA	GPA of the last semester(score range:0–4)	–	3.06 (0.64)
	Self-reported Creative quality improvement	How much has your experience at this institution contributed to your knowledge, skills, and personal development in the following areas? Curiosity and imagination Solve problems through creative approach and method Removable and flexible skills Critical thinking Options:1–4:never, sometimes, frequently, always	0.85	2.84 (0.63)

students' learning outcomes for each thinking level group.

$$SLO_i = \beta_0 + \beta_1 AE_i \times DTL_i + \beta_2 DT_i + \beta_3 DTL_i$$
$$+ \beta_4 X_i + \beta_5 SD_i + \varepsilon_i \qquad \text{(Model 2)}$$

It should be noted that although the regression models control for many factors, such as students' motivation and thinking skills, there is still an endogeneity issue between the core explanatory variables (AE_i) and the dependent variable learning outcomes (SLO_i). Therefore, β_1 of the two models strictly reflects the correlation rather than causality between active expression behavior and learning gains.

Both Model 1 and Model 2 are estimated using the least squares (OLS) estimation method. The dependent variable is standardized, and the other variables are entered into the equation according to their original values. The regression estimation is clustered by the school to address the problem that the individual sample residuals are not independent within the same school. The missing flag method is used to address the problem of a high number of missing values for the student's NCEE score variable. All quantitative analyses were conducted using Stata 13.

5 Results and Findings

5.1 The Current Situation of Active Expression Behavior in Class for Chinese College Students

Although the average score of active expression in class among college students in China has not yet reached the medium level ($M = 2.25$, $SD = 0.66$), students can express themselves actively in class to some extent. Specifically, 34.03% of students were able to *often* or *very often* ask questions or discuss in class, and 24.98% of students *often* or *very often* challenged the teacher's viewpoints.

Furthermore, we divided the scores of active expressive behaviors into three groups, high, medium, and low levels, according to the actual meaning of the scores ([3, 4] for the high-level group, [2, 3] for the medium-level group, and [1, 2] for the low-level group). The percentages of each group were 20.47%, 60.56%, and 18.97%, respectively. In detail, students in the high-level group ($M = 3.30$, $SD = 0.39$) are quite extroverted. Most of them *often* or *very often* seize the opportunity to ask questions, discuss, or challenge their teachers in class. In the medium-level group ($M = 2.17$, $SD = 0.24$), students were able to express themselves moderately. Most students in this group *sometimes* or *often* discuss or question the teacher. In the low-level group ($M = 1.39$, $SD = 0.21$), students are almost silent, and none of them *often* or *very often* ask questions, discuss, or question their teacher. Overall, 81.03% of college students exhibited at least moderate active expressive behavior in the classroom, while less than 20% remained mostly silent. (Table 3).

We also classify the student deep thinking engagement scores into high, medium, and low groups with the same criteria. The mean scores of each group showed that the three groups of students could think *more* ($M = 3.33$, $SD = 0.36$), *moderate* ($M = 2.47$, $SD = 0.29$), and *less* ($M = 1.62$, $SD = 0.26$), respectively. This is crossed with the three-level groups of active expressions in class scores to obtain nine classroom participation types. Among them, the high expression & medium thinking group (5%), high expression & high thinking group (15.39%), medium expression & medium thinking group (32.98%), and medium expression & high thinking group (26.88%) accounted for 80.25% college students for classroom participation. This demonstrates that most students (99.04%) who expressed their opinions in the class

Table 3 Performance of active expressive behavior in classes of college students in China (weighted)

Overall performance					
grouping by level	high level		medium level		low level
Proportion (%)	20.47%		60.56%		18.97%
average score (SD)	3.30(0.39)		2.17(0.24)		1.39(0.21)
Performance on specific items					
Ask questions or contribute to course discussions in other ways	never	0		1.31%	39.47%
	sometimes	5.21%		74.52%	60.53%
	frequently	48.65%		23.87%	0
	always	46.13%		0.30%	0
Challenge teachers' viewpoint in class	never	0		2.08%	83.00%
	sometimes	12.70%		86.16%	17.00%
	frequently	56.17%		11.53%	0
	always	31.13%		0.22%	0

had *moderate* or *more* thinking engagement as a basis. In addition, both *silent participation* (low expression & high thinking group) and *mechanical learning* (low expression & low thinking group) were less common, at 4.49% and 1.61%, respectively (Fig. 2).

5.2 The Impact of Active Expressive Behavior in Class on Students' Learning Gains

The results of regression model 1 show that active expressive behavior in class is significantly and positively correlated with both knowledge gains (self-reported knowledge gains and GPA) and creativity quality improvement. A 1-point increase in active classroom behaviors is associated with a 0.07-0.09 standard deviation increase in overall learning achievement for students with the same level of deep thinking and other influential factors.

The results of regression model 2 show a different effect of active classroom expression on students' learning outcomes for each thinking level group. For students in the low-level thinking engagement group, active expressive behavior has the most significant impact on their knowledge gains, with a 1-point increase in this variable associated with a 0.18 standard deviation increase in self-reported knowledge gains and a 0.27 standard deviation increase in GPA score for this group. However, there was no significant correlation between active expressive behavior and increased self-reported creativity quality for this group. In comparison, for students in the medium- and high-level thinking engagement groups, active expressive behavior scores in
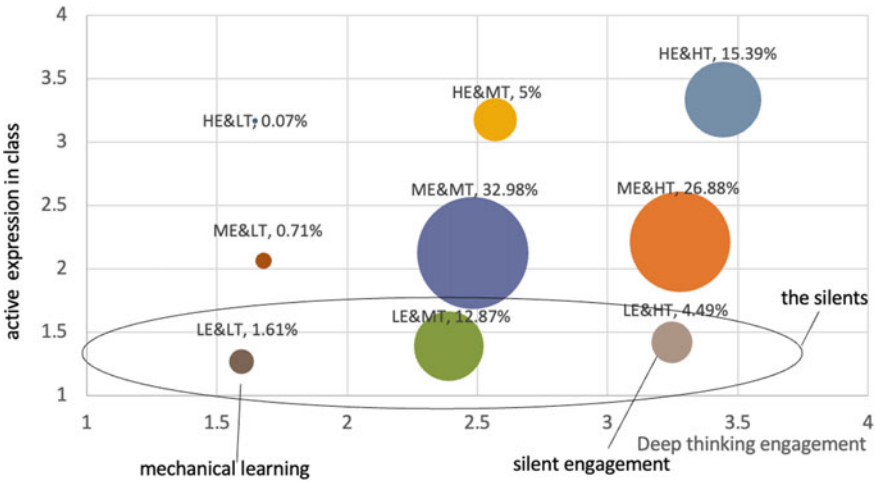
Fig. 2 Classroom participation types of Chinese college students (HE&LT: high expression & low thinking group; ME&LT: high expression & low thinking group; LE&LT: low expression & low thinking group; HE&MT: high expression & medium thinking group; ME&MT: medium expression & medium thinking group; LE&MT: low expression & medium thinking group; HE&HT: high expression & high thinking group; ME&HT: medium expression & high thinking group; LE&HT: low expression & high thinking group)

class were significantly and positively correlated with all types of learning outcomes. (Table 4)

6 Conclusions and Discussion

This study shows that Chinese college students have moved beyond class reticence and can express themselves actively in class to some extent. That is, 34.03% of students can *often* or *very often* ask questions or discuss, and the proportion for students who *often* or *very often* disagree with the teacher's viewpoint is 24.98%. Less than 20% of the students remained almost silent in class. This performance is better than that in other studies, such as Lv and Zhang (2015). In their study, insightful and knowledgeable questions or opinions were emphasized. It would be true that Chinese students are relatively less skilled to ask quality questions because of knowledge levels. The Confucian cultural qualities of modesty and low profile may also lead students to express more conservatively. Thus, the percentage of students in their study who can express themselves actively is lower than the percentage drew in this paper. This result reflects the characteristics of modern students and youth in China. On the one hand, they understand and inherit the traditional value of respecting teachers, so they still seldom question teachers' authorities in class to

Table 4 The impact of active expression on learning gains of students with different levels of deep-thinking input

	Knowledge gains	GPA score	Creativity quality improvement
Model 1 estimated value of $\beta_1 \sim \beta_1$ (standard error)			
Active expression behavior(β_1)	0.08***(0.01)	0.07** (0.02)	0.09***(0.01)
Deep thinking engagement(β_2)	0.35***(0.02)	0.04+ (0.02)	0.49***(0.01)
Control variables	Y	Y	Y
constant	Y	Y	Y
Sample size	104,000	79,176	104,000
R^2	0.35	0.11	0.41
Model 2 estimatedvalueof β_1 for three groups (standard error)			
High-level thinking group	0.06***(0.02)	0.04* (0.02)	0.07***(0.02)
Medium level thinking group	0.10***(0.02)	0.10** (0.03)	0.11***(0.01)
Low level thinking group	0.18*(0.07)	0.27** (0.08)	0.03(0.12)
Control variables	Y	Y	Y
constant	Y	Y	Y
Sample size	104,000	79,176	104,000
R^2	0.35	0.11	0.41

$+ \, p < 0.1$, $*p < 0.05$, $** \, p < 0.01$, $*** \, p < 0.001$; other estimated values of independent variables are omitted. Please contact us if needed.

show their respect to teachers. On the other hand, as digital natives of the information age, growing up in an era of globalization and accelerating China's reform and openness, they are generally more independent, confident, and open than their parents' generation and thus more willing to question what they have learned and participate in public discussions.

The results also show that almost all students (99.04%) who have some external expressive behaviors have fair or much thinking input behind them. This suggests that Chinese students tend to engage in careful thinking before their expressions, although the level of depth and accuracy of their thinking may vary. The result is consistent with a Chinese saying that *speaks and acts cautiously*. Among students who tend to remain silent in the classroom, 91.37% have a modest or high level of thinking engagement, suggesting that silence in the classroom is not a sign of a lack of thinking. There are also studies (e.g., Lv, 2016) that suggest the positive effects of silence in the classroom, especially silence with an altruistic tendency (i.e., unwillingness to disturb the teacher and classmates), which is significantly and positively related to deep thinking. In addition, the percentages of students featuring *mechanical learning* and *silent participation* were minimal (1.61% and 4.49%, respectively), indicating that these labeling expressions are biased perceptions by researchers who do not truly understand this group. Thus, it is dangerous to give a label to college students' classroom participation characteristics in China.

In addition, promoting active expressive behavior in the classroom contributes to higher academic performance levels in courses and improved innovative quality. Research in linguistics (e.g., Burr, 1995; Vygotsky, 2010) shows that verbal expression is an important way to practice and shape thinking ability by guiding mental cognitive processing, forcing information organization and reflection, and assuming thinking construction and representation tools, thus improving deeper understanding and innovation of knowledge. However, compared to deep thinking input, active expressive behavior contributes to learning gains less. This result may be due to the indirect role of active expression behavior on learning gains through self-efficacy and other psychological factors.

Furthermore, by increasing the level of active expression in class for students with low-level deep-thinking engagement, knowledge gains are enhanced, yet the creativity quality is not improved. This result may be because students with a low level of engagement in thinking are less likely to engage in academic activities that exercise deeper thinking. Based on the data in this study, the percentages of students in the low-level thinking group who have participated in academic competitions, academic research, and conferences/journals are 7.79%, 5.73%, and 2.94%, respectively, compared to 32.04%, 22.95%, and 16.76% in the high-level thinking group and 17.15%, 10.65%, and 6.08% in the medium-level thinking group, respectively. For students in the low-level thinking engagement group, expressing opinions in class may be one of the few opportunities they get to exercise their thinking abilities and, therefore, positively affect their knowledge gain. However, the improvement of creative qualities is based on knowledge gain and deep-thinking processing. Only after such students have a good knowledge base and a certain degree of deep-thinking skills will active expression behavior be effective in improving their innovative qualities.

6.1 Implications

First, both traditional and modern culture should be considered when exploring Chinese college student learning features. After the 1990s, research on *Chinese learners* gradually increased in international academia and found that Chinese students often exhibit different mental models, learning values, and behaviors than Western students. The existing studies have provided a cultural perspective to dispel many Western prejudices about Chinese student learning characteristics.

However, the study of Chinese students' learning characteristics should also move beyond cultural determinism and focus more on society's influence, the modernization of China's higher education, and undergraduate education reform. Although all Chinese students are born and grow up in China's cultural context, they have different cultural perceptions, value identities, and life experiences. As a result, broader and accurate investigations should be conducted to describe Chinese students' various learning characteristics rather than simplified labeling.

Second, we should change teachers' and students' traditional concepts about active expression and encourage students to actively express their ideas in class. The results show that even in Confucian culture and educational contexts, active in-class expression helps enhance student learning gains and even overall teaching quality. However, it is deeply influenced by stable teaching and learning beliefs rooted in traditional Chinese culture. For example, students worry about speaking incorrectly, lacking depth, being not modest, and so on. (Zhu, 2017; Lei, 2017). Simultaneously, some teachers have an overly high expectation for students, expecting them to ask high-quality questions and have critical ideas, which worsens students' concerns. Teachers and students should change these conceptions to promote students' active expression in class. Then, measures should be taken to improve campus interpersonal relationships, teaching methods, and students' learning preparation. In addition, we should pay special attention to two categories of students. The first is students who are skilled in deep thinking but can only speak at a moderate level. They account for nearly 60% of Chinese college students. Increasing their active expression level will transform our higher education classrooms into interactive, intellectually stimulating environments. Second, we focus on students who engage less in deep thinking. School administrators and teachers should provide them with more opportunities for thinking practices such as classroom presentations, faculty research, academic competitions, and academic conferences to promote higher levels of learning gains and broader future development.

Appendix

Definition, measurement and descriptive statistics of other control variables

Variable name	Definition and measurement	M(SD/percentage (weighted)
Receptive engagement	To what extent students listen carefully and take notes in class, including 2 items	2.96 (0.65)
Overall motivation	To what extent the student is motivated to learn, containing 1 item. Continuous variable	4.95(1.32)
Extracurricular academic engagement		
Peer learning	To what extent students learn with their peers (e.g., ask questions each other), containing 4 items. Continuous variable. Cronbach's α = 0.77	2.77(0.58)
Student-faculty academic interaction	To discuss homework and course content with teachers out of class, containing 2 items. Continuous variable. Cronbach's α = 0.76	2.23 (0.74)

(continued)

Variable name	Definition and measurement	M(SD/percentage (weighted)
High-impact educational activity participation		
Extended activity	Whether students participate in any activities beyond the curriculum requirement such as language learning, study abroad, and take a second degree, dummy variable, 1 = participated,0 = not participate(comparison group)	1 = 20.04%, 0 = 79.90%
Research-related activity	Whether students participate in research-related activities such as academic competitions, academic research, and contributed to conferences/journals, dummy variable, 1 = participated,0 = not participate(comparison group)	1 = 35.16%, 0 = 64.78%
Social practice	Whether students participate in social practice such as an internship, social practice investigations, or volunteer activities, dummy variable, 1 = participated,0 = notparticipate(comparison group)	1 = 72.75%, 0 = 22.22%

The missing rate of the NCEE score was the highest, 6.61%. In comparison, the missing rate of other variables is less than 3%

Campus support		
Relational support	The overall relationship between students and various types of teachers and peers, containing 4 items. Continuous variable. Cronbach's α = 080	5.13(1.15)
Developmental support	Student perceived academic, vocational, psychological, entertaining and economic support, containing 5 items. Continuous variable. Cronbach's α = 0.86	3.22(0.50)
Student background characteristics		
Female	Whether or not the student is female. Dummy variable, 1 = yes, 0 = no (comparison group)	1 = 47.98% 0 = 52.02%
Minority	Whether or not the student is minority student or not. Dummy variable, 1 = yes, 0 = no (comparison group)	1 = 8.28%, 0 = 91.72%

(continued)

Variable name	Definition and measurement	M(SD/percentage (weighted)
Single child	Whether or not the student is the only child in his/her family. Dummy variable, 1 = yes, 0 = no(comparison group)	1 = 46.06%, 0 = 52.41%
Parental occupation	Integrated parental occupation status (higher occupation status between student's father and mother). 1 = farmer(comparison group), 2 = non-technical worker, 3 = skilled technician/self-employer/police, 4 = professionals, 5 = middle- or high-level company manager/government officials, 6 = others	1 = 11.18%, 2 = 15.68%, 3 = 32.37%, 4 = 13.30%, 5 = 18.05%,6 = 7.92%
Family first-generational students	Whether student is a first-generation college student in their families. Dummy variable, 1 = yes(parental education level is high school and below),0 = no (parental education level is junior college and above)(comparison group)	1 = 69.75%, 0 = 30.25%
Rural	Whether or not the student lives in rural areas before college. Dummy variable, 1 = yes, 0 = no (comparison group)	1 = 28.61%, 0 = 71.39%
NCEE score	Student National College Entrance Exam score. Continuous variable. It is standardized according to live areas, entry year, and major	481.22(116.93)
Key high school	Student once studied in the key high school in their cities. Dummy variable,1 = yes, 0 = no (comparison group)	1=47.67%, 0=52.33%
university type	University and college type student study in. categorical variables. 1 = 985 project universities (comparison group), 2 = 211 project universities, 3 = local universities, 4 = local colleges	1 = 3.07%,2 = 7.99%, 3 = 36.89%, 4 = 52.044%
Humanity and social science	Whether or not the student majors in humanities and social sciences. Dummy variable, 1 = yes, 0 = no (comparison group)	1 = 43.02%, 0 = 56.98%

(continued)

Variable name	Definition and measurement	M(SD/percentage (weighted)
Higher grade	Whether student study in higher grade (the third and fourth grade);Dummy variable, 1 = yes,0 = no (comparison group)	1 = 50.90%, 0 = 49.10%
Social desirability level	Individual proposition and tendency to give a better response when filling in self-reported questions, containing 8 items	53.30(21.65)
Year 2017	Whether student participate in the survey in 2017;Dummy variable, 1 = 2017, 0 = 2016(comparison group)	1 = 53.54%, 0 = 46.46%

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Values Education for Rural Children in Ethnic Areas of China

Jieyuan Sun

Abstract Values education for rural children in ethnic areas is a specific issue arising from the integration of ethnic education, rural education and values education. It serves as the key to fostering a sense of community for the Chinese nation among rural children in ethnic areas and promoting the symbiosis of national cultural values and social governance. Values education is premised on a full understanding of objective conditions and limitations in multiple realities include in ethnic areas, in the rural communities, in China and the world, a breakthrough in the traditional concept of values education, and the application of new methods of values education and new forms of educational practice. Therefore, we are supposed to attach special emphasis to develop children's rational judgment of value and foster their correct cultural values of ethnic minorities, social values of rural community and political values of China-world. Families, schools and communities are supposed to work together because families are the source of values "imitation", schools are the major front for cultivating social values, and communities provide values with an indispensable "leisure" educational space.

Keywords Ethnic areas · Rural society · Children · Values education

1 Introduction

At present, our values education research mainly focuses on several themes: the basic theory of values education, college students' socialist core values education, socialist core values education for the youth, and values education comparison (Wei & Liu, 2019). The mainstream concept and perspective have considered that values education should be in the category of moral education or ideological and political education, and have formed the values education research paradigm with the pursuit of interpreting, spreading and shaping multiple moral or political values systems.

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Research on the values education of rural children and children in ethnic minority areas is very rare. There are two main points of concern. First, we should pay attention to the values education of left-behind children. For example, some scholars pointed out that the lack of family education resulted in the deviation of children's value view (Xia, 2013). Some scholars believe that the gradual decline of local culture as children's living place and spiritual home has caused the cultural dilemma of rural children's value formation, and they advocate of strengthening children's cultural identity and cultivating rural public culture (Shen, 2016). Some scholars also value the cultural advantages of the culture of rural sages in cultivating the values of rural children, and advocate of remaking the rural gentry (Li & Sun, 2018). The second is to pay attention to the relationship between minority culture and the formation of minority children's values. The basic idea is to stress the restrictions of different moral values education in social and cultural environment, and emphasis the significance of the socialist core values or social common values system which leads the ethnic differences in moral values, that is to form the moral consensus. Meanwhile, it is necessary to point out the problems that minority children's values tend to be single and narrow (Wan, 2015). The research on values education in our country is rich, which is the foundation that later researchers cannot go beyond and must rely on. There are few studies on the values education of rural children in minority areas, and the few works are undoubtedly valuable for exploring.

At the same time, the theoretical perspective of values education research or children's values education research is not broad. The prominent feature is that the academic circle mainly focuses on the types of moral values and political values, but the types of values are not limited to these.

Although some people have been concerned about the values education of ethnic minority children and rural children, relevant studies are sparse and fragmentary, and lacking the construction of theoretical paradigms and the discussion of basic principles. In particular, people seldom consider how to base on "values" concept analysis to further establish the more abundant connotation of the values education concept. People also seldom explore the condition of children's values education practice, processes, and goals from the perspectives of children from specific groups and their survival field. These certainly can enhance the depth of the values education research and the inner structure of broadening the values education practices.

Values are people's views, opinions and attitudes about the function, significance and value of something to them (Yuan, 2005). In terms of the demand relationship between people and a particular object, values are people's survival and development requirements, and the fundamental value of things. Values are the overall concepts about how to distinguish between good and bad, kind and evil, and in line with wishes and against wills. Values are the basic principles about what you should do and what should not do (Yang, 2015). The core is the standard of value on the basis of measuring the value of things (Chen, 1990). The purpose of children's values education is to educate or shape children's correct values, which is not only the inner requirement of children's development but also the core link of children's education. Rural children's values education in ethnic regions is the superposition and fusion of values education, national education and rural education. It emphasizes a sense of history and practice

of children's values education. It further highlights the dependence and the stipulation of children's values education on social and cultural environment, as well as the high-order leadership of the socialist core values system. Under the current background of national strategies and major challenges, such as consolidating the consciousness of the Chinese nation community, the symbiotic development of multiethnic cultures, the national governance and social governance, the problem of values education for rural children in ethnic minority areas, is particularly urgent.

2 Field of Values Education for Rural Children in Ethnic Minority Areas

Children grow up and live in a certain specific field, and they are the children in the real field. Field, as a form of the relationship strength for children's survival and living, makes the children's values have a certain reality: the reality of the content of values and the condition of values formation. Both individual values and values of different social groups are neither inherent nor subjective in people's minds. Instead, they are gradually formed in certain social environments and activities. This means that the subject creatively grasps social existence and social life in practice activities through self-consciousness (Wu, 2008).

1) National field: the original culture for children's growth, the psychological space

Ethnic areas are the natural field of values education for children in ethnic areas (National field for short), and they are the cultural relations space or ethnic culture field created by local people (the main body is ethnic minorities) based on their labor practice. "Culture" refers to minority cultures in the static sense. It is what British anthropologist Taylor (1992) said, "in terms of its broad ethnological significance, ethnology includes all of the knowledge, faith, art, morals, law, custom, and the complex for skills and habits, which is known and accepted by the community members of people". Many scholars have also proposed a concept similar to this "complex" called "lifestyle"; that is, national culture is regarded as a national lifestyle. In this regard, more emphasis is placed on the more hidden and central existence within the national culture: values and rules. Some scholars claimed that lifestyle itself is not culture but the concept of how to live is culture (Chen, 2017). On the basis of reflecting Taylor's definition of culture, some American scholars also believed that culture is something deeper than visible behavior; it is an idea that value and concept shared and transmitted by society. It gives meaning to experience, produces behavior and is reflected by behavior (Ha, 2014). Therefore, when we talk about the national culture, basically it refers to a particular nation to create and maintain the traditional values and living standards of our culture and life. Values and living standards constitute the fundamental strength to maintain and progress the national community. For instance, anthropologist Benedict (1988) claimed that what truly binds people together is their culture, that is, the ideas and principles they shared.

The national cultural field manifests two basic characteristics: first, the cultural network constructed by the link of the core of the national culture, namely, the values and living standards; and second, the common psychological tacit understanding, values and ethnic identity formed by ethnic members living in this cultural network which is also called the national cultural psychological field. Chinese anthropologist Xiaotong Fei (1988) pointed out that people of the same nation feel that they belong to the same community of people. This kind of psychology is an objective existence, and everybody can experience. This feature may be more important than others in forming and maintaining the human community of nations. Psychological research shows that there are certain common psychological characteristics among members in the same environment and affected by the same culture; if the geographical conditions are roughly similar but the cultural types are different, then different psychological characteristics can be seen to form (Huang, 2001). Children in ethnic areas have been living and growing up in the ethnic cultural field since they were born. Cultural networks have become the prerequisite for games, learning and life and the most direct medium for socialization. Therefore, children have been implanting corresponding values and living standards. The psychological field is a self-sufficient environment for children to gain a sense of security and belonging. Meanwhile, children gradually consolidate and extend their national psychological field in the process of living with the environment, others and social interactions. Anthropologist Murphy (2009) pointed out that culture was the mother's womb from which we were born, the anvil on which each of us and our destiny were forged. The ethnic cultural field is the mother's womb for the growth and development of children in ethnic areas: children absorb milk from their cultural mothers to educate their character and mind, form their worldview and view of life and values, and naturally gradually develop their attachment and identification to the "mother". At the same time, the national culture obtains the continuation and innovation of cultural life because of giving birth to children. When a new life came to this world, the culture tradition already existed, and the new organisms living in it directly accepted this culture and were gradually created and accumulated by many people for a long time (Fei, 2007). Therefore, the culture is historic and across time, space and the things of life; it is also ahead of a individual, and will not disappear with the disappearance of the individual. It can be said that in such a cyclic interactive practice between children and culture, a symbiosis mechanism and self-organizing energy are gradually generated, that is, culture is continued by "transforming people", while the subject is grown by "learning". These two practices are dialectically unified and co-exist and co-thrive.

2)   The rural field: A habitat of children distinct from the city

Generally, when we emphasize ethnic areas or ethnic fields, we mainly talk about "ethnic" from the cultural perspective and focus on the "ethnic" characteristics of the culture. As a natural field for the growth and life of rural children in ethnic areas, rural areas are also defined by many scholars from a cultural perspective. They regards "rural" as a cultural concept and call it local culture that originated from life and formed by farmers' wisdom and strategies to cope with and deal with problems in life (Lu, 2017). This is a cultural epistemology constructed from the perspective of

rural subjects' labor practice; in other words, local culture is thelifestyle of farmers and the value system and rule system contained in it. Farmers in the traditional sense of China are mainly engaged in farming, so this culture is also called farming culture, and this way of life symbolizes farming civilization. The problem is that "farming" does not seem to include "nomadism" or "fishing" because a large portion of our rural areas are geographically spread out across vast grasslands and oceans, and they all have rich lifestyles and endogenous cultural values. However, whoever they are, farmers, herdsmen or fishermen, what they have in common is that people always live and work together. They must properly deal with the relationship between people and people and the relationship between people and nature. Then inevitably create all kinds of ethical rules, etiquette and custom civilization and moral concepts, and forming the elements and patterns of rural culture.

As a comprehensive space for children's survival, the countryside is defined in the sense of distinguishing itself from urban space to a large extent, and emphasizing the special significance of the countryside as a field for children's survival and development. The countryside is the "habitat" for the growth of rural children; it is the original field on which rural children's life development and socialization development depend (Ye, 2018). There is no doubt that there is a "field" difference between rural and urban children's education. However, the difference is not opposition. If we believe that the environment restricts behavior, then the behavior will lead to environmental change (Huang, 2001). Children and their environment are interdependent, interactive and symbiotic, and the field constructed by children and the environment constitutes an objective relationship network for children's growth. Therefore, we will not put the two different life fields, the city and the country, in opposition, or even make an evaluation comparison of the advantages and disadvantages of these two. Instead, we should regard them as differentiated children's education and cultural space, and different fields of educational significance. "I do not agree with the dichotomy between urban children and rural children. The environment in which they live is unique and irreplaceable, and they can all become education resources to promote growth. The differences created by the environment can be changed through education" (Ye, 2018). Therefore, Ye (2018) suggested that the research focus needs to be shifted down, and the research questions should be deepened. We should study the problems of child development and educational change in the context of children's lives. Fei (2012) also indirectly pointed out that the countryside children cannot read well in the classroom as the professors' children do, and the professors' children are not good at catching grasshoppers in the fields as the countryside children do, in the same sense. Country people do not know how to handle cars because they do not have the experience of living in the city. It is a matter of knowledge, not intelligence, just as city people cannot drive off dogs when they go to the country. Although Fei's (2012) specific case may have changed with the pace of urbanization and social transformation in China, the basic value proposition (real intention) hidden behind his discourse is not out of date and can even better reflect the urgency of education reform and development in contemporary China, which is the special significance of rural life and local culture on the growth and development

of rural children: not only in the aspect of epistemology but also in the aspect of ontology and axiology.

3) Chinese field: the fundamental provisions of children's values education

The values education of children in ethnic areas of China is fundamentally based on the "Chinese field", and there should be at least three meanings of interpretation: the territory of China as the geographical space, the Chinese nation as the cultural space and the nation of China as the social-political space. We must fully affirm the essential nature of "China" in the territory-geographical environment, in history-cultural pattern (nationality), and in social-political mode, as to be the objective tolerance and limitation of the values education for rural children in China's ethnic areas. There is an inevitable interaction amongst the geographical environment, human beings and their labor practices. One of the most important products is the regional culture with different styles. Scholars have pointed out in the book "Chiyou's Conjecture:the Creation of Chinese Civilization" that living in different geographic conditions, people will form different personalities, adopt different methods for the organization of social systems, and determine different legal and political systems. The Chinese civilization is probably the most peaceful one in the world. The only source of such spiritual qualities is from China's special geographical environment of Asian monsoon (Qian, 2011). Montesquieu (2012) once said that the people of mountainous and difficult regions enjoyed more freedom than those of better natural conditions. If the world is divided according to the ideas of people, it will be surprising that most of the time, the most fertile land is desert, and in unproductive land, powerful nations have sprung up. It is not difficult to explain the various cultural types of different ethnic groups, and the colorful cultural styles or styles presented by different regions in China, that has a vast territory, abundant resources and diverse geographical environment, and constitute the overall characteristics of Chinese national culture. All these factors make China extremely rich in inner vigor and vitality in the cultural connotation. This is the unifying relationship between China as the geography and China as a culture or civilization.

Historically, the geographical barriers kept Chinese civilization far away from other major civilizations, so it was not affected by foreign civilizations on the whole. and it maintained a sustained and stable development. The history of more than five thousand years fully proves that the Chinese civilization originated and is rooted in this land, that is the most suitable for China's geographical environment and for the people living, producing and surviving on this land. However, the significance of China is not simply explained by the number of square kilometers or geographical coordinates, but by a living history of the development of the country and the nation-community (Ge, 2015). The Chinese civilization includes, on the one hand, China's diverse national civilizations and rich regional civilizations; on the other hand, it refers to a stable common spirit and value system gradually condensed on the land of China after the continuous integration, change and development of these civilizations.

First, "country" is a political concept, and we need to ask and answer "what is China" from a political perspective; in other words, it is the question of "what is the political nature of China". The answer is clear: China is a socialist country

and, by extension, a socialist country with Chinese characteristics. Hence, the rural children in ethnic areas in China must also be defined in this political discourse that they are citizens of a socialist society with Chinese characteristics. Therefore, in the political sense, the values education of children in ethnic areas must be carried out in China, the socialist country with Chinese characteristics, rather than in other countries or other social forms. Therefore, we will add political dimensions on the basis of geographical and cultural provisions to build a more realistic and holistic field of children's values education with rich levels and full vitality.

4) The human field: children are in the conflict between cultural globalization and values

Children are different from teenagers, adults and the elderly. They shows significant differences in the body, mental development and cultural socialization in the same sense of time dimension. Regardless of the concept, "children" as a kind of "class" symbolizes the initial stage of human life development. Regardless of nationality or ethnics, children are homogenous in the sense of "kind". Rural children in ethnic areas are not only belong to the ethnics, the rural area and the nation, but they are also belong to humans and the world, at least from the aspect of universality of pure life and the global phenomenon represented by children's cultural symbols. Therefore, it is possible to say, from a macroscopic holistic perspective, that children lives on the earth and the earth is the home of all children; in this sense, children have the cultural characteristics of subjectivity, power and consistency as they are being children.

Historically, at least in the past 200 years, the global development history has indicated the view of "one world" or "global village". Harari (2014) gave an in-depth description of its formation: "In the first half of the twentieth century, scholars believe that each culture is unique, harmonious and coexisting, and has its own unique and unchanging essence. Each group of people would have its own worldview and social, legal and political system, and each would operate as smoothly as the planets around the sun. According to this view, culture, as long as it is independent and unaffected, will not change but will continue at the same pace and in the same direction as it was. However, most cultural scholars now agree that the opposite is true. Although each culture has representative beliefs, norms and values, they are constantly fluid and changing. So long as the environment or the culture in the neighborhood changes, the culture will be changed and responded. In addition, culture creates its own dynamics for change. Even if the environment is completely isolated and the ecology is stable, there is no way to avoid change." Sociologist Giddens (2011) profoundly revealed that the global trend of modern culture tends to fuse, defining globalization as the strengthening of social relationships around the world. The relationships connect the distant regions ina way that something took place here may be caused by other long distant events which are many miles away, and vice versa.

The initial production of thoughts, concepts and consciousness is directly interwoven with people's material activities, with people's material communication and with the language of real life. People's imagination, thinking, and spiritual interaction are also direct products of people's material actions. It can be said that today, when industrial technology and the market economy gradually penetrate into every region

where human beings live and material production and construction of social relations inevitably take place, the so-called regional culture or people's concept system also changes and reshapes accordingly. The development of interrelationships among ethnic groups largely depends on the development degree of the nation's productivity, division of labor, and internal communication (Marx, 2012). However, this interrelationship has become an objective fact and has become increasingly intense, complex and diversified. Therefore, we should not stay in the static vision to understand the national culture, the countryside or China. It is difficult for us to judge the pure national culture, what is rural or what is urban in the cultural sense, unless we fully realize that "pureness" already contains "change". Harali (2014) claimed that we often say that some cultures are 'pure', but if by 'pure' we mean that there is no external interference from the beginning to the end, only the oldest local traditions, then there is no pure culture in the world. In the past few centuries, the surging tide of globalization has transformed almost all cultures so that they can no longer be seen as they were. The trend of world assimilation and simplification can be regarded as "an inevitable result of human history", but "it does not necessarily represent any culture in the world today". Although globalization is a single flow, it is not homogenous. Just as a single organism has many different organs and cells, a single global culture contains many different types of people and lifestyles, from a stockbroker in New York to a shepherd in Afghanistan. But in any case, they are closely related and influenced in many different ways. In this regard, values education should be fully integrated into the human vision and the globalization dimension; it should be involved in the tide of modernization, and establish positive correlations among values education, the development of rural children in ethnic areas and the destiny of the world.

Another important consequence of modernization and globalization is the intense cultural contradiction and value conflict after the multicultural collision, which is a challenge of modern children's values education and a cultural field that must be faced directly. In the history of different ethnic groups, there was no cultural collision or value conflict. Therefore, values education is at most the natural state of culture or life itself. It is the inevitable result of modernization and globalization that values education is truly highlighted and moves towards conscious practice. In a sense, the more modernized and globalized a society is, the more intense the tension of culture and values within it becomes, which is the basic law of cultural development. Furthermore, human society increasingly needs values education because it is fundamentally derived from the social reality value problem, especially the value conflict problem. The vivid history of all countries in the world has proven that value conflict is an important cause of social turbulence and may brew potential social crises. The British values education research expert Taylor (2003) claimed that we lived in a 'value pluralism' society rather than a worthless or a relativist dominated society. However, it is also a society in which many beliefs, values and traditions are not highly valued. Therefore, values education for rural children in ethnic minority areas is not just a simple transmission and identification of certain traditional values. In the modern social field with multiple value conflicts, values education has many other important things to do.

3 The Purpose of Values Education for Rural Children in Minority Areas

The problem of what values to educate is the fundamental problem of children's values education, which is closely related to the realistic field on which values education depends. Only based on the real field, we can truly grasp the correct direction and specific content of children's values education and construct the educational theme of children's development in accordance with the specific field conditions. At the same time, the reality of the direction and content of values education can promote the reality itself to acquire significance and development opportunities under the influence of educational power.

1) The essence of children's values education: traditional innovation

Marxist theory of values revealed that "value is a kind of relationship, but not the relationship between any two things, or even the relationship between things and people in general, but the relationship between certain objects and people's needs". "The needs and satisfaction of the subject is the yardstick of values, the yardstick to measure whether a certain object has value, what value it has and how much value it has". The commonality of the needs of the subject forms the common value; the difference of the needs the subject forms the different values. In short, value is determined by the specific relationship between the needs of a person and the object. The needs of a person are derived from the cultural tradition, empirical reality and practical activities he or she confronts; and the needs are acquired products rather than innate. Value refers to the subject's view or attitude about values, that is, the view or attitude about the "demand relationship" (Ma, 2017).

Among people's views or attitudes include emotion, cognition, evaluation and its criteria, evaluation is the core. Evaluation inevitably involves value goals and value pursuit. The essence of the evaluation of the relationship between value and demand is to make value judgments about it is worth or not worth, good or bad, good or evil, right or wrong, and what should be done. To a large extent the basis of the judgment is the value orientation held by the subject. Evaluation must rely on a certain measure, standard or norm, in doing so value contains value norm, value scale and other contents. Evaluation is not dependent on existing criteria, standards or norms but can be regarded as a means of value generation that evaluators make judgments on things about good or bad, excellent or inferior, should to be or should not to be, worth or not worth according to their own needs or interests. In fact, this is to establish value relations and create value. Therefore, on the whole, values at least contain value evaluation, value norm, value yardstick, value goal, value pursuit. However, there is also a key element, namely, value rationality, which is the form and ability of value rationalization and the basis of forming the ability of value judgment and value selection (Shi, 2009).

China's traditional values education mainly focuses on moral values education. Normally, in the Chinese context, "values education" may mainly focus on the presentation, interpretation and propaganda of values, with a strong color of cognitivism

(Shi, 2009). That is, traditional values education mainly focuses on teaching people to understand and internalize the existing values or value systems in the cognitive sense, which can be called the values education of "talking and teaching". Objectively speaking, "moralizing" traditional values education has a realistic necessity because those values system transcendentally existed before children, as the values consensus, with repeated proof and extraction, is largely a rational reflection from the laws of human development and social development. They greatly need direct domestication or "indoctrination" for spread and inheritance.

There are several problems in the traditional values education of "preaching", which are worth reflecting upon. First, in epistemology, it regards values as truth or absolute knowledge, which largely erases the subjectivity, constructiveness and social historicity of values. However, the inner structure of value is generated by the emotional experience, value principle, value criteria, value evaluation and value pursuit contained in the value. Second, in terms of methods, it is easy to equate values education with imparting and oppressing knowledge education. People learn and accept the existing value system, as similar as to learning certain knowledge. Students' value learning is different from knowledge learning and skill learning. It has its own rules (Shi, 2014). Third, fundamentally, values are abstracted as existence separated from specific subjects, history, society and cultural situations and become something without carrier and independent of specific value relations or demand relations. Therefore, values education is difficult to promote the subject to establish reasonable value pursuit, value norms and value evaluation resources under specific historical conditions and social situations; and it is difficult to establish a value relationship that conforms to the law and the purpose.

Therefore, we need to expand the connotation of values education and its realization way, try to integrate and restore the existing human consensus values system to the specific field, and construct the realistic values system of children's values education in the specific field. There is a need to emphasize the construction of values,. That to emphasize subjectivity and field regionalism, as well as the history and reality of value types. The types of values are the full reflection of the vivid value relationship between real people and real things. For example, political practices involve political values; cultural practices involve cultural values; economic behaviors involve economic values; and interpersonal behaviors involve social values. Values are organized by many factors, including spiritual, moral, social and cultural experience fields as a whole, as well as specialized values, such as spiritual values, moral values, social values, cultural values or other values (Taylor, 2003). Taylor's (2003) classification of values reveals that the practice of values education should reflect its inevitable richness, diversity and the process in content and method. According to Taylor (2003), our current values education focuses on the type of the values, which is the part of "whole field of experience", which lacks a "special" or specific types of the view of value. This means that we need to return to the children's living field, fulfill the children's values education with a sense of history and reality, and realize the traditional innovation.

2)   The core of children's values education: values judgment

Values education, different from imparting knowledge education, involves the cultivation of children's comprehensive ability or quality, and the core is the cultivation of value judgment. Regardless of whether or not values education is to encourage children to form a correct view of the existing value system or to guide children to construct a correct value system in the field of reality, the key lies in the cultivation of children's value judgment. On one hand, children should make judgments on the established universal value system, which contains the double meanings of cognition and evaluation. Cognition is the premise of evaluation, and evaluation is the motive force of cognition. On the other hand, children should learn to judge their own relationship of needs and evaluate its legitimacy and rationality, as well as the relationship of needs of others, which is conducive to the establishment of the value principle. If values education can take the development of children's evaluation ability as an important purpose as well as an important method, it will be very conducive to the effective practice of values education. Especially in the sense of a method, evaluation can enhance students' in-depth understanding of the human value spectrum because the evaluation process needs students to develop their potential, ability and experience in various aspects and involves positive judgment, situational analysis and limitation analysis.

Regarding judgment, there is a deep difference in value. In one case, a judgment is merely the statement or record of those given values and given utility. These judgments are judgments of values and utility. In the other case, there are no given or determined values for us to judge. For an absent, undefined value, we resort to assessment and valuation. That is, children can construct values through evaluation and appraisal, further to create values, and give judgment a creative function (Feng, 2009). But the judgment must be realistic to judge, when we do not have any data at all and when we do not have judgments about certain objects and relationships, we cannot form a judgment about what we like and cannot determine what is definitively good or what is definitively useful.

The core concept of modern education is to advocate the development of children's interests, hobbies and creativity. However, value judgment often involves rational examination and review of interests, preferences and desires, which is called "consideration". The development of children's value judgment allows children to learn from their experience and to be good at judging self-preferences, interests and desires in life aspects of reality and legitimacy. Its significance lies not only in forming the cognition of "what is" about interests and preferences in experience, but also in constructing legitimate preferences and interested things and at the same time developing rational thinking and value judgment (Feng, 2009).

The theory that connects value with liking, preferences and interests is actually the theory of how value events occur in the sense of existence. I have supplemented this theory: only the liking, preferences, and interests, which are taken into account, are sufficient conditions for the existence of something of value. It is precise because what is called valuable involves consideration, and then it has characteristics or universal characteristics that can be developed in consideration, comparison, and

synthesized development. In this sense, developing children's value judgment is much more important than respecting children's natural interests and preferences. A legitimate, noble, and practical interest is more valuable and worth developing. They passed through what Dewey called "consideration," or the judgment of the measure of rational judgment. They experienced the consideration of judging, developing, comparing, associating, and synthesizing and of existence. Fundamentally speaking, educated interest or hobby is supreme. The supreme interest or hobby is called 'conscience' in the moral sense, 'insight' in the rational sense and 'interest' in the aesthetic sense (Feng, 2009).

3) Cultivation of children's national cultural values: the fundamental essence of national education

Children growing in ethnic minority areas and infiltrating in the field of ethnic culture, especially minority children. Their experience, interests and needs have been naturally wrapped with their survival and living environment as a whole: the national culture shapes children's cultural personality; in turn, children with their own social development also add new vitality to the national culture. Therefore, to develop a kind of reasonable, national and cultural value should become an important part of children's growth and development. From the perspective of the relationship between values, that is, between needs and objects, we can see that needs reflect the relationship between human's overall existence and the surrounding environment, which is constituted by human's physiological and psychological structure and social and cultural structure. It is a conscious tendency towards balance based on the imbalance between human-beings and the environment (Ma, 2017). In this sense, the representation of national cultural value means the value relationship established between children's needs in national regions and ethnic minority culture; furthermore, children's national cultural values should be embodied in children's evaluation and views on this kind of value relationship, the value of the culture and the views of value in that culture.

The existing practice of ethnic education pays special attention to the cultivation of children's cultural identity in a similar sense, but this is not exactly the same as the education of national cultural values. Cultural identity mainly expresses the subject's psychological and emotional recognition and the approval of the national culture, which means the confirmation of pride and belonging. In the cognitive sense, they mainly tend to seek the difference between their own national culture and other cultures, that is, "identity". The strength of identity represents the strength of children's understanding of their own national culture. Cultural values are more concerned that children can establish their own rational judgment for the intrinsic value of our national culture (whether worthy of existence and continuation or not), the advantages and disadvantages of culture (the legitimacy of the value system and living rules as the core of culture), and the value relationship between the culture of the "I" (whether the culture satisfies my growth and development requirements or what is the value of the culture to me). Logically, cultural values include cultural identity, and strong cultural identity means positive cultural values. However, positive cultural values do not necessarily mean a strong cultural identity. For example,

children think critically that there are some backward elements in their own national culture and propose innovation and improvement. Under certain circumstances, the correct national cultural values are even the criticism of the national cultural identity, for instance, when the national cultural identity may not be conducive to the development of the national culture, or when the mode of cultural identity is still stuck in one's own way under the multicultural, open and integrated cultural pattern.

Under the modern background, the key to the national cultural values education for children in ethnic areas is to encourage children to form their own views or evaluations on the value significance and core values of the national culture itself. Specifically, it promotes children to be able to correctly evaluate the uniqueness of their national culture and the relationship between their national culture and other cultural systems and to reasonably judge the value relationship between their national culture and their own life existence and growth needs. They can make a correct evaluation of the political values, social values, natural values and moral values contained in their national culture. Children can consciously bring the existence and development of their own national culture into the scope of their own life meaning and social meaning construction. This means that regardless of what circumstances children and their national culture are in a common relationship, culture lives in children's lives, children live in the cultural meaning. This is not only the fundamental essence of national cultural inheritance but also the basic connotation of children's development in ethnic areas.

4) The development of children's rural social values: the era proposition of rural education

At present, as the dual proposition of values education and rural education, the values education of rural children in ethnic minority areas has two basic problems worth considering: the reasonable relationship between rural education and rural society, and what kind of values rural education should shape for children. The logical premise of these two questions is that education is education in rural society, and children are children in rural society. Rural society is the field where rural education takes place, and rural society is the field where rural children live and survive. Therefore, rural society is the basic limit of rural education and the development of children's values.

To judge the reasonable relationship between rural education (mainly referring to rural school education) and rural society, we can start from the reasonable relationship between education and society. The reasonable relationship between education and society conforms to the demands of realistic subjects, values and purposes, as well as the laws of reality. Its essence is the value that the realistic subject of education expects education to realize. It not only reflects the value relationship between the educational subject and education but also reflects the value relationship between education and the social field in which the educational subject resides. In the sense of rationality, as far as the latter is concerned, people certainly hope that education can improve society and promote social development. The kind of education that causes society to regress, stagnate or exert no positive influence on society has no legitimacy and does not conform to historical logic. According to Dewey's first educational creed, "I believe, education is the basic method of social progress and

social reform" (Zhao & Wang, 1981); Also, Yangchu Yan's (2014) credo of rural education was "not to accommodate society, but to transform society"; Shuming Liang believed that education (rural education) has a fundamental principle and two necessary conditions: education, as one of the careers, should not leave the present society in fact, and should spiritually leading the present society (Ma, 1994). If the education form of rural society cannot release its power in the sense of improving rural society, it means that the two have not truly established a reasonable value relationship.

The establishment of such a reasonable value relationship, on one hand, can be realized through the functional relationship between the school and society. For example, the school, as a purified and simplified organizational structure or a cultural field endowed with progressive significance, directly promotes the social outlook, political civilization and economic development of the whole rural society. On the other hand, it can be achieved by educating rural children and promoting rural children to contribute to rural society. It reflects that the essence of education is to reform the human being as the subject of social practice, and the human being in the real society is the fundamental force for the progress of real society. However, reflecting from the history of rural education in China, the above two aspects failed to succeed. As Chinese scholar Shuming Liang pointed out, "For decades, the Western-style school education, which is completely unsuitable for this rural society, is specially designed to lure the rural people to the city, to enhance their desire and destroy their ability, and finally to become the advanced beggar; The transportation of steamships and trains, the rise of new industries and commerce, the imitation of urban civilization, all lead people away from the countryside and away from a simple and secure life" (Ma, 1994). Another Chinese scholar, Xingzhi Tao, regretted: "China's rural education is on the wrong road, which teaches people how to escape from the country and run for the city" (Tao, 2014). In fact, Shuming Liang and Xingzhi Tao simultaneously pointed out the fundamental crux of rural education in China: rural education fails to educate children's correct rural social values, eventually resulting in children's "running to the city".

Rural social values are children's fundamental views and attitudes about the relationship between themselves and the rural society in which they live, about the good and bad of the rural society, what they should do, and whether or not it is worth living. It mainly includes children's value judgment and evaluation, such as the value relationship of rural and urban society as a whole, the value situation of rural society in the modern situation, various traditional customs in the rural society, people's moral habits and values, social behavior, rural social order and political order. In this kind of value judgment and evaluation, the purpose of values education is to support children in constructing reasonable value standards and evaluation criteria and finally establish the correct rural social values. First, it means that children can make a reasonable evaluation of the inevitable and necessary value relationship between themselves and rural society. Furthermore, children can reasonably evaluate the unique intrinsic value of rural society, the value system that is worth cherishing and learning in rural society, and the "evil" or "backwardness" of rural society. It is in the process of such value judgment and evaluation that a reasonable value relationship between children

and rural society is confirmed. Education guides children to regard the progress of the society they live in as their own value goals or value pursuits, and regard the progress of rural society as an important dimension and value medium to evaluate the value of self-development, and finally, a kind of symbiosis values of self-development and the development of rural society are formed.

5) The shaping of children's political values: as citizens of China and the world

Marx (2012) pointed out that in "Critique of Hegel's Philosophy of Law", man is not an abstract and dormant existence outside the world; man is the human world, is the country, and is the society. Marx (2012) further emphasized a kind of reality of a human being that a human-being is a person in a country, and a specific person lives in a specific country; a country is a society of people, and people live in a society as a state. In the political field of view, the nature of the country is the nature of the society. For example, the political attribute of society in capitalist countries is capitalism, and the political attribute of society in socialist countries is socialism. Aristotle (2013) said, "Man is by nature a political animal. Children are ungrown citizens and virtual citizens with reservations in meanings as well". In other words, a child is already a prospective citizen at birth or a child is a citizen of a country to be shaped.

China is a multi-ethnic country. The most core and essential characteristic of a nation-state is the unity of the nation and the state, that is, the nation has acquired the form of the state and the state has the connotation of the nation. The union of nation and state is realized through the identity of the nation (all the people of the state) (Zhou, 2013). Thus, "Chinese nation" can be equated with "China"; the great rejuvenation of the Chinese nation means the rejuvenation of China's 56 ethnic groups, and the common rejuvenation of the 56 ethnic groups means the rejuvenation of the Chinese nation as a whole, that is, the rejuvenation of China. Chinese rural children's values education in ethnic regions and the formation of the correct political values, first means to guide children to learn to recognize and think about the positive value relevance between themselves and their country, and further learn to make the right value judgment and set up the correct value pursuits. At this moment, the socialist core value system, as the national moral code, is the highest standard of value judgment, such as patriotism. Second, it means guiding children to gradually establish a deep emotional and cultural connection between themselves and the Chinese nation which is an internal value relationship, that is, the existence value of the relationship itself. At this time, ethnic identity and national identity have the same meaning. For example, the judgment of "I am a member of the Chinese nation" is formed. The basic representation of successful political values education should be that the process of children growing up as Chinese citizens is the process of constructing and stabilizing their political values gradually. Values education can guide children to realize that they need the country and the country also needs them. Children can construct a correct value evaluation standard about the goodness, justice or corruption and injustice of national politics in their hearts and then know what is a good political life, a reasonable political order and a due political civilization. Through objective evaluation, children can correctly arrange the reasonable value sequence of countries,

ethnic groups, groups, families and individuals. Children can practice the socialist core value system in their own practical activities, living situations, and specific behaviors so that this value system can be confirmed in practice.

However, in the process of modernization, nations and states have been interrelated to constructing a global economic, cultural and political space. Whether arising from positive value connections or shared practical challenges, this global relationship has gradually endowed members of all ethnic groups and citizens of nations with natural global citizenship. This means that the countries of all ethnic groups, between humanity and the earth, must establish the value of a symbiotic relationship. Countries must work together to create a global political order of peace and common prosperity. The global process is also a positive historical turn: the construction of a community with a shared future for mankind, which means the spatial liberation of individuals and nations. Marx (2012) pointed out that "The degree of liberation of each individual is consistent with the degree to which history completely transforms into world history. As for the spiritual richness of the individual's reality, it is entirely up to the richness of his real relations. Only in this way can the individual, be free from all kinds of national and regional limitations, come into practical contact with the production of the whole world (and also with the production of the mind) and acquire the ability to make use of this comprehensive global production (all that man has created) ". Space liberation and the expansion of value relations do not necessarily damage the independence of the nation and state, as Baumann (2013) stated "Integration and division, globalization and localization, is a process of two complementary". When everything is moving towards uncertainty, ungovernability and self-promotion, vagueness and singularization in the process of globalization, all nations and countries need a kind of self-validation and the reshaping of internal order to ensure their independence and self-consistency. When everything in globalization towards uncertain and difficult to manage and promote themselves and blurred, simplification, nationalities and countries need just self-verification and reshaping of the internal order to ensure their independence and self-consistency.

The Chinese nation, as a political construction, is the product of the modern era of "internal turmoil and foreign invasion". In the era of globalization, when we are deeply involved in the modern trend and world order, we also need a self-sufficient political construction, which is exactly the realistic logic to ensure national independence and state sovereignty. The more actively we work for the construction of a community with a shared future for mankind and a global harmonious political order, the more we will be able to demonstrate and confirm the political civilization and national sovereignty of the Chinese nation.

Therefore, the education of children's political values needs to be fully incorporated into a global political framework. Children should not only learn to correctly judge and evaluate the value relationship between themselves and their motherland, and the significance relationship between themselves and the Chinese nation; but also learn to correctly judge and evaluate the value relationship between themselves and the earth, and between human beings and the world. In this process, a positive representation of political values should be that children can learn to take the sustainability of the earth, the existence of high quality of human life, the harmonious co-existence

of all ethnic groups, and the mutual benefits and win–win of all countries as the supreme value principles; as a human-being, a member of the planet, children are able to make correct judgments about what they should and should not do, what is good, what is evil, what is a desirable life, and what is duty and responsibility. This will not diminish the political role of children as Chinese people and Chinese citizens. On the contrary, children shape their global citizenship and construct their world obligation view on the basis of this. In this process, the children have a sense of pride and honor in being Chinese citizens and standing for the Chinese nation.

4 Path of Values Education for Rural Children in Ethnic Minority Areas

Education is the core path for children to develop their values. Education is regarded as the core of the development of social values (Taylor, 2003). Based on the characteristics of children's stage, the reality of children's survival and life and the law of values education, values education for children in rural ethnic minority areas must rely on the coordination and joint action of schools, families and communities.

1) Family education: the source of children's "imitation" of values

The education of children's values in their families involves several aspects. The first is to make the family atmosphere democratic because the construction of children's value judgment, value goals, value principles and other aspects depends on the creativity and courage brought by the democratic environment. The establishment of children's democratic values can only be realized in the democratic way of life. Second, family culture construction cannot break away from national culture and rural society; homes must be properly combined with national culture elements, and family life must be properly integrated into rural society. All these factors help children to make a reasonable judgment of the value of the family and help in the correct construction of children's own value relationship with national culture and rural society. Third, family members develop good moral habits and stable value pursuit and construct a family behavior pattern or normalized scene of value clarification and value defense, which is conducive to children's imitation and learning. Childhood values are formed by imitating and absorbing the words and actions of parents and those close to them. The values at this time are those of adults, with obvious perceptual forms (Zhao & Wang, 1981). At the same time, children can gradually internalize and learn to judge proper values and value behaviors from the interaction between family members and family behaviors.

2) School education: the core position for children to develop their values

In a rural society in ethnic areas, on one hand, schools impart minority culture and rural social value systems to children through curriculum as media to realize value

identification; at the same time, children should be taught how to make reasonable value judgments in national life and rural society. Dewey claimed that no one would doubt that children who grow up in poor neighborhoods and children who grow up in well-educated families have different experiences. Children in the country and in the city, children in the seashore and children in the inland grasslands have different experiences. The primary duty of the educators is not only to understand the general principles by which the conditions of the environment shape practical experience but also to recognize what circumstances in practice are conducive to guiding the growth of experience. Above all, they should know how to make use of their existing natural and social environment and take everything that will help form a valuable experience. Therefore, values education for children in rural schools in ethnic minority areas first requires teachers to have critical spirits and practical spirits. Teachers must make full use of all resources of national and rural areas that are conducive to children's values education through active efforts to promote the inheritance of core values, the improvement of rural society and the development of children. The education of children's values in school should also be based on the values acquired by children in the family. Schools should develop gradually from the family life; it should adopt and continue the activities that children are already familiar with in the family (Zhao & Wang, 1981). It is better to unite parents to make joint exploration and educational actions, which can drive the enthusiasm of parents in education and correct their incorrect educational methods and values.

3) Community education: a natural space for children to develop their values

Communities are the main living space of children's families and children and have an irreplaceable values education function. First, children gain real value life experience in community life and accumulate the experience of understanding and judgment. Second, a community is a block of society and a sample space of all kinds of social values and behaviors to provide the facts and process of verification and integration for the values education that children receive in school. Third, a community can purposefully and systematically design a community culture that is conducive to the formation of correct values for children so that the values of children can be formed into an imperceptible situation, and the values of children can be internalized as well.

Ethnic rural communities are embedded in ethnic cultural fields and rural social fields. Various ethnic cultural resources and rural social resources are the natural conditions to highlight the characteristics of this community education space, such as ethnic customs, games, labor, and art. These natural conditions are not only natural values education resources with enculturation functions but can also be transformed into rich and diversified forms of values education through systematic artificial design to construct a community values education mode that is different from school and family values education. For children, the prominent features of this community values education model are life-like and socialized, and playfulness and leisure. The general experience of children's growth shows that community life is the natural tendency of children. Children experience lifestyles, games and values that are different from family and school. Community life is the objective condition for children to achieve social development successfully.

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The Health Cost of Attending Higher-Achievement Schools: Peer Effects on Adolescents' Academic Performance and Mental Health

Yuxiao Wu and Fan Zhang

Abstract It is important to examine the effects of peer groups on students' development as schools are sites of social interaction for children and adolescents. By analyzing nationally representative survey data of junior high school students, this paper examines the two functions of peer groups (social conformity function and social contrast function) on students' academic performance and mental health within the context of intense educational competition in China. It finds that peer groups have a "double-edged sword" effect on adolescents' development. Attending elite schools or classes has positive effects on students' academic performance and negatively affects their mental health. Simply put, attending elite schools may be accompanied by health deficits in adolescents. On the other hand, the heterogeneity of peers' academic ability is positively related to students' test scores but has no effects on their mental health. At the end of the paper, the authors suggests that reducing the intensity of educational competition and improving ability-based integration among students in schools are conducive to promoting adolescents' positive development.

Keywords Adolescent development · Educational competition · Peer group · Academic performance · Mental health

1   Introduction

In modern society, school is the most important place for socializing for adolescents other than family. Peers in school are closely related to adolescents' development. According to the Coleman Report (Coleman, 1966), the influence of peer groups on the development of adolescents is as important as parental involvement, teachers' quality, and class size. Therefore, the theoretical discussion and rigorous empirical examination of peer effects upon students' development play a crucial role in educational policymaking.

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Many studies in education and economics have proven that higher quality peers in school positively relate to students' academic achievement (Sacerdote, 2011). It is also what we often call the "*Jin Zhu Zhe Chi*"[1] effect. However, according to reference group theory, peer groups have another function called "social contrast" (Kelley, 1952; Merton, 1968), which will create depressing effects because peers learn or imitate each other and compare with each other. Surrounded by excellent peers, individuals' self-concept or self-esteem will decrease. However, most of the studies about the peer group effect on adolescents mainly focus on the peer's "*Jin Zhu Zhe Chi*" effect or the depression effect. Few studies explore how the two functions simultaneously affect individuals. Therefore, it is necessary to test the two functions and consequences of peer groups in one comprehensive analytical framework (Kelley, 1952), which could shed light on theoretical discussions of the influence of peer groups on adolescents' development.

In terms of outcome variables, most of the previous studies mainly focus on adolescents' academic performance, educational aspiration, social behavior, and self-evaluation. Few studies explore the relationship between peer groups and mental health. First, mental health is an essential part of the development of adolescents. The mental health of teenagers is related to a person's overall educational achievements in the future and has a profound impact on his physical health, educational attainment, and socioeconomic status in adulthood (Case & Paxson, 2006; Ettner et al., 1997). Second, the current mental health problems of adolescents have become a challenging global public health issue. Approximately 20%–25% of adolescents worldwide have experienced mental health problems of different degrees, and there is a steady upward trend (Bor et al., 2014). Anxiety and depression are among the fastest-growing mental health problems in adolescents (WHO, 2012).[2] Third, peer groups are among the most critical structural contexts in adolescents' social and interpersonal interactions. According to Pearlin's sociological theory of stress, a peer group may become a source of stress influencing adolescents' mental health (Pearlin, 1989). Stress is crucial in mental health problems such as anxiety and depression. In other words, the relationship between peer groups and adolescent mental health is worthy of rigorous examination. Will the "*Jin Zhu Zhe Chi*" effect indeed have a cost to mental health? It is the main theoretical question to be answered by the current study.

Moreover, discussing the effect of peer groups on adolescents' development will have a real world impact. At present, educational anxiety has become a common

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[1] "*Jin Zhu Che Chi*" (近朱者赤) is a Chinese saying, meaning that one will be a better person if she/he is surrounded by good peers.

[2] In China, the mental health problems of teenagers cannot be ignored. Studies have found that since the early 1990s, mental health problems (such as anxiety, depression, and other symptoms) of Chinese adolescents have been increasing year by year (Xin & Zhang, 2009). According to the results of a youth mental health survey jointly conducted by the China Youth Research Center and the Institute of Psychology of the Chinese Academy of Sciences in 2019 (see the 7th edition of China Youth Daily on April 11, 2019, for a detailed report), nearly 30% of the adolescents surveyed were at risk of depression, an increase of 5.4 percentage points over 2008. The proportion of middle school students (junior high school and senior high school students) with depression risk was higher than that of other age groups. See Zhang Z. (2019, April 11). Young people's mental health sounds the alarm: nearly 30% are at risk of depression. *China Youth Daily*. (in Chinese).

challenge faced by most Chinese families. The competitive parenting 'Squid Game' (Western cultural reference, this does not exist in China, but should be good for Western readers) has become increasingly fierce. The heavy academic burden on teenagers and the resulting psychological problems have also attracted the public's attention.[3] According to the patterns demonstrated by the newly released dataset of the Program of International Student Assessment (PISA, 2018), Chinese students rank at the top in test scores of reading, mathematics, and science around the world, but their life satisfaction score (an indicator closely related to mental health) is almost at the bottom.[4] Therefore, it is necessary to explore whether other reasons that lead to the paradox of Chinese students' high achievement and low subjective well-being other than frequently examined factors such as the pressure of entering high-ranking schools and heavy academic burden under the exam-oriented system. If excellent peers are a "double-edged sword", then it is worth examining the practice of ability grouping in primary or secondary education stages. The incessant pursuit of entry into highly ranked schools may also need to calm down. More importantly, we should pay enough attention to the policy-making process to promote the balanced development of adolescents between their academic performance and health.

2 Literature review: Two Functions of Peer Groups

As a structural context factor beyond individual or family characteristics, peer groups have two functions: social conformity and social contrast. These produce two different effects on group members. Under the logic of the social conformity function, the normative influence of peer groups may have the group members engage in similar behaviors or make similar decisions. In contrast, the social contrast function regards the peer group as a reference group. Specifically, individuals will be discouraged or reduce their future expectations when peers' ability or achievement is relatively high.

(1) Social conformity function

Social conformity is composed of informal and formal social conformity (Abrams & Hogg, 1990). Informal social conformity is related to the process of socialization, which influences an individual's social development by unconsciously changing their attitude or values. Studies have shown that in the process of school selection, it will be easier to access information about a certain school for individuals when a large

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[3] According to the 2018 annual report on China's education (Yang et al., 2018), academic pressure is the primary cause of suicide among primary and secondary school students in China.

[4] Only students from Beijing, Shanghai, Jiangsu, and Zhejiang participated in the survey. Among the 70 countries that participated in the survey, the average life satisfaction of Chinese students was 6.64, ranking 11th from the bottom. See https://www.oecd-ilibrary.org//sites/c414e291-en/index.html?itemId=/content/component/c414e291-en#.

number of peers prefer it, consequently forming a subcultural orientation that encourages individuals to make the same choice (Fletcher, 2012; Meyer, 1970). Other studies have pointed out that peer groups have a "role model effect" (Spenner & Featherman, 1978). The role models provided by peer groups for learning and imitation will change individuals' behavior, values, and related involvement (Buchmann & Dalton, 2002). Moreover, even if the individual may have less interaction with them, excellent peers' "role model effect" will still affect the individual's expectation and satisfaction when they obtain better academic achievement (Stinebrickner & Stinebrickner, 2006).

Formal conformity behaviors mainly derive from group pressure or punishment. Peer groups can internalize their values and behaviors into a kind of social norm and force their members to abide by and coordinate with each other. In other words, the friendship network (peer group) is shaped by social norms and punishment (Coleman, 1988). Individuals do not necessarily agree with the values and behaviors held by their peers. However, they might be excluded, ostracized or even punished by group members if they do not comply. It means the pressure of coordination with the group forcing them to respond to peer values, decisions, or choices and consequently maintain their position within the herd (Festinger, 1954). Moreover, the more individuals attach importance to this particular sense of belonging, the more they will be willing to accept the values and behaviors of their peers and keep in line with the peer group to maintain or strengthen their relationship (Giordano, 2003).

The social conformity function of peer groups will produce the effect of "*Jin Zhu Zhe Chi*"—individuals will have similar values, behaviors, or decisions with their peers. It means that the learning model provided by excellent peers and the social norms transmitted internally will promote the individual's ability and performance. In contrast, adolescents will likely regress with lesser peers. In other words, peer groups are a kind of "catalyst" that transmits social norms, educational values, and learning skills. Adolescents can learn and motivate each other when together with excellent peers and consequently perform better, and vice versa (Putnam, 2015).

A large number of studies on peer groups have examined the "*Jin Zhu Zhe Chi*" effect under the logic of a social conformity function. Studies on labor or work efficiency have found that working with efficient peers (colleagues) can significantly improve an individual's work efficiency (Falk & Ichino, 2006; Mas & Moretti, 2009). Empirical studies in education also provide abundant evidence of the significant role of peer groups in individuals' educational development. Peer groups not only have a positive impact on students' behavior (Kremer & Levy, 2008) and academic achievement (Burke & Sass, 2013; Hasan & Bagde, 2013) but also their choice preferences will affect students' educational decision-making (Fletcher, 2012; Lyle, 2007). In addition, further studies have shown that students' educational aspirations are significantly influenced by the educational expectations of their peers. The higher the educational aspiration of peers, the higher the educational aspiration of adolescents (Buchmann & Dalton, 2002; Cao & Wu, 2019; Cheng, 2017).

(2) Social contrast function

Social contrast is another important function of peer groups closely related to the reference group theory. According to the view of the reference group, individuals will make self-evaluations and decisions according to their relative position in peer groups (Kelley, 1952; Merton, 1968). In other words, individuals' self-assessment is based on their relative ability compared with their peers rather than their absolute ability, which means that peer groups are not only partners of individuals but also mirrors of their self-evaluation. Individuals' weak competitive advantage in high-performance peer groups would probably result in a "depression effect" leading to subjective devaluation of self-esteem.

In education, Davis first examined the effect of peer groups' social contrast function (Davis, 1966). He found that students experience more significant competitive pressure in high-performance schools because of reduced advantage compared with their peers. As a consequence, their career expectations are lower than their equivalent-ability counterparts in low-performance schools. Recent studies have also reached similar conclusions. For instance, studies on academic self-evaluation show a negative correlation between the overall performance of peer groups and students' academic self-evaluation. The better the peer groups' academic performance, the lower the students' academic self-evaluation (Marsh & Hau, 2003; Seaton et al., 2010), and the lower the students' confidence in education (Pop-Eleches & Urquiola, 2013). Furthermore, studies have shown that peers with higher abilities will reduce students' educational expectations (Alwin & Otto, 1977; Cao & Wu, 2019) and affect the decisions they make regarding their educational tracking (academic-oriented or career-oriented differentiation) (Jonsson & Mood, 2008; Rosenqvist, 2018).

(3) Peer groups and mental health: A yet unsolved question

According to the literature review above, peer groups have two contradictory effects based on the social conformity function and social contrast function. Higher-performance peer groups will be conducive to individuals' development under social conformity. On the other hand, social contrast will cause high-performance peer groups also to harm the individual's self-esteem or self-confidence. However, previous studies on peer group effects in education have focused on academic performance, education and career expectations, social behavior, self-evaluation, and so on. Few studies have explored the relationship between peer groups and adolescents' mental health, as well as the relationship between peer effects, academic performance, and mental health. The mechanism of social conformity and social contrast affect students' physical and psychological health because both social conformity and contrast may lead to pressure, which ultimately harms mental health. In addition, the consequence of the social comparison function also implies a decline in an individual's mental health. An earlier empirical study found that the decline in self-esteem or self-evaluation can increase the risk of depression. In general, the relationship between peer groups and mental health as well as its mechanism will require further examination via empirical research (Pearlin et al., 1981).

Furthermore, the function of peer groups and their corresponding effect may be conditional. Specifically, it may depend on the attributes of the relationships

within peer groups. For example, in a peer atmosphere dominated by a cooperative relationship, the peer conformity function would be more prominent. In contrast, the social contrast function and its corresponding effect would be more significant in a competitive peer group. In short, the structure and characteristics of peer groups should not be ignored when investigating peer effects.

3 Peer Groups, Adolescents' Academic Performance and Mental Health in the Context of Educational Competition

(1) The structure and characteristics of school peer groups with the background of education competition

In recent decades, increasingly fierce competition in education and parenting has become a global phenomenon, especially in East Asian countries or regions (Doepke & Zilibotti, 2019). In Chinese society, education competition is steeped in cultural values because of the far-reaching Confucian tradition of attaching the utmost importance to education. Most families have high educational expectations for their children, hoping they can achieve upward social mobility and success through education. Since childhood, most children have been influenced by this concept and take it as the most important goal to study hard, obtain high scores, and be admitted to prestigious schools.

Fierce education competition also stems from realistic structural factors. First, since the market reform, China has experienced significant social polarization. Although social inequality has been effectively controlled in recent years, the Gini coefficient of income or property is still high (Li, 2017; Xie & Jin, 2015). The individual's perceived risk of social class solidification and the anxiety about social mobility are increasing continuously (Li & Zhu, 2015). Second, the economic returns to education (especially returns to higher education) are rising rapidly (Li, 2012; Wu, 2011). The decisive effect of education on occupational attainment is also growing year by year (Wang & Yuan, 2015). In reality, a college diploma is almost the most basic requirement for applicants to enter promising enterprises or to apply for positions as civil servants and jobs at public institutions. Employers have continually raised the threshold of academic qualifications for job seekers, and a phenomenon of "first-record discrimination"[5] has arisen. In short, education, especially diplomas signaling quality education, plays an increasingly important role in status attainment and social mobility. Third, there are severe discrepancies in educational resources between schools. Regardless of higher education, senior high school, or elementary

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[5] "First-record discrimination" means that employers attach great importance to the ranking of applicants for their bachelor's degrees. Even if the applicant has obtained a master degree or doctorate from a prestigious university, he may still encounter job-hunting obstacles if he studies at a low-status college or university at the undergraduate level.

education, there are huge gaps in teaching capability, reputation, and ranking between schools. Even in the same region (or city), different schools' quality and reputation vary greatly without regard to the regional imbalance of educational resources. Due to the emergence of private schools in recent years, the polarization between public and private schools has become increasingly prominent and even caused the worry of the "Latin Americanization" of elementary education (Wang, 2019). Almost every district has a school ranking system that is familiar to residents. The higher the rank of the school is, the higher the chance of obtaining high-quality educational resources in the next stage. As a result, the few top-ranking public and private "prestigious schools" are highly sought after.

Generally, education competition is a contest of "school selection", that is, the competition to enter the top-ranking schools. The "nearby enrollment" policy, which abolishes restrictions of the school district according to the location of the student's origin household registration, has been implemented in the elementary education stage of China. However, due to the scarcity and imbalanced distribution of high-quality education resources, as well as the price mechanism of the real estate market, huge housing price gaps have emerged between different school districts. The housing price exclusion mechanism—the better elementary education resources the district has, the higher the housing prices are—gradually leads to residential segregation (Zhao, 2019). In addition, the enrollment of private schools is not limited by school districts, and they can set the threshold for the quality of students and tuition fees. The higher the quality of private schools, the higher the tuition fees and the higher the requirements for students. Based on the reasons above, there exists an obvious phenomenon of socioeconomic segregation in junior high schools in China. Children with high socioeconomic backgrounds are enrolled in the top-ranked schools, while children from lower-class families are more likely to study in the bottom-ranked schools (Wu & Huan, 2016). The family's socioeconomic status is closely related to children's cognitive ability and academic performance. Hence, educational socioeconomic segregation implies the segregation of students' educational outcomes to a certain extent - meaning, the higher the quality of schools, the higher the average performance of their students.

In addition, the examination score is the most important indicator in evaluating students' ability and provides a vital reference for further education under the exam-oriented education system. Specifically, ranking is the key factor in educational competition. Because of the scarcity of high-quality education resources, only a small number of high-ranking students can be admitted to prestigious schools in the following education stage. As a result, parents and students concentrate more on rankings in classes, schools, or districts than absolute scores. The enrollment rate based on the students' ranking is the most important indicator to evaluate the quality of schools and the performance of managers. The ranking of the average class score and the proportion of excellent students is the measurement of the quality and performance of headteachers or other teachers within schools. In general, test scores ranking is crucially important for students, parents, schools, and teachers. Moreover, high-ranking schools attach greater importance to rankings to maintain the status

quo or a rise in reputation, which leads to strict requirements for students. It is one of the reasons that students at prestigious schools suffer from heavy academic burdens.

The fierce educational competition and the school socioeconomic segregation it caused will affect the structure and characteristics of students' peer groups. First, in terms of peer group structures, there are positive correlations between school ranking and students' family background, as well as the average performance of students due to school socioeconomic segregation. In other words, it is a kind of peer group structure with a positive correlation between self-ability and peer ability; that is, the better the performance of individuals is, the higher the achievements of their peers. Second, under the exam-oriented education system, there exists a competition context based on examination scores among peers of the same grade or same class within schools, in which the norm of "strive for the top" (studying hard to improve performance and winning in the competition) has been generally accepted by everyone involved. Students who do not comply with such norms may be "marginalized" and may not be accepted by teachers or parents. In such a competitive context, peers are partners and competitors. As a consequence, students would be more sensitive to their relative position in their peers and probably feel frustrated when falling behind. Moreover, students would suffer greater comparative pressure in high-ranking schools, not only because of the higher expectations from families and schools but also because of more competitive peers in the same class or grade.

(2) High-achievement peers as catalysts and stressors: the mental health cost of *Jin Zhu Zhe Chi*

According to structural context theory, pressure arises from the social structural arrangement (including social class, institution, or interpersonal network) producing real-life experiences with potential stress rather than from individual factors (Pearlin, 1989). For adolescents in school, peer groups are an important structural context of their life, learning, and social interaction. As a result, the structure and characteristics of peer groups in school (peers with a competitive relationship, and the stronger the individual ability is, the stronger the average ability of peers) are probably stressors for adolescents.

In the context of competition, the function of social conformity and social contrast would be strengthened. On the one hand, excellent peers may encourage each other, learn from each other, and make progress together, which would be conducive to improving the academic performance of each member in peer groups. More importantly, students have more intense compliance with the norm of "striving for the top" and have a stronger willingness and motivation to catch up with their high-achievement peers. Specifically, students may devote more to learning, including extending studying time, participating in extracurricular classes, etc.[6] There is no doubt that their endeavors triggered by social conformity could improve their

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[6] A recent study on Chinese junior high school students' participation in extracurricular cram classes found that if a student is in a context with a higher proportion of classmates participating and spending more tuition fees in the cram classes, then he is also more likely to participate in the cram classes and spend more (Zhou & Wu, 2018). That is, in addition to common reasons such as

academic performance, which is the mechanism of "*Jin Zhu Zhe Chi*" in peer groups confirmed by previous empirical studies. As mentioned earlier, conformity can also create pressure. In academic competition, students need to pay more effort into catching up with or surpassing their high-achievement peers, resulting in a heavier academic burden and less time for rest, sports, and entertainment, which may be detrimental to their mental well-being.

On the other hand, the function of contrast and its depressing effect in peer groups would be amplified in academic competition. Individuals would be more concerned about their comparative advantages and disadvantages in peer groups in more intense competitions, resulting in increased comparative pressure. Previous studies have confirmed that individuals are more likely to doubt their ability and have lower self-evaluation or self-esteem when they find themselves in better peer groups. In other words, the comparative pressure produced by the contrast function of peer groups may negatively affect students' mental health.

In conclusion, excellent peers are likely to be a "double-edged sword", simultaneously acting as a "catalyst" to improve academic performance and a "stressor" that may trigger negative emotions and impair individuals' mental health. Therefore, we formulate the following hypotheses:

Hypothesis 1a: Other things being equal, the average performance of peer groups has a significant positive effect on students' academic performance.

Hypothesis 1b: Other things being equal, the average performance of peer groups has a significant negative effect on students' mental health.

(3) Contrast selectively: in-group heterogeneity, academic performance, and mental health

Hypotheses 1(a) and 1(b) depict the relationship between the average performance (mean score) of peer groups and students' academic performance and mental health. In addition to the mean score, another measurement of the structural characteristics of peer groups is in-group heterogeneity, which refers to the diversity of individuals' abilities in peer groups. Regarding the effect of heterogeneity in peer groups, economists have proposed a "rainbow model", which points out that the diversity of peers' abilities is conducive to students' academic performance in the group (Hoxby & Weingarth, 2005). However, few previous empirical findings have supported the "rainbow model". A recent study on Chinese junior high school students found that the heterogeneity of academic performance within classes significantly affects students' educational aspirations, especially those with lower performance (Cao & Wu, 2019). Furthermore, another study found that the heterogeneity of students' family socioeconomic status[7] in junior high school is positively correlated

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"make-up" and "excellence improvement", the pressure of compliance among peers is an important factor in deciding whether to participate in extracurricular tutoring or the level of participation.

[7] It has been confirmed that there is a positive correlation between family socioeconomic status and academic performance.

with their educational expectations (Wu & Huang, 2016). As educational expectations have been proven to be a reliable determinant of students' academic performance or educational attainment, we assume that heterogeneity may also indirectly promote academic achievement.

Based on the above discussions, whether the heterogeneity of peer groups affects students' mental health is an empirical question. According to common sense and the contrast function of peer groups, it would benefit all members' mental health if it shows great heterogeneity of academic achievements in peer groups. Great heterogeneity means that there are both high-achieving and low-achieving students within groups. Based on the perspective of social contrast, it would have the effect of "worse than the upper while better than the lower", which may help individuals relieve the pressure of competition or obtain a sense of accomplishment from comparing themselves to low-achievement peers, consequently improving the mental health of peer groups. However, the validity of this inference depends on the habitus or fixed mindset of selecting the comparison objects.

In Chinese society, due to the deep-rooted notion of "*Mianzi*".[8] "*Panbi* (comparing)" has become a common social phenomenon, which is also the social-psychological foundation of fierce competition in education (Zhai, 1994). Success in education is usually regarded as success in life and the success of parents and families. It is an important indicator of "glorifying the ancestors" and an important aspect of "*Panbi*" between families. The word "*Panbi*" suggests "the upward comparison". Therefore, in the process of "*Panbi*", people are used to choosing high-ability peers or winners as the object of comparison, and there is no place for the losers. In education, "*Panbi*" is also a common phenomenon. Those "on the top-ranking list" in the examination are highly praised by the public and receive various honors or financial rewards. The "top scorers" of entrance exams will be widely publicized by schools and are promoted as role models to learn. Parents usually urge their children to catch up with or surpass their high-performance classmates. "*Panbi*" also means following the majority, imitating the actions or performances of most people. Under the exam-oriented system, which emphasizes ranking, students are used to comparing their grades with the average score of the class as well as their high-ranking classmates. As a result, even in peer groups with high heterogeneity of academic achievements, students are likely to compare themselves with overachievers, or at least with the average performance of the group. At the same time, it is difficult for underachievers to become the objects of comparison. That is, in the context of fierce competition and based on the fixed mindset of *"Panbi"*, it would not necessarily reduce one's motivation to keep up with high-achievement peers or relieve psychological pressure from conformity or contrast, even if there are low-achievement peers within peer groups. Meanwhile, the comparison with low-achievement peers would not necessarily bring the pleasure of winning since people are accustomed to seeing their superior peers as a reference or focusing on the overall level of peer groups.

Based on the discussion above, due to the habitual mindset of comparison with high-achievement peers, or at least with the average level of peer groups, students will

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[8] *Mianzi* (face) refers to honor or reputation.

not compare with their low-performance peers whether for conformity or contrast function. In other words, when controlling the average academic performance of peer groups, the heterogeneity of academic performance may not affect students' psychological pressure. Based on the theoretical logic of the rainbow model and the empirical evidence that the heterogeneity of academic performance could improve individuals' educational expectations, we suppose that the heterogeneity of grades in peer groups may improve students' academic performance. Therefore, we formulate the following hypotheses:

Hypothesis 2a: Other things being equal, the heterogeneity of academic performance in peer groups has a positive effect on students' academic performance.

Hypothesis 2b: Other things being equal, the heterogeneity of academic performance in peer groups would not significantly influence students' mental health.

4 Data, Variables and Methods

(1) Data

In China, junior high (or middle school) is a place with high academic pressure and fierce competition. The high school entrance examination is considered as important as the college entrance examination because the ranking of high school entrance examination not only determines whether the students can enter a "prestigious school" with high enrollment rates to universities but also serves as a reference for educational tracking (academic oriented or career-oriented differentiation). Schools, teachers, parents and students all attach great importance to examination results and ranking. Considering these circumstances, peers in schools are not only partners in school life but also competitors. In addition, due to the imbalanced distribution of high-quality educational resources, there are significant differences in the quality of teachers, reputation, and enrollment rate among junior high schools within the same areas. The higher the ranking of schools, the higher the average performance of peer groups, and consequently the more intense academic competition within peer groups. This study suggests that the structural context of fierce academic competition is suitable for examining the effect of peer groups, in which circumstances two effects of peer groups would be more significant. On the one hand, the group norms of "striving for the top" would make individuals work harder to improve their performance, so the "*Jin Zhu Zhe Chi*" effect would be more significant. On the other hand, individuals would be less confident among higher-achievement peers. Moreover, students would pay more effort to catch up with excellent peers, which may cause them to sacrifice their time for extracurricular activities.

Using data from the China Education Panel Study (CEPS) implemented by the National Survey Center at Renmin University of China, this study examines the effects of peer groups within the class on adolescents' academic performance and

mental health. The CEPS takes the 2013–2014 school year as the baseline, and the target sample is students of grade 7 and grade 9. 438 classes in 112 schools nested in 28 county-level units were selected for investigation throughout the PPS method. The CEPS includes detailed information on students, parents, school administrators, headteachers, and main course teachers. Moreover, compared with other similar surveys, CEPS samples all the students in selected classes, which could accurately measure the structure and characteristics of peer groups within a class. In this paper, the sample of the second wave survey conducted in the 2014–2015 academic year is used to answer our research questions. After deleting invalid samples and missing values, the final sample included 9449 students.

(2) Variables

1. Dependent variables: Students' academic performance and mental health

Students' academic performance was measured by Chinese, mathematics, and English scores in mid-term examinations when the survey was undertaken. For comparison, we convert the scores of the subjects whose total score is not 100 into the scores of the hundred-mark system[9] and then calculate the average scores of three subjects to measure students' academic performance.

Mental health is another outcome variable. A Likert scale was designed in the CEPS to measure respondents' mental health (see Table 1). The scale consists of 10 items to measure anxiety or depression. Each item corresponds to five possible options (on a scale of 1–5 for "never", "seldom", "sometimes", "often", and "always"); the larger the number, the more serious the corresponding psychological problems. As expected, the reliability of the scale is very high (pertaining an alpha value is 0.91). In this paper, we reverse the values of the 10 items mentioned above[10] and then use the principal component factor analysis to extract the common factors of these ten indicators. In addition, we standardized the value of mental health (range from 0 to 100) to facilitate easier interpretation in data analysis, in which higher values represent better mental health.

2. Independent variable: characteristics of peer group

In this paper, we use three indicators to measure the structure and characteristics of peer groups: local ranking of school, class average academic performance, and

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[9] CEPS not only collected the original scores of Chinese, mathematics, and English but also inquired about the total scores of each subject. Based on this information, we can convert the scores of all subjects into a 100-point system.

[10] The specific coding method is "never" $= 5$; "seldom" $= 4$; "sometimes" $= 3$; "often" $= 2$; "always" $= 1$. Table 1 shows the distribution of the 10 variables after recoding. The mental health of the investigated students was generally good. Almost 60% of the students in each item report "seldom" or "never" corresponding mental problems, but approximately 10% - 15% of the students report "always" or "often" corresponding mental health problems.

Table 1 Distribution of items on the mental health scale for 8th-grade students in CEPS (2014–2015 academic year) (%)

	Always (1)	Often (2)	Sometimes (3)	Seldom (4)	Never (5)
1. Feeling blue	3.82	7.27	29.79	33.07	26.05
2. Too depressed to focus on anything	3.88	7.74	25.84	31.50	31.04
3. Unhappy	4.37	7.65	26.88	35.38	25.72
4. Not enjoying life	3.97	5.58	15.66	27.93	46.86
5. Having no passion to do anything	3.76	6.92	22.79	32.54	33.99
6. Sad, sorrowful	3.74	5.95	21.54	35.37	33.41
7. Nervous	4.24	8.60	30.54	33.03	23.58
8. Excessive worry	4.09	6.13	18.94	31.42	39.42
9. Feeling something bad will happen	6.17	9.36	24.07	29.46	30.95
10. Too energetic to concentrate in class	4.34	6.85	20.40	33.26	35.15

the heterogeneity of class academic performance. The first two measure the average performance of peer groups, while the latter measures the heterogeneity of academic performance within peer groups. According to the principals' self-rating ranking of schools in counties (or districts), the outcome variable of school ranking is divided into three categories "medium and below", "medium and above", and "the best". As mentioned above, for various reasons, such as residential segregation and school socioeconomic segregation, there is a positive correlation between school ranking and student achievement. Therefore, school ranking is a reliable measurement of the average academic achievement of peer groups. The average academic performance is a more direct measurement of peers' ability within a class, derived from the average test scores of students in all classes (the average score of Chinese, mathematics, and English). The heterogeneity of class academic performance is calculated using the standard deviation of students' midterm scores, where a higher value represents higher heterogeneity of class academic achievements.

3. Control variables

Control variables cover the characteristics of students, their families, and schools. We include family socioeconomic status (SES) because it is one of the most important factors affecting adolescents' academic performance and mental health. We produced a comprehensive SES index (ranging from 0 to 100) composed of parents' occupation, parents' education, and Party membership through the principal components factor analysis approach.

In addition, several individual characteristic variables are included, such as gender (male = 1, female = 0), household registration (agriculture = 1, non-agricultural = 0), migration experience (yes = 1, no = 0), family living arrangement (living with

parents $= 1$, others $= 0$), age, number of siblings, and health (self-evaluation).[11] Furthermore, individual-level variables related to ability and behavior are also taken into consideration, including cognitive ability test score, bad behavior,[12] quality of best friends[13] and educational aspiration (the expected years of education, which is calculated as the highest level of education they "hope to achieve").

In addition, variables related to the family environment and parenting style are included, such as parent-child interaction, parents' educational expectations, parental supervision, and the number of extracurricular classes. The parent-child interaction is constructed according to the frequency of discussing "things that happened at school", "the relationship between children and their friends", "the relationship between children and teachers", and "children's worries or troubles" on parents' initiative.[14] Parents' educational expectations are measured in the same way as students' educational aspirations. Parents' supervision is calculated based on the strictness of parents on matters including "homework and examination", "performance in school", "whom to make friends with", "dress up", "online/Internet time", and "television time". We obtain the continuous variable of parents' supervision (ranging from 6 to 18) by taking into account the total score for these six activities (1=do not supervise at all, 2=supervise, but not strict and 3=strictly supervise). The number of extracurricular classes is the total number of Mathematical Olympiad, Ordinary mathematics, Chinese (writing), and English classes.

Several variables of schools and classes are also considered, including student-teacher ratio, quality of teachers, whether or not teachers have participated in mental health training, and class size. The student-teacher ratio refers to the ratio of the number of students to the number of teachers in schools. The quality of teachers is measured by the proportion of teachers with a bachelor's degree. Teachers' mental health training was measured according to "whether the school conducted mental health training for teachers" (yes $= 1$, no $= 0$). Table 2 shows descriptive statistics of all variables used in the empirical analyses.

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[11] Self-rated health is the subjective evaluation of the respondents on their health status. The options "relatively good" and "very good" are reassigned to 1, and the rest are 0.

[12] The status of bad behavior was measured by a scale with 10 questions, including "Cursing or saying swearwords", "Quarreling with others", "Having a fight with others", "Bullying the weak", "Having a violent temper", "Unable to concentrate on one thing", "Skipping classes, being absent, or truanting", "Copying homework from others, or cheating in exams", "Smoking, or drinking alcohol", and "Going to net bars or video arcade", and the answer options were "1-Never", "2-seldom", "3-sometimes", "4-often", and "5-always". After summation, a continuous variable with a value range of $10 \sim 50$ is obtained. The larger the value, the more frequent the bad behaviors.

[13] The quality of the closest friends refers to the ratio of the number of excellent or positive friends to the number of bad friends among the five best friends of the respondents (ranging from 0.3 to 3). The higher the value, the higher the quality of friends.

[14] Each item has three options, namely, "1-never", "2-sometimes" and "3-often". After summation, we obtain a parent–child interaction frequency variable ranging from 4 to 12. The larger the value is, the better the parent–child relationship is.

Table 2 Descriptive statistics of all variables ($N = 9{,}449$)

variables	Mean / Percentage	S.D	Min	Max
Students' level variables				
Mental health index	70.460	20.622	0	100
Psychological status at baseline (Grade 7)	75.160	19.493	0	100
Academic performance	64.709	19.532	0	97.8
Academic performance at baseline (Grade 7)	80.512	21.692	5.67	139
Family SES	46.304	15.827	0	100
Gender (male = 1)	0.522	0.500	0	1
Household registration (agriculture = 1)	0.539	0.498	0	1
Number of Siblings	0.708	0.812	0	6
Migration (yes = 1)	0.182	0.386	0	1
Family living arrangement (living with parents = 1)	0.792	0.406	0	1
Quality of close friends	2.259	0.674	0.333	3
Self-rated health (health = 1)	0.642	0.479	0	1
Bad behavior	15.555	4.852	10	50
Children's educational aspiration (year)	16.307	3.189	8	22
Cognitive ability test score	22.956	6.791	0	35
Parent–child interaction	8.837	2.172	4	12
Parents' educational expectations (year)	16.671	3.238	8	22
Parental supervision	13.809	2.403	6	18
Number of extracurricular tutorial lessons	0.605	0.943	0	4
School (class) level variables				
Student–teacher ratio	12.475	4.529	2.87	30.7
The undergraduate ratio of Teachers	0.823	0.222	0	1
Teachers' mental health training (yes = 1)	0.872	0.334	0	1
Class size	46.167	11.661	9	76
School Rankings				
Medium below	0.210	0.407	0	1
Medium above	0.527	0.499	0	1
The best	0.263	0.440	0	1
Class average academic performance	64.709	12.819	27.2	89.2
Heterogeneity of class academic performance	14.291	4.245	2.57	27.9

(3) Methods

Accurately assessing the peer group effect is a difficult methodological problem, and the biggest challenge is the bias caused by the self-selection process (Hoxby, 2002; Sacerdote, 2011). Families will have their children "selectively" enter the school

they prefer for many reasons, such as income, place of residence, choice preference, and so on. It means that students can choose their peers subjectively rather than randomly entering into peer groups of schools or classes. The self-selection problem is particularly worthy of attention in this paper. As discussed earlier, compulsory education in China is not selective and institutes a "nearby enrollment policy" based on registered residences. However, due to the imbalanced distribution of high-quality educational resources and educational competition in advance, students' ability and family socioeconomic factors still play important roles when choosing a school (school district). Moreover, some studies have shown that socioeconomic segregation in Chinese elementary education has become more prominent (Wu & Huang, 2016) as individual ability and academic performance are closely related to family socioeconomic status, there exists a common phenomenon that the more excellent the individual is, the higher performance the peers have. Therefore, if we ignored this problem and used conventional statistical methods, it would probably result in statistical severe bias.

The ideal method to solve selective bias is to use random trials, but that is not suitable for the observational survey data. Therefore, we choose to adopt the stabilized inverse probability treatment weights (SIPTW) approach to ease the bias from the homogeneity of group composition caused by self-selection. After calculating the probability of individuals entering schools with different rankings, we construct a weighted pseudo-population based on the weight calculated from the probability to achieve the balance of data. The weights of schools in different ranking levels are calculated as follows:

$$SW_i = \frac{P(S_i = J)}{P(S_i = J | X_i, C_i)}$$

where S_i stands for the school ranking that student i entered; X_i is a series of variables that affect entering different levels of school when student i was in sixth grade; and C_i represents other demographic characteristics. We use the multinomial logistic regression model to estimate the probability of students entering schools with different rankings (Imbens, 1999; McCaffrey et al., 2013). "School Ranking" mentioned above is the dependent variable. The covariates include demographic characteristics such as students' gender, household registration, number of siblings, migration experience, family living arrangements, family SES, educational performance in sixth grade (self-efficacy, the learning ability of main courses, and ranking of academic performance), whether taking an entrance examination, whether parents take action to help them enter school, grade skipping, grade repetition or transfer experience in primary school, and other variables related to learning and school selection experience before entering secondary school, as well as standardized scores of cognitive ability in baseline survey (Grade 7).[15]

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[15] We do not show a detailed description of the specific measurement of these covariates in this paper. Interested readers, please contact the author.

Significantly, when using the SIPTW approach to deal with the problem of sample selection, a diagnosis of data balance is required to test whether the impact of data imbalance on model estimation is minimized. Here, we diagnose by estimating a weighted multinomial logistic model.[16] If each covariate in the weighted model no longer significantly affects the probability of students entering different ranking schools, this balance is achieved. In contrast, the problem of sample selection still exists. The results of the pre-weighted and weighted multinomial logistic models are shown in Table 3.

From Table 3, we can find that before conducting the SIPTW approach (pre-weighted model), the probability of students entering different ranking schools is significantly affected by the covariates mentioned above. Students with higher SES families, parents' help in enrollment, no migration experience, few brothers and sisters, urban registered permanent residence, higher cognitive ability, and better educational performance in sixth grade are more likely to attend higher-ranking schools. The pre-weighted model results show that the selective problem of entering different quality schools is significant. However, the model weighted by SIPTW (the weighted model in Table 3) shows that almost all covariates are no longer significant (the only exception is that family SES still significantly affects the probability of enrollment). It means that, except for very few variables, the SIPTW method almost eliminates the problem of data imbalance. That is, the selection of entering different quality schools has been greatly reduced. Therefore, it is feasible to conduct the SIPTW approach for the data used in this study.

Another problem in estimating the peer group effect is omitted variables. Some factors that simultaneously affect dependent and independent variables cannot be controlled because they are uncollected or difficult to measure, which will also lead to the estimation bias of core independent variables. In this study, we adopt three approaches to overcome this problem. First, we use the county (district) fixed effect model[17] to eliminate the estimation bias caused by regional differences (including all factors such as economic development level, education level, quality of teachers, test difficulty, etc.). Second, with the advantage of CEPS as tracking survey data, we use the information of the dependent variables of the previous year as control variables in the model.[18] We can then control those omitted variables at the individual level as much as possible because omitted variables may affect the dependent variables (academic performance and mental health level) of the previous year and the current year simultaneously. Third, we use the seemingly uncorrelated regression model to estimate the coefficients. There are two dependent variables of academic

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[16] We also refer to Guo Shenyang's (Guo & Fraser, 2014) method to conduct a single variable test. That is, the weighted regression model is estimated with covariates as dependent variables and school ranking as independent variables. The results of this method are highly consistent with the current practice.

[17] Some specific education policies, teaching management methods, assessment, and test questions in junior middle school are unified in the same county (District).

[18] The subjects of this study were eighth-grade students. The dependent variable information of the last year is the mental health level of the seventh grade (the semester of the baseline survey) and the mid-term examination scores (average scores of Chinese, mathematics, and English).

Table 3 Preweighted and weighted multinomial logistic model for estimating schools in different rankings (data balance diagnosis results)

variable	Pre weighted model		Weighted model	
	Medium above vs. medium below	The best vs. medium below	Medium above vs. medium below	The best vs. medium below
boy	−0.111*(0.056)	−0.022(0.066)	0.015(0.060)	0.041(0.071)
Rural	−0.196**(0.063)	−0.230**(0.075)	−0.074(0.073)	−0.050(0.084)
Number of siblings	−0.141***(0.034)	−0.173***(0.044)	0.006(0.036)	−0.021(0.044)
Migration experience	−0.883***(0.066)	−1.313***(0.086)	0.009(0.066)	0.050(0.094)
Family living arrangements	−0.032(0.067)	0.105(0.082)	0.023(0.070)	0.004(0.088)
Family SES	0.006*(0.002)	0.031***(0.003)	0.007**(0.002)	0.004(0.003)
Skipping experience (yes = 1)	0.133(0.198)	−0.322(0.284)	0.017(0.208)	−0.191(0.304)
Repetition experience (yes = 1)	−0.064(0.077)	−0.019(0.101)	0.038(0.081)	0.130(0.109)
Transfer experience (yes = 1)	0.121[+](0.063)	−0.079(0.078)	0.040(0.068)	0.078(0.084)
Self-efficacy in sixth grade	0.098*(0.044)	0.227***(0.053)	0.007(0.047)	0.023(0.058)
Educational performance in sixth grade	−0.336**(0.122)	−0.031(0.149)	0.104(0.132)	−0.064(0.161)
Learning ability of main courses in sixth grade	−0.005(0.015)	0.032[+](0.018)	−0.005(0.016)	−0.008(0.019)
Take the entrance examination (yes = 1)	0.207***(0.056)	0.208**(0.066)	−0.045(0.059)	−0.061(0.072)
Parents take action to help enroll (yes = 1)	0.127*(0.064)	0.580***(0.073)	0.046(0.070)	−0.013(0.080)
The standardized score of cognitive ability in Grade Seven	0.310***(0.035)	0.540***(0.041)	−0.005(0.037)	−0.054(0.046)
Constant	0.973***(0.232)	−2.076***(0.279)	0.585*(0.244)	0.164(0.303)
N	9,449			9,449

(continued)

Table 3 (continued)

variable	Pre weighted model		Weighted model	
	Medium above vs. medium below	The best vs. medium below	Medium above vs. medium below	The best vs. medium below
Log-likelihood	−8,933			−9,621

Note [+]P < 0.10, *P < 0.05, **P < 0.01, ***P < 0.001; the standard error is in the parentheses of the model before weighting, and the robust standard error is in the parentheses of the model after weighting. The reference group was medium to low

performance and mental health, and the independent variables used to estimate them are the same. Hence, the general approach is to estimate the two least square (OLS) models separately. Since the model may not include or observe factors that affect both dependent variables (and there is an association between academic performance and mental health), residuals in the two separate models are correlated. The SUR model combines the above two separate models for estimation, which can improve the estimation efficiency and reduce the estimation bias caused by omitted variables to a certain extent. The specific formula is as follows:

$$\begin{cases} E_{ij}=\alpha_j+\beta Z_{ij}+\sum \gamma_k X_{ijk}+\varepsilon_{ij} \\ D_{ij}=\zeta_j+\theta Z_{ij}+\sum \varphi_k X_{ijk}+\xi_{ij} \end{cases}$$

where E_{ij} and D_{ij} represents the scores of academic performance and mental health of student i in city j, respectively; Z_{ij} is the characteristics of the peer group of student i in city j; other variables are all represented by X_{ijk}; α_j and ζ_j are the fixed intercept of academic performance and mental health models, which contain the unobserved urban characteristics, ε_{ij} and ξ_{ij} are residual terms. If the residual terms of the above two equations (ε_{ij} and ξ_{ij}) are independent of each other, then the results of the SUR model are equivalent to the results of the conventional separate estimation of the two OLS models. In contrast, the SUR model can make a more effective estimation. In this study, we use the user-written Stata command "mysureg" to estimate the SUR model (Gould et al., 2010).

5 Results

(1) The health cost of being with high-achievement peers

Table 4 shows the outcomes of the four SUR models predicting peer influence on students' academic performance and mental health. Model 1 is a baseline model,

which accounts for only the effects of all control variables.[19] When everything else is constant, boys' academic performance is lower than girls', but their mental health is better. The quality of close friends is positively correlated with academic performance and mental health, while the effect of bad behavior is the opposite. Students' physical health has no significant impact on academic performance, but it is positively related to mental health. Furthermore, it can also be found that students' educational aspiration and cognitive ability can promote their academic performance but have no significant influence on their mental health. Parent-child interaction plays an important role in adolescents' development. Favorable parenthood not only helps in improving academic performance but also has a positive effect on children's mental health. Parents' educational expectations do improve children's performance, while the effect on their mental health is not significant. Parents' supervision does not influence students' educational performance but negatively affects their mental health a significant manner. Children have more severe emotional problems, such as anxiety and depression, when their parents strictly supervise them. In particular, more attention should be paid to the influence of extracurricular lessons. Attending cram school (private sector tutoring services) is helpful for greater academic achievements, but it has a negative impact on mental health.

For school-level factors, model 1 shows that the higher the student-teacher ratio is, the lower the students' performance. In contrast, the effect of the student-teacher ratio on mental health is not significant. Teaching personnel quality positively correlated with students' scores but negatively with their mental health. The possible reason may be that students would suffer tremendous pressure in high-ranking schools with higher quality teachers. Moreover, there was no correlation between teachers' mental health training and students' academic performance or mental health. Finally, class size also does not affect the two dependent variables.

Two points should be emphasized about the results of model 1. First, family SES has no significant effect on the two outcome variables (although the coefficients are positive), which may not align with our expectations. However, we consider that other variables in model 1 (including children's ability, educational expectations, family environment, and parenting style) may reduce the effect of family background. Second, to obtain unbiased estimates of core independent variables, we take students' academic performance and mental health status at the baseline survey (when they were in the seventh grade) as control variables in the model. It can be found that the test score of the last year is positively correlated with the academic achievement of the current year (in line with the expectation) but not with mental health. That is, previous excellent academic performance will not improve subsequent mental health. Mental health in the last year is not only positively correlated with current mental health (which is also in line with expectations) but also has a significant role in improving current academic performance. The results here also support the findings

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[19] The test result of the covariance coefficient of residuals at the bottom of model 1 is statistically significant; that is, the residuals of the two models (with different dependent variables) are indeed correlated, which indicates that the SUR model is a more appropriate method.

Table 4 Seemingly unrelated regression model of peer group situation on adolescent academic performance and mental health (IPTW weighted; county fixed effect; N = 9449)

	Model 1		Model 2		Model 3		Model 4	
	Academic performance	mental health	Academic performance	mental health	Academic performance	mental health	Academic performance	mental health
Academic performance at baseline survey	0.624***(0.010)	−0.020(0.014)	0.622***(0.010)	−0.018(0.014)	0.568***(0.010)	−0.005(0.015)	0.568***(0.010)	−0.006(0.015)
mental health at baseline survey	0.023***(0.006)	0.339***(0.012)	0.024***(0.006)	0.338***(0.012)	0.020***(0.006)	0.339***(0.012)	0.020***(0.006)	0.339***(0.012)
Family SES	0.083(0.090)	0.201(0.161)	0.048(0.089)	0.220(0.161)	−0.060(0.083)	0.244(0.161)	−0.061(0.083)	0.244(0.161)
Male	−2.421***(0.218)	2.823***(0.408)	−2.475***(0.216)	2.879***(0.407)	−2.707***(0.207)	2.932***(0.408)	−2.708***(0.207)	2.932***(0.408)
Rural	0.393(0.257)	0.368(0.458)	0.578*(0.258)	0.223(0.461)	0.864***(0.246)	0.158(0.460)	0.848***(0.246)	0.153(0.460)
Siblings	0.002(0.161)	−0.537+(0.313)	0.001(0.159)	−0.559+(0.311)	0.162(0.153)	−0.595+(0.311)	0.166(0.154)	−0.594+(0.311)
Migration experience	0.182(0.335)	−0.557(0.565)	−0.143(0.328)	−0.280(0.557)	−0.040(0.307)	−0.303(0.557)	−0.030(0.307)	−0.300(0.557)
Living with parents	0.060(0.274)	0.662(0.508)	0.058(0.271)	0.642(0.506)	0.170(0.257)	0.616(0.505)	0.181(0.256)	0.620(0.505)
Quality of close friends	1.248***(0.198)	1.527***(0.383)	1.210***(0.196)	1.554***(0.382)	0.975***(0.186)	1.608***(0.383)	0.976***(0.186)	1.608***(0.383)
Bad behavior	−0.094***(0.028)	−1.265***(0.060)	−0.095***(0.027)	−1.264***(0.060)	−0.091***(0.026)	−1.265***(0.060)	−0.092***(0.026)	−1.266***(0.060)
Self-rated health	−0.334(0.227)	6.057***(0.422)	−0.285(0.226)	6.014***(0.420)	−0.231(0.215)	6.001***(0.420)	−0.230(0.214)	6.001***(0.420)
educational aspiration	0.403***(0.046)	−0.103(0.083)	0.396***(0.046)	−0.091(0.083)	0.384***(0.043)	−0.088(0.083)	0.390***(0.043)	−0.086(0.083)
Cognitive ability test score	0.388***(0.023)	0.037(0.039)	0.387***(0.023)	0.036(0.039)	0.351***(0.021)	0.044(0.039)	0.351***(0.021)	0.044(0.039)

(continued)

Table 4 (continued)

	Model 1		Model 2		Model 3		Model 4	
	Academic performance	mental health	Academic performance	mental health	Academic performance	mental health	Academic performance	mental health
Parent–child interaction	0.176**(0.056)	0.228*(0.107)	0.151**(0.055)	0.255*(0.107)	0.137**(0.053)	0.259*(0.106)	0.140**(0.053)	0.260*(0.107)
Parents' educational expectations	0.300***(0.043)	0.069(0.077)	0.297***(0.043)	0.069(0.076)	0.313***(0.041)	0.066(0.076)	0.314***(0.041)	0.066(0.076)
Parental supervision	0.000(0.050)	−0.358***(0.092)	0.001(0.049)	−0.356***(0.092)	−0.018(0.047)	−0.352***(0.091)	−0.025(0.047)	−0.354***(0.091)
Number of extracurricular tutorial classes	0.520***(0.115)	−0.569*(0.227)	0.490***(0.114)	−0.543*(0.228)	0.313*(0.108)	−0.503*(0.228)	0.319**(0.108)	−0.501*(0.227)
Student–teacher ratio	−0.120**(0.037)	−0.100(0.071)	−0.156***(0.036)	−0.051(0.071)	−0.131***(0.034)	−0.056(0.071)	−0.106***(0.035)	−0.048(0.072)
Proportion of teachers with bachelor degree or above	1.420+(0.760)	−3.803**(1.333)	0.153(0.795)	−2.539+(1.357)	−2.718***(0.755)	−1.883(1.368)	−2.599***(0.752)	−1.843(1.367)
Teachers' mental health training (yes = 1)	−0.567+(0.332)	0.632(0.731)	−0.322(0.342)	0.163(0.740)	0.157(0.336)	0.054(0.742)	0.161(0.337)	0.055(0.742)
Class size	−0.014(0.017)	−0.018(0.028)	−0.035(0.017)	−0.002(0.028)	−0.104***(0.016)	0.014(0.029)	−0.116***(0.016)	0.010(0.029)
School ranking[a]								

Table 4 (continued)

	Model 1		Model 2		Model 3		Model 4	
	Academic performance	mental health	Academic performance	mental health	Academic performance	mental health	Academic performance	mental health
Medium above			2.491***(0.294)	−1.347*(0.612)	1.013***(0.288)	−1.009(0.622)	0.808**(0.298)	−1.079+(0.632)
The best			4.132***(0.420)	−3.813***(0.771)	0.508(0.410)	−2.986***(0.803)	0.392(0.411)	−3.025***(0.805)
Class average academic performance					0.384***(0.016)	−0.088***(0.026)	0.405***(0.019)	−0.081**(0.028)
Dispersion degree of class							0.123**(0.041)	0.042(0.068)
District (county) fixed effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Constant	0.067(1.455)	38.130***(2.875)	0.737(1.472)	37.185***(2.881)	−14.801***(1.558)	40.732***(3.059)	−17.692***(1.902)	39.755***(3.424)
Covariance of residuals	−4.467*(1.818)		−3.541*(1.792)		−1.836(1.698)		−1.871(1.695)	
Log-likelihood	−74,937		−74,864		−74,423		−74,416	

Note +P < 0.10, *P < 0.05, **P < 0.01, ***P < 0.001; standard error in brackets. (a) The reference group was "medium below"

of previous studies; that is, adolescents' mental health indeed plays an important role in ensuring their psychological health and educational development.

Based on Model 1, the school ranking variable is added in Model 2. The results show that even after controlling the sample self-selection problem through the SIPTW approach, school ranking still significantly impacts students' academic performance and mental health. We find that the higher the ranking of the school, the better the average score of students, but the worse the level of mental health. Specifically, the academic scores of students who enrolled in the medium above and the best schools were 2.491 and 4.132 points higher than those in the lower-ranked schools, respectively. At the same time, the mental health index was 1.347 and 3.813 units lower, respectively. The level of significance is more minor than 0.05. In general, students display better academic performance in high-ranking schools, but it comes at the cost of mental health, which verifies hypotheses 1a and 1b. Based on the unbalanced development of schools, high-performance students tend to enroll in high-ranking schools, so students studying in high-ranking schools will consequently have better peers. Good peers lead to better academic performance but also worse mental health due to the accompanying competitive pressure.

In model 3, another peer group characteristic variable, class mean academic performance, is added. It is considered to be a more direct and accurate variable to measure the structural characteristics of peer groups because a class is the most basic unit in a school. It is where students have the most contact with their classmates, and classmates are also the objects of direct competition or comparison. The result of model 3 also proves the cost of mental health. In peer groups with high achievements, students achieve better academic performance but lower mental health. Specifically, after controlling for other factors, an increase of 1 point in class mean score results in an increase of 0.384 points for students' scores but a decrease of 0.088 points in mental health, both above the significance level of 0.001. The findings further support hypotheses 1a and 1b. From this point of view, an excellent peer group is indeed a "double-edged sword" that needs to sacrifice psychological health while helping to improve academic performance. It is noteworthy that the coefficient of school ranking decreases significantly after adding the class average academic performance, and few dummy variables even become insignificant. This is considered to be reasonable because the average ability of classmates is highly correlated with school ranking. Moreover, classmates within a class interact the most and are directly compared as peers rather than students outside the class. Therefore, the effect of school ranking can be largely explained by the characteristics of peers within the class. However, even when the peer group variable is included, students' psychological well-being in the highest-ranking schools is still significantly worse than that of their counterparts in lower-ranking schools.

Finally, we add the standard deviation of the class academic performance variable in model 4 to test the effect of heterogeneity of performance on students' performance and mental health. The results support hypotheses 2a and 2b; the heterogeneity of class academic performance is positively correlated with students' academic achievement but does not affect students' mental health (although the coefficient is positive). The positive correlation between the heterogeneity of class academic performance

and students' achievement attests to the "rainbow model" proposed by economists, but its mediation mechanism needs to be further explored. The results could conclude that improving the heterogeneity of class students' ability or moderately increasing the diversity of students' sources would benefit all the students in peer groups.

(2) Robust tests

To ensure the reliability of the above results, we conducted robust tests using two approaches. First, the class size may affect the methods of measuring the characteristics of peer groups in a class. If the class size is too tiny, extreme values would easily affect the average academic performance (mean score) and the heterogeneity of academic performance (standard deviation). Therefore, we conduct a robust test of revisiting the effect of class peer group characteristics (mean and standard deviation of academic performance) when excluding classes with a small class size in our sample. We attempt to conduct a robustness test for two possible cases, which excludes classes with fewer than 25 or fewer than 35 students. The results of the tests are shown in Table 5 (dependent variables, independent variables, control variables, and statistical methods are entirely consistent with model 4 in Table 4). Another robust test approach is to select samples according to the CEPS sampling method. The CEPS is composed of three independent subsamples[20]: "non-Shanghai and non-migrant population subsample", "Shanghai subsample", and "migrant population subsample", which differ greatly in their population characteristics. Most of the respondents in the "migrant population subsample" are the children of rural migrant workers, many of whom enroll in a migrant children's school. Therefore, the situation of respondents in the "migrant population subsample" may be quite different from the other two subsamples. As a consequence, we re-calibrated the model when excluding the migrant population subsample (the results are also shown in Table 5).

The results in Table 5 show that regardless of which way the robust test is conducted, the results estimated by our robust test model (coefficient of the peer group characteristics) are consistent with the results of model 4 in Table 4. Although changes have taken place in the coefficients of these variables (due to the difference in the samples), the direction of effects and the significance level are entirely consistent with model 4 in Table 4. In general, the robustness test results show that our conclusions based on the models in Table 4 are relatively strong.

6 Conclusion and Discussion

Peer groups play an important role in an adolescent's development. Analyzing the second wave of CEPS data (2014–2015) and conducting the SIPTW approach to correct the estimation bias caused by sample selection, this study finds a significant and robust peer group effect on students' development in junior high school in

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[20] For the introduction of these three subsamples, please refer to the "CEPS baseline data user manual".

Table 5 The results of the robustness test (SUR model; fixed effect of districts and counties)

	Class size ≥ 25 (n = 9196)		Class size ≥ 35 (n = 7926)		non-floating population subsamples (n = 6111)	
	Academic performance	mental health	Academic performance	mental health	Academic performance	mental health
School ranking [a]						
Medium above	0.693*(0.322)	−1.209+(0.672)	0.212(0.387)	−0.290(0.819)	0.008(0.491)	−1.488(0.947)
The best	0.327(0.424)	−3.240***(0.833)	0.062(0.474)	−2.219*(0.960)	0.710(0.622)	−3.036**(1.131)
Class average academic performance	0.411***(0.020)	−0.076**(0.028)	0.421***(0.021)	−0.094**(0.031)	0.387***(0.026)	−0.086*(0.035)
Heterogeneity of class academic performance	0.129**(0.042)	0.026(0.072)	0.185***(0.048)	0.069(0.082)	0.106*(0.052)	0.086(0.082)
Others[b]	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
Constant	−17.388***(1.940)	39.071***(3.549)	−18.635***(2.216)	37.766***(4.619)	−10.556***(2.626)	37.690***(3.961)
Log-likelihood	−72,400 400		−62,365 365		−48,010 010	

Note [+]P < 0.10, [*]P < 0.05, [**]P < 0.01, [***]P < 0.001; standard error in brackets. (a) The reference group was "medium below"; (b) other variables were consistent with all variables in model 4 of Table 3, including district (county) fixed effects

China. The structure and characteristics of peer groups will affect students' academic performance and mental health. Specifically, the conclusion of this paper takes a three-pronged approach. First, being with excellent peers does have the effect of *Jin Zhu Zhe Chi* on students' academic performance, which is consistent with most previous studies. After controlling for other factors, students in high-ranking schools or those with high-achieving classmates would have higher academic performance. Second, in an environment of intense academic competition, excellent peers also become stressors and negatively affect the psychological wellbeing of teenagers. With everything else constant, students will have more psychological problems such as anxiety or depression, whether in high-ranking schools, or with high-performance classmates. Third, after controlling for class average academic performance and other factors, the heterogeneity of peer groups' academic performance is directly proportional to group members' academic performance but has no significant impact on mental health. Generally, from the perspective of the comprehensive development of adolescents, excellent peers are likely to be a "double-edged sword". Especially in a competitive atmosphere, being surrounded by excellent peers can improve students' academic performance. However, at the same time, they will sacrifice at least some of their mental health.

The results of this study show that it is meaningful to pay attention to the different influences of peer groups to understand the social consequences of China's increasingly fierce education competition. On the one hand, increasingly fierce educational competition has brought many problems to society, families, and adolescents, including increasing investment in education (time and money), the widespread phenomenon of extracurricular tutoring, and students' increasingly heavy academic burden. On the other hand, school socioeconomic segregation caused by residential segregation, the difference of selective ability of schooling among social classes and other factors means that children from higher SES families are more likely to interact with children from a similar background. The peer group's "*Jin Zhu Zhe Chi*" effect makes these children who have an advantage in their ability perform better and better, which then forms a virtuous cycle. For the same reason, children from lower-class families are excluded from this cycle and even fall into the vicious circle of "*Jin Mo Zhe Hei*", which is the potential risk of increasing social inequality caused by the peer group effect has been a concern of many scholars (Doepke & Zilibotti, 2019; Putnam, 2015). However, at the micro-level, peer groups' negative effects are still not given enough attention. It needs to be further explored to what extent mental health costs along with the" *Jin Zhu Zhe* Chi" effect can affect adolescents' comprehensive development, physical and mental health, occupational status in adulthood, and the corresponding social consequences.

Due to the different effects of peer groups on students' academic achievements and mental health, some overperformance-oriented practices (pursuing the goal of enrollment rate or school ranking) in elementary education, including dividing students into different schools or classes according to their academic performance or even giving special favor to excellent students, should be examined. In addition, it should be a point of caution for schools, teachers, and parents to constantly urge students to pursue excellent academic achievements using various measures. There

is a consensus in current society that admission to famous schools means a well-paid career after graduation, which will be conducive to children's long-term happiness. However, when pursuing these goals, the cost of mental health and its potential negative impact on other aspects of adolescents should not be completely ignored. One should be aware that such a situation where families or children themselves tend to choose to sacrifice their health when children's mental health conflicts with other important life goals (such as entering a higher-achievement school). In the long run, this kind of short-sighted approach may cause adverse consequences to teenagers themselves and society as a whole.

As we discussed in the text, the social contrast function of peer groups and its depressing effect will be more prominent in the context of fierce competition. At present, fierce education competition in elementary education is caused by a series of structural or institutional factors. Therefore, we should focus on these sources to alleviate fierce competition and achieve genuine burden reduction. Moreover, this study finds that improving the diversity (heterogeneity) of students' ability in the class is conducive to the improvement of each student's ability and not harmful to their mental health. Thus, it would be a feasible attempt to promote the desegregation of schools in elementary education and promote the diversification of students' family backgrounds or abilities. We are glad that the Chinese education administration has been making efforts in this direction, such as the "school district system" reform implemented by some local governments in recent years.

There are some limitations to this study. Due to the limitation of data, we cannot observe whether the students are enrolled in their current class due to the difference in academic performance, so it is difficult to correct the selective bias caused by "class selection". In addition, we only analyzed the short-term effects of peer groups on academic performance and mental health. Due to the lack of long-term follow-up data, it is impossible to test the long-term impact and the trend of the effect of peer groups on students' academic performance and mental health. Finally, our discussion on the "double-edged sword" effect of peer groups is preliminary. Further analysis of this issue still requires qualitative and quantitative data collection of peer interaction.

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Job Demands, Job Resources and Teachers' Job Satisfaction: An Empirical Study Based on the TALIS 2018 Shanghai Database

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Abstract Based on the Shanghai TALIS 2018 database, this study discusses how school job characteristics impact teachers' job satisfaction under the framework of the job demands-resources model. The main findings are as follows: (1) Job demands (JDs) negatively predict teachers' job satisfaction, and work pressure plays a completely mediating role in this path. (2) Job resources positively predict teachers' job satisfaction. (3) Only the organizational type of job resources can mitigate the negative impact of JDs on teachers' job satisfaction, and for such job resource types, teachers would own the highest level of job satisfaction in the school environment with a combination of high job demands and high job resources. The above findings confirm the importance of improving school management practices and optimizing the combination of work resources and demands to improve teachers' job satisfaction.

1 Introduction

In recent years, policies such as *Opinions on Comprehensively Strengthening the Reform for the Development of Teachers in the New Era* and the *Action Plan for Revitalizing Teacher Education (2018–2022)* have been introduced successively, and development opportunities for teachers have entered a new historical period (Wang, 2018). In the process of constructing high-quality teaching staff, improving teachers' job satisfaction, in terms of "self-perceived job satisfaction", is crucial (Sims, 2017). The probable reason is that high teachers' job satisfaction can not only promote their willingness to spend time and energy to improve their teaching skills (Collie et al., 2012; Hagenauer et al., 2015; Kunter et al., 2013), but can also help them better perceive the value and significance of the job (Hagenauer et al., 2015), resulting in a

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strong sense of job commitment and a low turnover intention (Skaalvik & Skaalvik, 2011; Toropova et al., 2020).

Job characteristics in the school environment are closely related to teachers' job satisfaction (Collie et al., 2012; Sims, 2017). However, there are very limited empirical studies focusing on the job satisfaction of teachers in China, and most of them lack rigorous study designs and are based on small sample data (Wu, 2019). Therefore, the current condition of teachers' job satisfaction and related problems are unclear in China, which makes it hard for managers to improve teachers' job satisfaction by improving school administration or optimizing the setting for job demands and job resources. The job demands-resources model (JD-R model) provides an organically integrated theoretical framework for analyzing the effect of job characteristics on teachers' job satisfaction in the school environment (Yin et al., 2018). According to this model, job characteristics can be categorized into two broad categories, job demands (JDs) and job resources (JRs), which have different and specific functions (Demerouti & Bakker, 2011). Then the JD-R model can simultaneously analyze the positive and negative effects of job characteristics under a balanced, comprehensive, interactive, and unified analytical framework, which may be applied to various occupational settings (Bakker & Demerouti, 2007; Demerouti et al., 2001; Yin et al., 2018). Hence, the analysis results from the JD-R model can become an appropriate communication tool for relevant persons in the organization.

Based on the database of Teaching and Learning International Survey (TALIS) of Shanghai in 2018, this paper reveals the effect and mechanisms of JDs and JRs on teachers' job satisfaction under the analysis framework of the JD-R model, in order to provide evidence for enhancing teachers' job satisfaction through improving school administration.

2 Literature Review and Research Hypotheses

According to the JD-R model, job characteristics in any occupations can be divided into JDs and JRs (Bakker & Demerouti, 2007). Among them, JDs require individuals to continuously carry out physical or mental labor and take a long time to complete, which is usually measured by objective indicators such as working hours or subjective scales such as the self-perceived workload scale. By comparison, JRs refer to the psychological, social, or organizational resources that individuals obtain from their jobs. JRs specifically include task resources with a connotation of work autonomy, organizational resources with a connotation of career development, and social resources with a connotation of good interactions and communications with colleagues. Excessive JDs are often regarded as "bad things" that consume energy in the work environment, while more JRs are often regarded as "good things" (Bakker & Demerouti, 2007). The JD-R model integrates the following three basic psychological processes to analyze the relationships between job demands, job resources and personal perceptions of emotions, such as job satisfaction (Bakker & Demerouti, 2007; Demerouti & Bakker, 2011; Demerouti et al., 2001).

The first psychological process is the depletion path through which JDs negatively affect an individual's perception of positive emotions. In this path, increasing JDs will trigger job pressure and resulting in constant decreases in job satisfaction (Bakker & Demerouti, 2007). The possible reason is that when faced with ever-increasing JDs, individuals are more likely to perceive a high level of work-related pressure and need to respond to pressure and meet the JDs through continuous hard work; however, sustained hard work consumes both physical and mental energy and causes individuals to experience more negative emotions (e.g., job burnout) and less positive emotions (e.g., job satisfaction).

Some scholars have conducted studies using samples from different countries and occupations and have consistently confirmed the hypothesis in the JD-R model that JDs are positively correlated with the perception of negative emotions (e.g., job burnout) or negatively correlated with the perception of positive emotions (e.g., job satisfaction) (Bakker et al., 2003; Yeh, 2015; Yin et al., 2018). In the school environment, some scholars have also carried out a series of relevant studies. For example, Hakanen (2006) measured the JDs of Finnish teachers using the workload burden scale and found that JDs negatively predicted teachers' organizational commitment level but positively predicted teachers' health problems. Yin () explored the relationship between the work environment and teachers' well-being in Hong Kong and found that JDs positively predicted teachers' negative emotions, such as anxiety and depression. Skaalvik and Skaalvik (2018) measured the JDs of Norwegian teachers using the indicator of working hours and found that JDs negatively predicted teacher job satisfaction and positively predicted teachers' turnover intention. We infer that such a depletion path may also exist under the Chinese mainland school settings; thus, we propose the first hypothesis:

H1: JDs negatively predict teachers' job satisfaction.

Furthermore, the JD-R model holds that the aforementioned depletion path in which JDs negatively predict individuals' positive emotions is essentially due to JDs' triggering of job pressure (Bakker & Demerouti, 2007; Pearson & Moomaw, 2005; Yin et al., 2018). Nonetheless, there is a scarcity of research introducing job pressure as a mediating variable under the framework of the JD-R model to comprehensively reveal the path relationship between JDs and teachers' job satisfaction (Yin et al., 2018). Benefitting from TALIS 2018 investigating teachers' job pressure, we obtain data support for exploring this mediating path in the school settings. Therefore, we propose the second hypothesis:

H2: Job pressure plays a mediating role in the negative impact of JDs on teachers' job satisfaction.

The second psychological process is the gain path through which JRs positively influence an individual's perception of positive emotions. In this path, increasing JRs (e.g., timely feedback from administrators) will trigger a process of positive incentives and resulting in constant increases in job satisfaction (Bakker & Demerouti, 2007). The possible reasons are as follows: According to self-determination theory (SDT), individuals' self-perception of satisfaction and other positive emotions depend on the

satisfaction degree for three basic needs, i.e., autonomy, competence, and relatedness (Ryan & Deci, 2000). As task resources could enhance work autonomy, organizational resources could promote professional development, and social resources could increase interactions among colleagues; thus, more JRs could correspondingly help individuals meet their needs of autonomy, competence, and relatedness, thus naturally promoting individuals' perception of positive emotions (Bakker & Demerouti, 2007).

Some scholars conducted studies using samples from different countries and occupations, and the results relatively consistently supported the gain path in which JRs positively affect positive emotions (Bakker et al., 2003; Skaalvik & Skaalvik, 2018; Yeh, 2015; Yin et al., 2018). It is plausible to suppose that the gain path could also hold true in Chinese mainland school settings. Therefore, we propose the third hypothesis:

H3: JRs positively predict teachers' job satisfaction.

The third psychological process is the process through which JDs and JRs interact with each other and jointly affect individuals' perceptions of positive emotions (Demerouti & Bakker, 2011). On the one hand, in an environment with sufficient JRs, the possibility of achieving the JDs is high, which mitigates the likelihood that JDs trigger individual job pressure and naturally reduces the possibility that JDs negatively affect positive emotions. Such process is also called a buffering hypothesis. On the other hand, in an environment with high JDs, individuals are less likely to generate indolence but likely to be motivated to actively invoke JRs to achieve JDs, which helps to expand the promoting effect of JRs and enlarge the positive influence of JRs on job satisfaction. Such process is also called a response hypothesis. In the school context, existing related studies found that with an increase in JRs, the negative impact of JDs on teachers' job burnout decreases, which supports the buffering hypothesis (Schaufeli et al., 2009); meanwhile, with an increase in JDs, the positive effect of JRs on teachers' job performance increases significantly, which supports the response hypothesis (Bakker et al., 2007). However, these studies did not focus on teachers' job satisfaction.

In conclusion, based on the buffering hypothesis, it can be concluded that JRs could promote the possibility of achieving the requirement by JDs and then reduce the degree of job pressure triggered by JDs. In other words, JRs could moderate the indirect relationship between JDs and job satisfaction. When JRs are sufficient, the negative impact of JDs on job satisfaction may be small; on the contrary, when JRs are scarce, the above negative impact may increase. Therefore, we propose the fourth hypothesis:

H4: JRs can reduce the negative impact of JDs on teachers' job satisfaction.

Combining the buffering hypothesis and response hypothesis together, we can further infer that the optimal combination of JDs and JRs might be "high JDs-high JRs". That is, under the school environment with high JDs and high JRs, teachers' self-perceived job satisfaction may be the highest. Therefore, we propose the fifth hypothesis:

H5: Under the school environment with the combination of "high JDs-high JRs", teachers will perceive the highest level of job satisfaction.

3 Data and Variables

3.1 Data

The analytic sample of this study included 3,976 teachers from 198 schools in Shanghai who participated in the investigation of TALIS 2018. TALIS 2018 investigated indicators covering teachers' job satisfaction, job pressure, various job characteristics and personal characteristics, which provides excellent data support for revealing the influencing factors of teachers' job satisfaction under the JD-R framework.

3.2 Variables

(1) Job satisfaction (JSs)

The TALIS 2018 categorizes teachers' job satisfaction into three dimensions, i.e., career satisfaction, school environment satisfaction and salary satisfaction. The career satisfaction dimension includes five items (e.g., *"The advantages of being a teacher clearly outweigh the disadvantages"*); the school environment satisfaction dimension includes two items (e.g., *"I enjoy working at this school"*); and the salary satisfaction dimension includes two items (e.g., *"I am satisfied with the salary I receive for my work"*). All the items choose answers ranging from 1 to 4, indicating "strongly disagree", "disagree", "agree", and "strongly agree". The internal consistency of the three satisfaction dimensions is relatively good (their Cronbach's alpha coefficients are 0.750, 0.758 and 0.770, respectively). In each dimension, we carry out factor analysis for its contained items separately and then extract the value for the first common factor to generate the corresponding comprehensive satisfaction indicators, i.e., *career satisfaction, school environment satisfaction and salary satisfaction.*

(2) Job demands (JDs)

Working time is a typical indicator for JDs in previous research (Schaufeli & Taris, 2014). Referring to the idea of using working hours to measure JDs in existing literature (Pereira & Coelho, 2013; Skaalvik & Skaalvik, 2018; Yeh, 2015), this study uses *working hours* (hours per week) to measure teachers' JDs. The longer the working hours are, the higher the JDs that teachers face.

(3) Job resources (JRs)

In the existing literature (Bakker & Demerouti, 2007; Skaalvik & Skaalvik, 2018; Yin et al., 2018), JRs are mainly divided into three categories: task resources with a connotation of work autonomy, organizational resources with a connotation of career development, and social resources with a connotation of supportive interaction with colleagues.

Hence, this study measures JRs by four indicators in accordance with the aforementioned categories: (a) Task resources are measured by an indicator of *work autonomy*, which is investigated by means of a five-item question: whether teachers have autonomy in five types of teaching activities (e.g., "determining teaching content"). Responses are given on a 4-point scale from "strongly disagree" (1) to "strongly agree" (4), and the α coefficient is 0.922. (b) Social resources are measured by an indicator of *supportive colleagues*, which is investigated by means of an eight-item question: how is the participation frequency of teachers in eight types of teaching exchange activities (e.g., "teaming with teachers in the same class")? Responses are given on a 4-point scale from "no" (1) to "once a week or more" (4), and the α coefficient is 0.851. (c) Organizational resources are measured by two indicators of *supervisory support* and *performance feedback*. *Supervisory support* is investigated by means of an eight-item question: whether leaders give teachers support for participating in professional development activities in eight aspects (e.g., "reducing teaching tasks"). *Performance feedback* is investigated by means of a five-item question: whether performance feedback from school administration has positive effects on five types of teaching ability (e.g., "understanding of specialized knowledge"). All the thirteen items above should choose between 0 and 1, indicating "no" or "yes".

To obtain the eventually used variable, we carried out the following data processing processes. For the variables of *supervisory support* and *performance feedback*, we carried out factor analysis for its contained items and extracted the value for the first common factor to generate the corresponding indicators separately. For the variables of *work autonomy* and *supportive colleagues,* we generated two comprehensive indicators using item response theory (IRT) technology on its containing items. The larger the value of each variable is, the higher the level of teachers' possession of corresponding JRs is.

(4) Job pressure

Job pressure is measured with a seven-item question: how the pressure that teachers perceive in seven types of teaching activities (e.g., "time for lesson preparation")? Responses are given on a 4-point scale from "completely no pressure" (1) to "very high pressure" (4), and the α coefficient is 0.785. Factor analysis is used to obtain the first common factor to estimate the *job pressure* indicator, and the larger the value is, the higher the job pressure is.

(5) Control variables

To generate more effective results, the following control variables are introduced: *gender* (1 = female, 0 = male), *age group* (1 ≤ 30 years old, 2 = 30–39 years old, 4 = 40–49 years old, 4 ≥ 50 years old), *education level* (1 = master's degree, 0 = bachelor's degree or below), and *school location* (1 = rural area, 0 = urban area). In addition, to exclude interference from unmeasurable school factors, a school-level fixed effect term would be introduced in all models.

4 Empirical Study Results

4.1 Descriptive Statistical Analysis

The correlation coefficients between the study variables are shown in Table 1. The results show that *working hours* of JDs is negatively correlated with each indicator of job satisfaction (ranging from $r = -0.005$ to $r = -0.041$) and especially significantly correlated with *salary satisfaction.* All four measures of JRs correlated positively with each measure of job satisfaction (ranging from $r = 0.087$ to $r = 0.238$). The correlation between the JDs indicator and *job pressure* is significantly positive ($r = 0.142$), and *job pressure* is almost significantly negatively correlated with all the job satisfaction indicators. These descriptive results preliminarily support the relevant hypotheses of this study.

Furthermore, Table 2 provides the distribution of JSs, JDs, JRs and job pressure among individuals with different characteristics. The results show that male teachers have significantly lower levels of *career satisfaction* and *working hours* than female teachers but receive significantly more *supervisory support*. Compared to teachers with a higher education level (master's degree), teachers with lower educational level (bachelor's degree or below) show a significantly lower level of satisfaction in career and school environments; meanwhile, the latter group of teachers face significantly lower JDs and receive a significantly lower level for all aspects of JRs except for *work autonomy*. Compared with urban teachers, rural teachers face significantly lower JDs and obtain significantly fewer JRs, including *work autonomy* and *supportive colleagues*. Last, with the increase of age, teachers' JDs, JRs and JSs would all decrease significantly.

Table 1 Correlations among the study variables (N = 3 976)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) JDs - *working hours*	1.000								
(2) JRs - *work autonomy*	0.092***	1.000							
(3) JRs - *supervisory support*	−0.029***	0.031***	1.000						
(4) JRs - *performance feedback*	0.039***	0.083***	0.198***	1.000					
(5) JRs - *supportive colleagues*	0.182***	0.236***	0.183***	0.285***	1.000				
(6) *job pressure*	0.142***	−0.001	−0.144***	−0.113***	0.009	1.000			
(7) JSs - *career satisfaction*	−0.005	0.192***	0.192***	0.237***	0.200***	−0.283***	1.000		
(8) JSs - *school environment satisfaction*	−0.014	0.190***	0.222***	0.261***	0.238***	−0.284***	0.624***	1.000	
(9) JSs - *salary satisfaction*	−0.041***	0.087***	0.213***	0.204***	0.142***	−0.359***	0.499***	0.474***	1.000

Note ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

Table 2 Description of the distribution of job satisfaction, job demands, job resources and job pressure

	Total sample	Gender			Educational degree			Region			Age				F-value
		Male (N = 2 941)	Female (N = 1 035)	Difference (male – female)	Bachelor degree or below (N = 3448)	Graduate degree (N = 515)	Difference (bachelor-graduate)	Rural (N = 489)	Urban (N = 3 467)	Difference (rural -urban)	30-year-old and below (N = 653)	30 ~ 40 (N = 1316)	40 ~ 50 (N = 1418)	Above 50 year-old (N = 588)	
Job satisfaction (JSs) *career satisfaction*	63.28	62.272	63.643	−1.371**	62.885	66.157	−3.272***	63.283	63.212	0.071	67.43	64.04	61.89	60.31	18.984**
school environment satisfaction	60.83	61.565	60.576	0.988	60.632	62.243	−1.611*	60.330	60.866	−0.537	63.40	61.59	59.56	59.34	7.056**
salary satisfaction	46.97	47.305	46.851	0.453	46.790	48.327	−1.537	47.325	46.890	0.435	51.80	46.29	44.98	47.88	15.541***
Job demands (JDs) *working hours*	45.34	43.380	46.036	−2.656***	44.721	49.536	−4.815***	43.290	45.554	−2.263***	47.54	47.09	44.51	41.01	30.819***
Job resources (JRs) *work autonomy*	80.16	78.493	80.726	−2.232***	80.040	81.085	−1.045	78.590	80.387	−1.797**	80.83	82.53	79.38	75.32	20.949*
supervisory support	24.43	28.511	22.998	5.513***	23.297	31.745	−8.448***	23.373	24.485	−1.112	32.91	26.08	20.89	19.61	39.091***

(continued)

Table 2 (continued)

		Gender				Educational degree			Region			Age				F-value
	Total sample	Male (N = 2 941)	Female (N = 1 035)	Difference (male – female)	Bachelor degree or below (N = 3448)	Graduate degree (N = 515)	Difference (bachelor – graduate)	Rural (N = 489)	Urban (N = 3 467)	Difference (rural -urban)	30-year-old and below (N = 653)	30 ~ 40 (N = 1316)	40 ~ 50 (N = 1418)	Above 50 year-old (N = 588)	
performance feedback	72.38	73.483	71.997	1.486	71.674	77.158	−5.484***	73.272	72.180	1.092	77.92	72.77	70.74	69.06	8.035***
supportive colleagues	58.24	56.492	58.846	−2.354***	57.867	60.471	−2.604***	55.608	58.549	−2.941***	61.26	59.23	57.51	54.34	14.607***
Job pressure *job pressure*	36.86	37.332	36.692	0.640	36.757	37.364	−0.607	36.879	36.863	0.016	34.40	36.79	36.99	37.13	3.776

Note ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$, according to T test or one factor analysis of variance

4.2 Test for the Depletion Path that Job Demands Negatively Predict Job Satisfaction

First, models 1, 2, and 3 in Table 3 successively present the estimation results for the impact of JDs on *career satisfaction, school environment satisfaction* and *salary satisfaction,* respectively. The results show that the coefficient of *working time* is significantly negative, indicating that with the increase in JDs, teachers' self-perceived job satisfaction decreases. Therefore, Hypothesis 1, i.e., the depletion path that JDs can negatively predict teachers' job satisfaction, is supported.

Next, to test the second hypothesis that job pressure plays a mediating role in the negative impact of JDs on teachers' job satisfaction, this study carried out mediation analysis based on the steps recommended by Baron and Kenny (1986). In the first step, we demonstrated significant negative effects of JDs on all three aspects of job satisfaction by models 1, 2, and 3 in Table 3, which contain both the direct impact and the indirect impact through job pressure together. In the second step, we demonstrated that JDs significantly and positively predict job pressure by model 4. In the third step, we excluded the indirect impact of JDs on job satisfaction though job pressure in model 5, 6, and 7 and found that neither of the coefficients of JDs is significant for any dimension of job satisfaction, but the coefficients of job pressure are still significantly negative for each dimension of job satisfaction. These results indicate that job pressure plays a complete mediating role in the depletion path of JDs affecting job satisfaction. In other words, JDs could indirectly affect job satisfaction through their triggering effect on job pressure.

To better ensure the validity of the results, we used the bootstrap method to carry out robust analysis (Wen & Ye, 2014). As shown in Table 4, the results of the bootstrap method show that the path coefficients of the indirect effects of job pressure on career satisfaction, school environment satisfaction, and salary satisfaction are all negative, and their 95% confidence intervals (CI) of the mediating effects calculated by the bootstrap method do not include 0. Therefore, Hypothesis 2 is supported robustly, which means that job pressure is indeed a complete mediator that links JDS to job satisfaction.

Meanwhile, the estimation results for control variables in Table 3 show that, for older teachers, job satisfaction is significantly lower and job pressure is significantly higher than those of teachers under 30; for teachers with a master's degree, self-perceived career satisfaction is significantly higher than that of teachers with a bachelor's degree or below; for female teachers, self-perceived school environment satisfaction is significantly lower than that of male teachers; and for rural teachers, self-perceived salary satisfaction is significantly higher than that of urban teachers. Limited to the fact that this paper focuses on the analysis of teachers' job satisfaction under the framework of the JD-R model, we do not carry out an in-depth discussion of the above findings. However, the heterogeneity of job satisfaction in individual characteristics is worthy of further exploration in future studies.

Table 3 The impact of job demands on job satisfaction

Dependent variable	Career satisfaction (1)	school environment satisfaction (2)	salary satisfaction (3)	job pressure (4)	career satisfaction (5)	school environment satisfaction (6)	salary satisfaction (7)
Independent variable							
working hours	−0.048**(−2.25)	−0.049**(−2.07)	−0.082***(−3.28)	0.226***(8.81)	−0.000(−0.02)	0.005(0.23)	−0.008(−0.34)
job pressure					−0.230***(−14.71)	−0.249***(−14.53)	−0.343***(−19.43)
30 ~ 40 years old	−2.634***(−2.99)	−1.413(−1.50)	−4.688***(−4.69)	3.506***(3.44)	−1.864**(−2.20)	−0.619(−0.69)	−3.500***(−3.72)
40 ~ 50 years old	−4.700***(−5.13)	−3.426***(−3.48)	−5.028***(−4.82)	3.507***(3.36)	−3.897***(−4.43)	−2.553***(−2.71)	−3.887***(−3.93)
Above 50 years old	−6.211***(−5.46)	−3.775***(−3.06)	−2.724**(−2.17)	4.136***(3.24)	−5.218***(−4.69)	−2.859**(−2.37)	−1.422(−1.18)
master's degree	1.681*(1.82)	−0.361(−0.36)	0.696(0.66)	0.710(0.66)	1.905***(2.15)	−0.128(−0.13)	1.198(1.20)
Female	0.938(1.33)	−1.292*(−1.69)	0.350(0.43)	−1.467*(−1.87)	0.557(0.82)	−1.685**(−2.27)	−0.298(−0.39)
Rural	−1.352(−0.34)	−5.773(−0.97)	12.829*(1.93)	−3.061(−0.56)	−2.196(−0.50)	−6.716(−1.14)	11.542*(1.86)
Constant term	71.035***(11.45)	75.794***(8.91)	33.338***(3.43)	29.965***(3.55)	78.182***(11.63)	83.518***(9.39)	43.825***(4.72)
School level fixed effect term	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3891	3890	3898	3895	3866	3865	3867
Adjust $R2$	0.07	0.08	0.09	0.07	0.14	0.14	0.20

Note ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; Control variables are introduced in the form of dummy variables, which means, the 30-year-old and below group is used as control group for age variable, the bachelor-and-below group is used as control group for educational degree variable, the male group is used as control group for gender variable, and the urban group is used as control group for region variable

Table 4 Mediation analysis using the bootstrap method for "job demands → job pressure → job satisfaction"

	Z-value	P-value	95% confidence interval
job pressure → career satisfaction	−16.03	0.000**	[−0.277, −0.217]
job pressure → school environment satisfaction	−17.23	0.000***	[−0.301, −0.20]
job pressure → salary satisfaction	−20.20	0.000***	[−0.400, −0.330]

Note ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$; All the control variables and fixed effect terms are the same as those shown in the table 3

4.3 Test for the Gain Path that JRs Positively Predict Job Satisfaction

This study measures teachers' JRs by four indicators, i.e., work autonomy, supervisory support, performance feedback, and supportive colleagues. Models 1, 2, and 3 in Table 5 successively present the estimation results for the impact of JRs on three job satisfaction dimensions, i.e., *career satisfaction, school environment satisfaction* and *salary satisfaction.* The results show that the coefficients of all JRs variables are significantly positive, indicating that the increase in JRs may indeed play a role in promoting teachers' perception of job satisfaction by triggering a motivation process. Therefore, Hypothesis 3, namely, that JRs positively predict teachers' job satisfaction, is supported.

4.4 Test for the Mitigating Effects of JRs in the Process of JDs Affecting Job Satisfaction

This study will test Hypothesis 4 by constructing Eqs. (1)–(3) recommended by Edwards and Lambert (2007). That is, to prove that in the group with high-level JRs, the indirect effect of JDs on teachers' job satisfaction (through a trigger of job pressure) is relatively small, while in the group with low-level JRs, such an indirect effect is relatively large. The specific test equations are as follows:

$$M = \alpha_0 + \alpha_1 X + \alpha_2 W + \alpha_3 X \times W \tag{1}$$

$$Y = \beta_0 + \beta_1 M + \beta_2 X + \beta_3 W + \beta_4 X \times W \tag{2}$$

In Eq. (1) and Eq. (2), X is the independent variable (i.e., JDs), M is the mediating variable (i.e., job pressure), W is the moderating variable (i.e., JRs), and Y is the dependent variable (i.e., job satisfaction). By substituting Eq. (1) into Eq. (2), we could get Eq. (3):

Table 5 The impact of job resources on job satisfaction

Dependent variable Independent variable	career satisfaction (1)	school environment satisfaction (2)	salary satisfaction (3)
work autonomy	0.151***	0.172***	0.080***
	(7.05)	(7.58)	(3.32)
supervisory support	0.093***	0.108***	0.124***
	(7.06)	(7.34)	(7.97)
performance feedback	0.087***	0.105***	0.094***
	(8.26)	(9.21)	(7.67)
supportive colleagues	0.073***	0.111***	0.047**
	(3.87)	(5.44)	(2.12)
Control variables	Yes	Yes	Yes
Constant term	Yes	Yes	Yes
School level fixed effect term	Yes	Yes	Yes
N	3019	3020	3023
Adjust R^2	0.16	0.19	0.16

Note The same as in table 3

$$
Y = (\beta_0 + \alpha_0\beta_1) + [\beta_2 + \beta_1(\alpha_1 + \alpha_3 W)] \times X \\
+ (\beta_3 + \beta_1\alpha_2)W + \beta_4 X \times W \tag{3}
$$

In Eq. (3), the conditional indirect effect size of the mediating effect is $\beta_1(\alpha_1 + \alpha_3 W)$. . We calculate the aforementioned conditional indirect effects when the moderating variable W is at a high level (1 standard deviation (SD) above average value) or a low level (1 SD below average value) respectively, and then calculate the 95% CI for the difference between these two conditional indirect effects. If this 95% CI does not contain 0, it indicates that the moderating mediation effect is supported.

Table 6 provides the testing results for the moderating mediation effect based on the bootstrap method. First, comparing to the group with low work autonomy, the negative mediating effect of JDs on teachers' job satisfaction through job pressure is significantly higher in the group with high work autonomy (the 95% CI for the difference of the indirect effects between the groups does not contain 0). Therefore, Hypothesis 4 is rejected with respect to work autonomy, which is one indicator of the task resources aspect of JRs. Second, comparing to groups with low supervisory support or performance feedback, the negative mediating effect of JDs on teachers' job satisfaction through job pressure is significantly lower in the group with high supervisory support or performance feedback (the 95% CI for the difference of the indirect effects between the two groups does not contain 0). Therefore, Hypothesis 4 is supported with respect to supervisory support and performance feedback, which are two indicators of the organizational aspect of JRs. Finally, comparing to the group

with less supportive colleagues, the indirect mediating effect of JDs on teachers' job satisfaction through job pressure is higher in the group with highly supportive colleagues, but the above difference is not significant when using career satisfaction and environment satisfaction as dependent variables (the 95% CI for the difference of the indirect effect between the groups with high supportive colleagues and low supportive colleagues includes 0). Therefore, Hypothesis 4 is not supported with respect to supportive colleagues, which is one indicator for the social aspect of JRs.

Next, we would intuitively present the moderating effect of JRs on the mediation path of "Job demands $\rightarrow$ job pressure $\rightarrow$ job satisfaction", and carry out tests by comparing slopes directly. Before carrying out intuitive analysis, job demands and job resources are divided into high- and low-levels based on their scores above or below one SD of the mean value in corresponding indicators. After the above categorizing settings are completed, we carried out simple slope tests, and the results are shown in Fig. 1–Fig. 4 intuitively.

Figure 2 and Fig. 3 show that, compared to the low condition of supervisory support or performance feedback, in the high condition of supervisory support or performance feedback, the positive relationship between JDs and job pressure would be mitigated or buffered by these two JR indicators. The results are consistent with the results of previous bootstrap testing. This means that when teachers have a higher level of organizational resources in JRs, the triggering effect of JDs on job pressure will be smaller. In contrast, Fig. 1 and Fig. 4 show that, compared to the low work autonomy or supportive colleagues, in the high condition of work autonomy or supportive colleagues, the positive relationship between JDs and job pressure would even be enhanced by these two JR indicators instead of being mitigated.

In summary, the mitigating role hypothesis (Hypothesis 4) that "JRs can reduce the negative impact of JDs on teachers' job satisfaction" is supported only in organizational resources aspect of JRs, while it is rejected in the task resources aspect of JRs. The results indicate that for school management, providing more support for teachers' professional development activities and more positive feedback to teachers for teaching activities could help to increase the possibility of meeting JDs, which in turn reduces the likelihood that JDs trigger job pressure and reduce job satisfaction. We speculate that the rejection of the buffering hypothesis for work autonomy might be due to the influence of collectivist culture. Chinese people tend to be more collectively centered, which makes individual psychological and emotional perception and behavioral decisions more dependent on organizational norms or other people's requirements. Therefore, compared with teachers who have a low level of autonomy, when JDs increase, those who have a high level of autonomy are more likely to perceive pressure due to uncertainty about others' decisions or the requirements of the organization because they are more collective-centered.

Table 6 Bootstrap test for the moderating mediation effect

		Coefficient for effect size	Standard error	95% CI	
				lower limit value	upper limit value
	low work autonomy	−0.032***	0.012	−0.058	−0.011
	high work autonomy	−0.078***	0.015	−0.108	−0.049
	Group difference (low–high)	0.046**	0.022	0.001	0.089
	low supervisory support	−0.065***	0.011	−0.094	−0.046
	high supervisory support	−0.036***	0.010	−0.054	−0.016
Job demands (X) →	Group difference (low–high)	−0.029*	0.016	−0.007	−0.004
job pressure (M) →	low performance feedback	−0.066**	0.011	−0.085	−0.042
career satisfaction (Y)	high performance feedback	−0.035***	0.009	−0.054	−0.019
	Group difference (low–high)	−0.030**	0.016	−0.053	0.000
	low supportive colleagues	−0.043***	0.009	−0.059	−0.024
	high supportive colleagues	−0.069***	0.011	−0.097	−0.051
	Group difference (low–high)	0.027	0.016	−0.007	0.057
	low work autonomy	−0.037**	0.015	−0.066	−0.008
	high work autonomy	−0.089***	0.016	−0.121	−0.056
	Group difference (low–high)	0.052**	0.026	0.003	0.103

(continued)

Table 6 (continued)

		Coefficient for effect size	Standard error	95% CI	
				lower limit value	upper limit value
	low supervisory support	−0.069***	0.012	−0.097	−0.045
Job demands (X) →	high supervisory support	−0.039***	0.011	−0.064	−0.019
job pressure (M) →	Group difference (low–high)	−0.030*	0.017	−0.067	0.003
school environment	low performance feedback	−0.069***	0.012	−0.097	−0.048
satisfaction (Y)	high performance feedback	−0.036***	0.010	−0.058	−0.020
	Group difference (low–high)	−0.033*	0.018	−0.063	−0.000
	low supportive colleagues	−0.046***	0.011	−0.070	−0.024
	high supportive colleagues	−0.073***	0.013	−0.097	−0.050
	Group difference (low–high)	0.027	0.019	−0.011	0.065
	low work autonomy	−0.048**	0.019	−0.084	−0.003
	high work autonomy	−0.117***	0.021	−0.162	−0.063
	Group difference (low–high)	0.069*	0.038	−0.005	0.140
	low supervisory support	−0.098***	0.015	−0.127	−0.070

Table 6   (continued)

		Coefficient for effect size	Standard error	95% CI	
				lower limit value	upper limit value
Job demands (X) →	high supervisory support	−0.053***	0.014	−0.085	−0.027
job pressure (M) →	Group difference (low–high)	−0.044**	0.024	−0.093	−0.002
salary satisfaction	low performance feedback	−0.093***	0.016	−0.128	−0.067
(Y)	high performance feedback	−0.050***	0.015	−0.081	−0.024
	Group difference (low–high)	−0.043*	0.024	−0.090	0.001
	low supportive colleagues	−0.061***	0.014	−0.084	−0.025
	high supportive colleagues	−0.100***	0.016	−0.136	−0.074
	Group difference (low–high)	0.040*	0.023	0.002	0.091

Note The same as in table 3

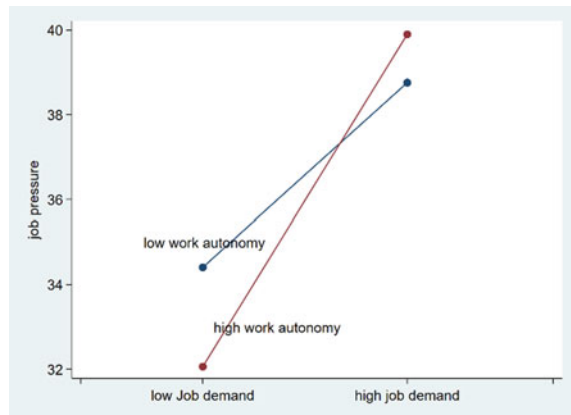**Fig. 1**   Moderating effect of work autonomy on the effect of job demands on job pressure

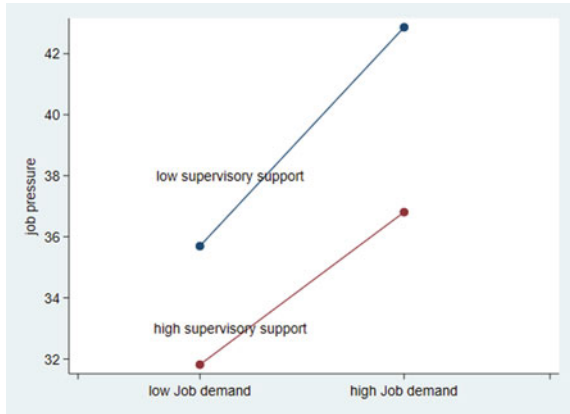**Fig. 2** Moderating effect of supervisory support on the effect of job demands on job pressure

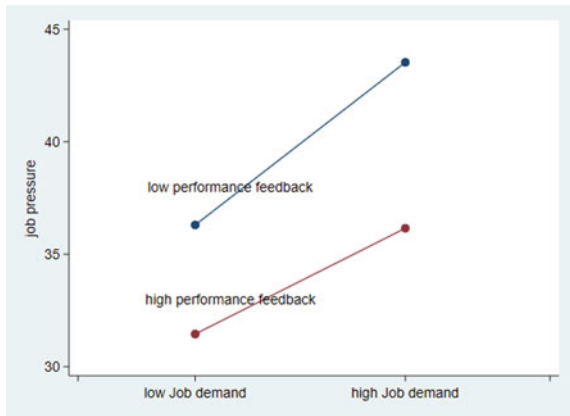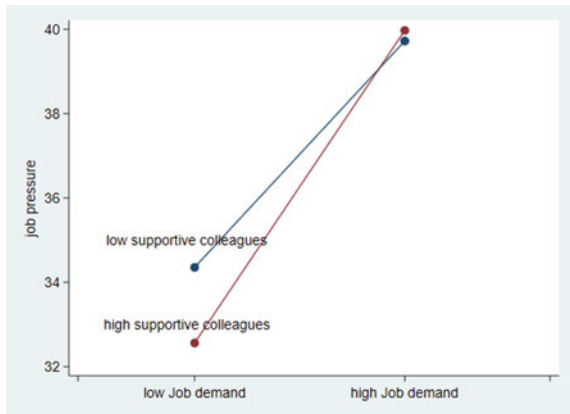**Fig. 3** Moderating effect of performance feedback on the effect of job demands on job pressure

Fig. 4 Moderating effect of supportive colleagues on the effect of job demands on job pressure

4.5 Test for the Response Effect of JDs and JRs Jointly Affecting Teachers' Job Satisfaction

Referring to the existing literature (Bakker et al., 2007; Hakanen et al., 2006), we tested the joint interaction influence of job demands and job resources on teachers' job satisfaction. That is, to test Hypothesis 5: under the school environment with the combination of "high JDs-high JRs", teachers will have the highest level of job satisfaction. We categorized samples into the high- and low- JDs groups correspondently, based on their working hours locating in the upper 25% and lower 25% distribution of working hours. In the same way, we categorized samples into the high- and low-JRs groups correspondently, based on the value of specific JRs indicator locating in the upper 25% and lower 25% distribution of such indicator. Then, we could obtain various combinations of different JDs and JRs, i.e., high JDs-high JRs, low JDs-high JRs, low JDs-low JRs, and high JDs-low JRs. Table 7 shows the value of teachers' job satisfaction under various interaction combinations of JDs and JRs.

The results indicate that, for the two JRs indicators (i.e., supervisory support and performance feedback), for any job satisfaction indicators, two-way ANOVA shows that the job satisfaction is significantly different under various interaction combinations of JDs and JRs; and job satisfaction all shows the following order: high JDs-high JRs > low JDs-high JRs > low JDs-low JRs > high JDs-low JRs. Therefore, Hypothesis 5 is supported in these two JRs indicators, which belong to the organizational resources. That is, for these two JRs indicators, "high JDs-high JRs" is the optimal combination for teachers to perceive job satisfaction, indicating that when JDs are high, teachers may be more motivated to seek and use performance feedback and supervisory support to achieve JDs. This expands the promotion effect of high JRs and naturally enhances the positive influence of JRs on positive emotions, such as job satisfaction.

In contrast, for the remaining two JR indicators (i.e., work autonomy and supportive colleagues), regarding any job satisfaction indicators, job satisfaction shows an entirely different order under various interaction combinations of JDs and JRs: low JDs-high JRs > high JDs-high JRs > low JDs-low JRs > high JDs-low JRs, and the between-group difference is also significant based on two-way ANOVA. Therefore, Hypothesis 5 is not supported with respect to the two JRs indicators, which reflects the influence of collectivist culture on teachers' behavioral decision-making and psychological and emotional perceptions. When teachers face high JDs, increasing work autonomy and supportive colleagues cannot help them achieve JDs. Therefore, the self-perceived job satisfaction of teachers with the "high JRs-high JDs" combination is lower than that of teachers with the "high JRs-low JDs" combination.

Table 7 Job satisfaction under various interaction combinations of JDs and JRs

	Career satisfaction		School environment satisfaction		Salary satisfaction	
High job demand—High work autonomy	66.66		63.87		47.64	
High job demand—Low work autonomy	61.25	F = 50.29	58.62	F = 44.40	43.98	F = 8.73
Low job demand—High work autonomy	68.27	P < 0.01	65.40	P < 0.01	48.87	P < 0.01
Low job demand—Low work autonomy	60.59		57.69		47.02	
High job demand—High supervisory support	67.64		66.54		51.16	
High job demand—Low supervisory support	54.65	F = 76.60	50.93	F = 109.56	37.48	F = 66.89
Low job demand—High supervisory support	65.90	P < 0.01	65.19	P < 0.01	50.30	P < 0.01
Low job demand—Low supervisory support	57.74		53.96		41.37	
High job demand—High performance feedback	69.14		66.89		53.94	
High job demand—Low performance feedback	60.18	F = 47.09	57.65	F = 57.08	40.60	F = 60.66
Low job demand—High performance feedback	67.37	P < 0.01	66.64	P < 0.01	53.91	P < 0.01
Low job demand—Low performance feedback	59.10		56.91		43.68	

Table 7 (continued)

	Career satisfaction		School environment satisfaction		Salary satisfaction	
High job demand—High supportive colleagues	68.69		66.80		50.14	
High job demand—Low supportive colleagues	58.13	F = 53.11	54.00	F = 76.54	38.87	F = 26.84
Low job demand—Low supportive colleagues	69.18	P < 0.01	68.61	P < 0.01	51.96	P < 0.01
Low job demand—High supportive colleagues	59.70		56.30		45.24	

Note The statistical test is a two-way ANOVA, where the dependent variable is the corresponding satisfaction indicator, and the independent variables are group type variables (High vs Low) for JDs and JRs

5   Conclusions and Implications

According to the framework of the JD-R model, this study tries to explore the relationships between school job characteristics and teachers' job satisfaction and its related mechanisms based on the TALIS 2018 survey data of teachers in Shanghai, China.

First, JDs have a negative impact on teachers' self-perceived job satisfaction through the full mediating effect of job pressure, then the depletion path hypothesis in the JD-R model that JDs negatively predict teachers' job satisfaction is supported. This is consistent with findings from other samples of socioeconomic and cultural backgrounds or occupations (Demerouti & Bakker, 2011; Yin et al., 2018). This indicates that excessive JDs may trigger individuals' job pressure, and then reduce teachers' self-perceived job satisfaction.

Second, all four indicators of JRs can significantly improve self-perceived teachers' job satisfaction, and the gain path hypothesis in the JD-R model that JRs positively predict teachers' job satisfaction is supported, indicating that teachers have a strong need for learning, development, and career development. Adequate task resources, organizational resources and social resources can satisfy teachers' basic needs for competence, autonomy and organizational belongingness, motivate individuals to pursue growth and development, and facilitate the perception of more positive emotions, such as job satisfaction (Skaalvik & Skaalvik, 2018; Yeh, 2015).

Third, not all JRs can mitigate the negative impact of JDs on job satisfaction. For teachers, both supervisory support and performance feedback can reduce the possibility of job pressure triggered by JDs and thus play mitigating roles to reduce the negative impact of JDs on job satisfaction. However, work autonomy may increase the possibility of job pressure triggered by JDs and thus increase the negative impact of JDs on teachers' job satisfaction. Therefore, the hypothesis that JRs play as a buffer role in the depletion path where JDs negatively affect job satisfaction it is supported only in the JRs of supervisory support and performance feedback but rejected in work autonomy. The aforementioned result are consistent with the findings obtained from other occupations in China (Li et al., 2015). Li (2015) also found that for many different JRs, only supervisory support can act as a buffer in the depletion path of JDs. This shows that under the profound influence of collectivist culture and Confucianism, Chinese people's behavioral decisions and psychological emotions are more dependent on organizational norms and regulations (Ye, 2004). With the increase in JDs, support and feedback from leaders or managers are critical for relieving individuals' pressure and helping individuals recover physically and mentally from high JDs (Lu, et al., 2006). However, teachers who work in organizations with high levels of autonomy are also more likely to experience pressure due to uncertainty about organizational demands and others' choices.

Finally, in terms of the various interaction combinations of JDs and JRs categorized by their value, for the two JRs indicators of supervisory support and performance feedback, teachers in the work environment of "high JRs-high JDs" perceive the highest job satisfaction. In contrast, for the remaining two JRs indicators of work autonomy and supportive colleagues, teachers in the work environment of "high JRs-low JDs" perceive the highest job satisfaction, while job satisfaction perceived by those in the "high JRs-high JDs" work environment is comparably lower. However, regardless of any JRs indicators, teachers in the "low JRs-high JDs" work environment experience the lowest job satisfaction. Therefore, the response hypothesis of JD-R model that JDs could urge individuals to make full use of JRs to achieve JDs supported only for the two organizational job resources indicators (i.e., supervisory support and performance feedback). Nevertheless, the findings suggest that in school management practices, low JDs are necessarily a "bad thing". In fact, low JDs are likely to promote individuals' indolence and cause individuals to be nonproductive and feel less purpose in their work. However, with the increase in JDs, organizations need to increase JRs accordingly, which will help individuals to change from passive external motivation to active internal motivation to meet JDs, and make individuals less likely to perceive pressure in the process of completing tasks and, ultimately, have a higher level of job satisfaction.

Based on these results, this study has the following practical implications.

First, currently, the JDs faced by teachers are generally high (the average weekly working time of the sample teachers > 45 h per week). After achieving a reasonable distribution of working time, it is necessary for school administrators to appropriately reduce the ineffective work and working hours of teachers to avoid the possible loss in teachers' job satisfaction caused by excessive JDs. As noted in the existing literature, school administrators should reduce the "exhausting" and "low impact" working

hours that are not closely related to the actual work while ensure "breakthrough" and "supplementary" working hours.

Second, school administrators should provide teachers with more adequate and high levels of JRs, which can satisfy individuals' development needs and enhance teachers' job satisfaction. In particular, school administrators should pay more attention to providing more support for teachers' professional development and more positive and effective feedback regarding teachers' teaching activities, because this can help teachers cope with JDs and buffer the job pressure triggered by JDs, thus indirectly improving teachers' job satisfaction.

Third, school administrators should note that low JDs do not necessarily lead to high teachers' job satisfaction. Appropriate JDs are very important, and achieving the optimal combination of JDs and JRs through optimization is also important for teachers' job satisfaction. Increased JDs must be accompanied by increased JRs. In a high JDs work environment, when school administrators can provide sufficient JRs, high JDs can stimulate the internal work motivation of individuals and make individuals seek and use JRs to achieve self-actualization. In a high JDs-low JRs school environment, where only the JDs increase and adequate JRs are not provided, teachers' job satisfaction will be the lowest.

There are still some limitations in this study, which need to be further explored. First, because the TALIS 2018 data only include samples from Shanghai, China, and Shanghai is one of the regions with the highest level of economic, social and educational development in China, the external validity of the conclusions of this study is limited to a certain extent; further investigations in different regions of China should be carried out in the future to verify the relevant conclusions of this study. Second, in this paper, measurement indicators are determined after comprehensively considering the rationality of the indicators and data availability; however, inevitably, due to the rich conceptual connotation of the related variables, the comprehensiveness of the measurement indicators may be limited. For example, working time is a typical measurement indicator for JDs and is also used by many scholars. Therefore, the use of working hours in this paper to measure JDs has inherent rationality, but it is still not a comprehensive measure of the JDs of teachers because there may be internal heterogeneity among different types of JDs, such as breakthrough JDs, supplement JDs and exhaustion JDs, and the heterogeneity of their influences is worth dialectical analysis. Additionally, JDs are reflected not only in working hours but also in teachers' perception of JDs; therefore, it is necessary to use other tools, such as scales, for the measurement of JDs. Another example is that TALIS classifies teachers' satisfaction into three dimensions to maximally cover the conceptual connotation of teachers' job satisfaction. However, the need to focus on multiple dimensions and ensure the survey's execution may also limit the comprehensiveness of the tools for the measurement of job satisfaction. Therefore, more comprehensive, reliable, sophisticated, analysis-friendly assessment tools based on TALIS should be developed to conduct solid research in future studies. Third, because the impact of JDs and JRs on teachers' job satisfaction may lag, cross-sectional data are used in this paper, which may limit the inference of causality between the variables to a certain extent. Fourth, the descriptive analysis of data and the model estimation show that the

heterogeneities in satisfaction and their relationships with respect to the individual variable of age are very interesting; an investigation of these heterogeneities would be helpful to accurately improve teachers' satisfaction. Considering the focus and length of this paper, the above heterogeneities are not discussed, but they are worthy of an in-depth investigation in the future.

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Why and How Can the Place-Based Education Leadership of Rural Principals Be Improved?

Zhihui Wu and Pei Zhang

Abstract In the background of urbanization in education, rural education is increasingly divorced from rural children's experience, local environment, and community culture. The connection between classrooms and the rural community is also broken. Place-based education serves as a feasible approach for promoting the modernization of rural education. Rural principals play an important role in this process by advancing the modernization of rural education, developing "earth-centric" leadership, and improving students' local-cultural identity in the global society. To improve leadership in place-based education, rural principals need to build philosophical beliefs in place-based education, to help teaching staff and community members accept the idea of place-based education, to create new methods of conducting place-based education in rural schools, and to develop rural students' key competencies and emotional support for place-based education.

Keywords Rural education · Rural principal · Place-based education · Leadership

In China, the progress of urbanization is promoted rapidly, and a considerable amount of the population living in rural areas has moved to the central town of counties. The number of rural students and schools in compulsory education has decreased tremendously. In detail, some rural schools were shut down or consolidated with other schools owing to the decrease in the number of school-age students. Accordingly, the traditional structure (including the allocation and size) of rural schools has been changed, and several new types of rural schools have been established, i.e., county-town schools with oversize classes, boarding schools in villages, and small-scale schools in the countryside. The change in the structure of rural schools has been adapted to the new distribution of school-age students and solved some old problems,

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such as the low-quality education in rural schools and the lack of teachers and basic education resources.

Stated another way, compared to studying in old rural schools, rural students can now study in a well-equipped school where there is a sufficient number of teachers providing enough national-standard courses and the teaching mode is standardized and normalized. It seems that rural students obtain a better education, but the teaching content in county-town schools is far from rural life, namely, rural children's life experience, local environment, and rural community culture.

In contrast to county-town schools, small-scale schools in the countryside are closer to the nature due to their location,[1] which means that they can provide more place-based education related to the local environment. Nevertheless, rural principals of small-scale schools still tend to ignore their difference from county-town schools and do not notice many features of education in the local context. The education provided by those small-scale schools lacks the connection to the community and environment, so students cannot be attracted by courses given by teachers, and they are still educated traditionally. The lack of modernized, personalized, and generalized education prevents students' development.

The current situation mentioned above introduces many new questions for rural education in China: how can rural education in China be modernized? Should rural education be reformed based on the experience and characteristics of urban education? Should the development of rural education completely rely on high technologies? Should rural education be developed in a localized way? Many rural principals are lost to answer these questions. From the point of the author's view, rural education can be modernized in many ways, and place-based education may be a good option. Generally, rural schools play an important role in rural children's future life, and rural principals, leaders of rural schools, can be the key person in the development of rural education (Yun, 2020). Helping rural principals to improve their abilities has been called for a long time, and leadership in place-based education has been highlighted as well.

The following is organized into three parts. The first part introduces the basic theory about place-based education, including its history and the conceptual discussion related to it. The second part is about the reason why the leadership of rural principals in place-based education should be improved. The value of place-based education is mainly concentrated. The final part discusses the possible practical methods.

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[1] In China, most small-scale schools are in the small natural villages or even mountain areas that are highly undeveloped and far from towns. Those play an important role in the primary education (specifically the low-grade primary education, such as Grade 1 to 3 or 4) of rural children. Otherwise, rural children may not obtain education due to the poor transport condition and high traveling expenses.

1   What Is Place-Based Education?

The theory of place-based education can be traced from humans' initial education activities associated with the local environment and daily living experience. The initial education activity was organized by people full of localized living experience. Students can study basic living skills and knowledge about the relationship between nature and humans within the community. Thus, to some degree, primal education was a kind of activity that unified the time, place, and event. With the development of human society, production tools have been applied in a broad range of fields, freeing people from heavy farming or hunting work and giving them much spare time. This provided the ground for the advent of schools. In other words, the initial education activity evolved into a formal school-education activity, which also suggested that the education activity started to become a kind of specialized activity separate from human society and daily life.

The specialization of education activity has intensified since the industrial revolution. The school has been a solely knowledge island whose aim is to provide students with educational services related to their self-interests, such as offering exercises for pursuing higher education or training for employment. Specialized education breaks off the tie between human and local contexts. In the initial education, the whole knowledge taught to students was highly related to the local context and students' daily life, and students could feel and use knowledge directly. However, it cannot happen when education specializes in general social activity, especially with the coming of the globalized and high-tech era. Globalization and high techniques lead education to a direction far from people's daily life, which is negative for human development. Thus, how to associate education with the local context becomes a key question in place-based education.

1.1   The Theoretical Basis of Place-Based Education

Although place-based education was formally proposed by researchers from Western countries at the end of the twentieth century, its origin can be traced from research work in the eighteenth century. The idea about naturalistic education proposed by Rousseau (1996), for example, supports that education not only refers to teaching knowledge but also means the development of the child's natural powers and abilities. He argued that "we do not understand children, have a wrong understanding of them to some degree, and regard them as adults sometimes. Children should be like children rather than adults" (Rousseau, 1996). He also held a point that following the orders and properties of nature should be the first principle in education, which was accepted by most workers in education. However, Rousseau's opinion on the educational value of children's surroundings is also ignored by educational practitioners. Rousseau further explained that "all necessities for children's growing are provided by education that is based on nature, human, and human activities" (Rousseau, 1996).

In his mind, modern education incorporates three parts, i.e., talents and physiological basis, human teaching activities that teach people how to use their talents, and local contexts affecting the accumulation of human experience. Among the three components, the local context highlights place-based effects and relevant societal (i.e., community) effects on children (Rousseau, 1996).

Another theory associated with place-based education is modern education theory, developed by Dewey (1994), based on Rousseau's philosophical thinking about natural growth. Dewey proposed that education is growing, and he found the educational value of daily life and society for children's growth based on human teaching activity and local context. He criticized problems caused by the separation between traditional school education, society, and daily life. He commented that "From the point of children's view, the tremendous waste of school education is because children there cannot entirely and freely use their living experience acquired outside of schools. In addition, in children's daily lives, it is difficult for them to directly use the knowledge and experience accumulated from teaching activities in school. This indicates the separation between school education and students' daily life. As stated in a more detailed way, when children enter the classroom and start to study in schools, they have to put their beliefs, interests, and activities aside. Schools need to make great efforts to motivate children to study by various methods since school education is far from children's daily living experience" (Dewey, 1994).

To solve the problem related to the separation between school education and society or students' daily living experience, Dewey and his daughter advised that "the tie between schools and the local context should be reinforced. Employees for school education everywhere should know that the method for making school education attractive and energetic is to establish the relationship between school education and developmental interests of local communities or the job market…. The strong link between schools and the local context can enrich educational activities, improve students' study motivation, and increase the number of social services" (Dewey, 1994).

In Dewey's theory, daily life, living experience, and society are key concepts, and other concepts of local context, such as local community and natural environment, are usually applied in a nonconscious way. Dewey did not accentuate the role of local context in a formal way, which was different from Rousseau's idea providing the basis for Dewey's thinking. This may be related to the background of Dewey's life. Dewey lived in a socially transformed period in which America was going to an industrial society from an agricultural society. In the context of progressivism, the goal of schools was designed to educate students to promote democratic, industrial, and scientific development in society. To fulfill this goal, schools were required to be updated by following the changes in society and to focus on the dissemination of practical knowledge or skills about daily life and work, such as gardening, cooking, woodworking, dressmaking, and so forth. Then, in the late 1960s, fast industrial and economic development caused the huge consumption of natural resources, the promotion of urbanization, and the consolidation between rural schools in terms of education. These substantive changes brought about the crisis of the natural environment,

rural communities, and rural education, which attracted researchers to concentrate on the concepts of "place" or "local context" again.

Theobald (1997) defined the concept of "place" as "public space". Further speaking, he thought that the place referred to space with a strong border and intensely internal-relied network. Under this definition, he expected that schools could reunite and recover the social network in local communities that was broken by the crisis mentioned before. Bowers (2006) also agreed with Theobald's definition of "place" and the role of schools in terms of community development, and he extended the definition by including the natural environment related to all aspects that were not monetized and privatized.

After reviewing the discussion about "place", to summarize, we find that the concept of "place" contains the contents of children's growth, daily life, and community development, as discussed by Rousseau and Dewey. Additionally, it is associated with the natural environment, which can extend the discussion of school-education value in a broad view, i.e., the role of education on the development of the earth. Generally, the goal of education is to provide students with basic tools to help them lead a happy life in their living place, which indicates that education activities are for general human development. It is not only for making the job choice between being farmers or workers in factories. This is because the quality of people's lives is affected not only by how much money people can make but also by the social relationship between people and the relationship between humans and the environment (Haas & Nachtigal, 1998). It can be concluded that the primal discussion about place-based education rediscovers the educational value of localities and emphases the integral role relationship between children's daily life, society, and natural environment in modernized education, where students can conduct a deep study related to their lives and have a general social and environmental consciousness.

1.2 The Definition of Place-Based Education

Sobel (2004) defined the concept of place-based education early and explained that "place-based education is based on local communities and the natural environment. It is regarded as the teaching process related to the content in terms of language, mathematics, social science, science, and other courses and emphasizes that students need to do the practice by themselves in the real world. Its advantages include the improvement of students' academic performance, reinforcing the relationship between students and their communities, developing students' appreciation of the natural environment, which can help students become more positive and charitable citizens".

To explain the definition of place-based education, Smith and Sobel (2010) provided some details about the practice. After the 1995s, the common trust fund of rural schools and communities in America started to provide funds for rural schools to promote place-based education. Some specific measures can be introduced. For instance, place-based education encourages students to study the knowledge about

history, culture, economy, literature, and art linked to local communities. The local community offers learning circumstances, and students can do some practice related to the needs of the communities. The members of communities can cooperate with schools and provide practical opportunities for students. To some extent, study related to the local context can not only be good for students' academic participation, i.e., promoting them to combine knowledge with the real world, but also be good for the preparation of citizens, such as helping them know how to respect local communities and relevant living styles.

Additionally, compared to rural education, urban education has accumulated some meaningful experience of place-based education in China. Besides the advantages of abundant and high-quality education resources in cities, education in cities has a strong tie with cities that give more practical opportunities for school education than education in rural areas. From a historical view, rural education has the tradition of imitating urban education and ignoring the educational value of rural communities. Currently, rural education is divorced from rural life, rural communities, and rural environments in China, which may have negative effects on its development.

Rural education requires the link to the local context since the local culture, history, and environment shape residents' identities. When the relationship between schools (or courses) and localities (or communities) is established, all local circumstances can become the connection between humanity courses and science courses in schools, i.e., the connection between science knowledge represented by school courses and the daily life knowledge represented by children's living experience. These connections provide the basis for the communication between humans and the natural environment that can even be extended from localities to the earth. When the study is related to the local circumstances, lectures in the classroom may be more attractive, and children can lead to a more brilliant and wonderful study life.

Overall, place-based education can be defined as an educational process whose aim is to establish the social relationship within humans and the relationship between humans and the natural environment and to lead students to harmony and happy life and is based on students' lives (i.e., all components in students' lives, such as politics, economy, society, culture, and natural environment). This kind of educational process tries to explore the connection between teaching content and the local context (including local-educational resources, children's living experience, and local communities). In addition, place-based education can modernize education by allowing students to link their studies to real life and to engage in innovation based on needs from their life.

Following the definition of place-based education, another topic, how to understand place-based education within rural education, would come. Namely, the definition of place-based education in rural areas can be discussed further. Place-based education in rural areas can be seen as a special case under the general application of place-based education. Thus, the characteristics of rural areas should be highlighted, including rural students' lives, rural communities, and rural environments, which can be connected in rural education. More details about place-based education in rural areas are presented below.

First, rural students' daily life should be considered. Rural areas can be seen as the natural and social space that incorporates many special components (such as agriculture, natural environment, community, and history), which is different from cities. This may indicate that rural education can work on its features associated with some unique education contents. By tradition, in China, rural education is more likely to fulfill the school's general education targets instead of students' specific needs, which may bring about the ignorance of the role of students' life in education. There are some special and local problems in villages that can be solved in various ways based on the ideas from residents, and the interaction between special problems and local strategies can offer study opportunities to students.

Second, place-based education in rural areas needs to develop students' modernity. Modernity is explained differently in Chinese culture than in Western culture. Chinese culture accentuates the connection between personal development (abilities and beliefs) and social development, which is distinguished from the sole highlight of personal development under individualism in Western culture. Specifically, school education in China not only works on students' academic performance and career development but also works on the development of students' responsibility for society, country, earth, and humans. In place-based education, students are trained in tandems of moral education, academic education, physical education, art education, and labor education, and their knowledge about exploration, cooperation, innovation, responsibility, and self-identity can be developed. To some extent, place-based education in rural areas fulfills several goals at the same time, including students' personal development, the protection of the natural environment, and the reform of communities. Students may become positive and responsible citizens and environmental managers and realize the unification of personal and social development.

Third, place-based education in rural areas is related to the reform of teaching methods. Place-based education can be generalized in all subjects (i.e., Chinese, Math, Physics, Morality and Law, and Chemistry) by creating communication between study and localities. Specifically, in the teaching design, teachers need to encourage students to study positively by participating in educational activities and connecting their studies with real life. In addition, teaching design can use rural communities as classrooms, regard students as the center, be organized by projects, and be based on the survey. The application of multidisciplinary knowledge and creative thinking, explanations about the local context, reforms of communities, and concerns about the natural environment can all be accentuated in teaching activities. The change in teaching methods improves the connection between knowledge from books and the local context (including daily life, social reform, and environmental protection). Finally, the school culture can be upgraded, and teachers and students are motivated in education. Students' academic performance can be improved as well.

Based on the discussion about the definition of place-based education in rural areas, it can also be observed that the place where rural schools are located is full of educational value. The combination of rural education and the local context can improve students' growth, motivate teachers' professional development, increase the quality of school education, and even help rural education find a developing path to realize the target of modernization confidently.

Regarding the role of rural principals, rural principals take responsibility for finding the educational value of local resources with residents, motivating teachers and students to use the local resources in the study, and making the teaching and study localized. They are the key person to the change from traditional rural education to modernized rural education. Therefore, their leadership ability is very important, and more specific explanations about the reasons are presented in the next section. The leadership of rural principals in place-based education refers to the ability to guide and motivate teachers, students, and residents to use local education resources to develop students' modern characteristics.

2 Why Should the Leadership of Rural Principals in Place-Based Education Be Improved?

The report of the 19th National Congress of the Communist Party of China introduced that "governments should promote the balanced development of compulsory education in cities and rural areas, especially the development of compulsory education in rural areas…..make great efforts to make sure that every child can enjoy the fair and high-quality education" (Yasong et al., 2017). The difference in education quality between rural and city schools is partly due to the gap in educational philosophy and innovation, and principals as explorers and designers in education have great effects on school reform. Place-based education, as a new option for rural education, can improve the gap, so the improvement of the place-based educational leadership of rural principals is meaningful, which can be explained as follows in a detailed way.

2.1 The Requirement of Promoting the Modernization of Rural Education

In China, traditional rural education may neglect students' exploration and experience of localized knowledge. Rural students only study knowledge based on books, and this kind of knowledge is divorced from space. Giddens (2011) remarked on the relationship between knowledge and space and argued that "During the period before modern society, social space is consistent with the place where people live. For most people, their social space is constrained by the physical living place and relevant activities. When society is modernized, factors without associations with living places are developed, and the disembedding of the social system occurs. In other words, social interaction does not require the living place where people can interact in a face-to-face way". He further explained the concept of disembedding referring to the "lifting out" of social relations from local contexts of interaction and their restructuring across indefinite spans of time–space (Giddens, 2011). Although the knowledge lifted out of the local context contains the general meaning, it cannot

relate to the children's daily experience and local context and became pure-theoretical science knowledge. There is a large amount of localized knowledge that is linked to children's daily life, which is distinguished from theoretical science knowledge. Science knowledge is far from children's lives and causes stiff obstacles for children to understand it. For most Chinese students, the only way to study this pure-theoretical science knowledge is to recite it again and again.

Compared to traditional rural education, place-based education is based on the local context and adopts the teaching method linked to practical questions, social emotion, and STEM (science, technology, engineering, and mathematics). It can increase students' outdoor-studying experience, which can promote the general application of multidisciplinary knowledge and improve the motivation for exploring and learning unknown things. Accordingly, knowledge from books can interact with knowledge from the local context in students' minds. At the same time, students' academic performance can be improved significantly, and students can develop special abilities for their own needs. The evaluation of some projects on place-based education in rural schools in America indicated that place-based education can significantly motivate students to participate in educational activities and improve their academic results. In addition, it also found that place-based education is good for students to know how to take responsibility for humans, communities, and nature and is also positive for the development of teachers' professions and communities and the modernization of rural education.

2.2 The Requirement of the Earth-Centric Leadership

Traditional rural education neglects the development of students' ecological literacy. After the industrial revolution, the requirement of knowledge and workforce for social development was substantively important, which also allowed people to give the role of education much attention. Education can receive people's attention because education can be a bridge between the knowledge (including values) based on nature and the applied skills working on nature. However, many researchers have criticized the educational pattern and its results in the context of the industrial revolution, such as the book "Silent Spring" written by Carson et al. (2002) and the book "The Limits to Growth" written by Meadows et al. (1972), which both accentuate the disaster caused by the terrible relationship between humans and nature ignored by education.

School education after the industrial revolution breaks the connection between children and nature. Since the last century, the boom in high techniques has taken children's lives into virtual space. Children have been far from most natural things, such as mountains, rivers, forests, and lakes. They do not want to observe and explore nature like before and try to keep the distance from natural experience and innovation because nature cannot provide them with internet and electricity for their smart devices (Louv, 2008). Currently, urban schools are in a space full of modern buildings with few natural components, and rural schools are still situated in the natural environment.

People today are more willing to pay attention to education related to reading and mathematics presented in books rather than the education related to the ecological literacy presented in real-life experience. Language and words are full of social meaning. Mastering language and reading skills refers to the process of combining knowledge from books with daily experience from the living place. The local context is the root of all creative writing. Knowledge from books is based on humans' daily living experience, so understanding daily life should precede students' study in schools (Na, 2016). When language and words cannot reflect daily life exactly, they may torture life and lose attractiveness.

Orr (2018) argued that all education can be ecological education. If all lectures in schools do not have ecological consciousness, students may think ecology is not important for history, politics, economics, and sociology. Thus, students may have little knowledge about nature. One of the modern properties of place-based education is ecological literacy, and it requires principals to have earth-centric leadership to connect knowledge with children's living experience. Place-based education provides another way different from city schools for rural principals to modernize rural education. How rural principals understand place-based education and their abilities to conduct it directly decide the future development of rural education.

2.3 The Requirement of Improvement on Students' Local-Cultural Identity in the Global Society

The importance of students' participation in community activities is less focused on traditional rural education, such as taking part in community services and reform. In China, parents and teachers both hold a firm belief that the most important thing for students is to make efforts to study to obtain high test scores, so they do not agree that working in community activities is necessary for students. After the consolidation of rural schools due to urbanization, most schools now in villages and towns are called "central schools", but people do not know the real meaning of the central school. Tao Xingzhi, a renowned Chinese educator and reformer, argued that "There are three reasons why some rural schools are called central schools. First, in China, school life is the center of life in villages. Second, schools can be regarded as the center of social reform. Third, some high-quality rural schools can be used as the training center for teachers" (Xingzhi, 1989). To some degree, school education has a strong tie with community activities, which is also emphasized by Dewey's argument (i.e., study based on practical activities) and Tao Xingzhi's argument (i.e., the unification of teaching, study, and practice).

Connecting to local communities means that school education is related to community reform, environmental affairs, and services for residents and students. Students become positive community members, and knowledge studied from schools can be the power to lead school life, family life, and social life in a positive direction. Thus, schools can positively encourage all residents to educate their children in the

local context. Based on place-based education, when students take part in community affairs, it will be possible for them to find problems about communities, which can give them the motivation to solve problems and improve communities. Community activities can also teach them how to take social responsibility as community members. In contrast, in traditional rural education, without participation in communities, students may prefer to leave the rural community with problems since they are not familiar with rural communities and even hate to stay in rural areas due to local problems. Rural students educated traditionally may desire to move to cities and become residents there, and they may feel hard to be respected and accepted in city communities due to the gap between cities and rural areas.

The community can be seen as the start of residents' social life or the space for their social interaction, which can affect and be connected deeply with the whole life of people living there. Community concern is the basis of students' relationship with their country and parents, which is consequential for students' local cultural identity. Maori in New Zealand uses the phrase "son of the earth" to express their loyalty and emotional ties to the community (Duhn, 2012). If there is no connection between residents and communities, residents may feel lonely and homeless. Keeping the local cultural identity can make students confident when they go to the world and enable them to tolerate other kinds of different cultures since they know who they are and where they come from. Cultural diversity is based on the cultural identity in the place where people live.

To summarize, taking part in communities can improve students' local-cultural identity and their study motivation. Therefore, rural education needs to reinforce its tie to communities (such as nature, culture, industry, daily life, and social activities), which is also positive for promoting the balanced development in rural areas in terms of industries, environment, culture, and governance, proposed by the Chinese government. Based on the community connection, rural children can associate their studies or knowledge with their community life. Specifically, they can feel the existence of life, ecology, culture, democracy, and science in their community, and they can even play some simulated roles to know them further by role education, such as citizens, officers, teachers, journalists, and security guards. Following this kind of practice, the educational idea about the harmonious relationship between humans and nature, the unification between teaching, study, and practice, and the cooperation between families, schools, and society can all be applied.

3 How Can the Leadership of Rural Principals in Place-Based Education Be Improved?

Although place-based education has been administered in many rural schools in China, it is still new for many rural principals. They do not understand place-based education and have no idea about how to conduct it. The leadership of rural principals in place-based education can be improved in several ways. First, rural principals need

to establish their philosophical belief in place-based education. Second, they need to improve the acceptance of place-based education among school employees and community members. Third, they need to innovate practical methods for place-based education in rural schools. Finally, they need to focus on students' academic and social development in place-based education.

3.1 Establishing Rural Principals' Philosophical Belief in Place-Based Education

Philosophical belief can be defined as a kind of idea or attitude related to the understanding of the exact ideology, concept, and theories, which is the unification of understanding, emotion, and will. Belief is the basis of motivation and action. Belief related to education not only means the simple and unique idea of education but also means structured theories about education. With the support of established educational beliefs, rural principals can promote education action firmly and stably. Dewey (1925) explained his belief in education (including the discussion about the basic definition of education, schools, textbooks, teaching method, and the relationship between schools and social progress) in his famous paper "My Pedagogic Creed". Rural principals can also build their beliefs related to place-based education by following the structure of Dewey's belief.

Specifically, rural principals need to hold a belief that study not only exists in books, classrooms, and exams but also happens in some areas outside of schools, such as nature parks and farmland. Best education should be connected to human life, and children can understand knowledge well when they experience or observe knowledge application in real life. Schools are a small part of communities, the nature, or the world, and education can be extended to other areas. The place outside of schools is also full of educational resources. In other words, education should be conducted in schools and areas distinguished from schools. Nature can be used as attractive books, for instance, and plants or animals in nature can be regarded as teaching materials for children's education. In addition, rural principals also need to believe that education should respect children's interests, experience, and abilities. Methods for teaching, learning, and knowledge application can be unified in educational activities. Stated another way, teaching methods should be based on learning methods linked to knowledge application. How to apply knowledge in life gives clues about how to study and teach knowledge. Knowledge should be combined with life rather than be taught only based on books.

Currently, environmental problems cannot be omitted anymore. Students not only need to care about their own life but also need to give more attention to the local environment and even the earth, and they should know how to think about themselves in a big world. The relationship between school reform, social progress, and environmental development refers to the relationship between humans, society, and nature. Based on the understanding of these relationships, rural principals can create their

philosophical belief in place-based education in tandem with professional development and the observation of the general trend in the world. To enhance their leadership in place-based education, they need to study more pedagogical theories and expand their views, which can help them think about education in a deeper and wider way.

3.2 Improving the Acceptance of Place-Based Education Among School Employees and Community Members

Most teaching staff and community members are not familiar with place-based education, and it is not easy to make rural society accept new things quickly, especially when new things are associated with their interests. Scott (2013) argued that "farmers whose aim is to keep themselves alive tend to give priority to the safety and reliability instead of long-term profits when they make a choice. This is because they cannot afford the cost of a wrong choice". Hence, rural residents prefer to hold "safety first" as their living standard. Following the same logic, it is also difficult for rural principals and rural teachers to afford the cost of the failed result of conducting place-based education. If school reform based on place-based education does not have good outcomes, rural teachers and rural principals need to take responsibility for students' parents and governments, which may scare them much. The tendency to prevent risk leads to the distrust and rejection of place-based education. The distrust related to the risk is not the same as the confidence that people like to keep a stable and natural attitude to their familiar things (Giddens, 2011). Trust indicates that people know the risk before the action, and they still want to take the unexpected outcomes resulting from their actions and choice. Rural teachers and parents are more willing to rely on traditional education since they are familiar with it and know its stability well. In contrast, the distrust of place-based education can be because it is new and may be full of risk, and rural residents do not understand it deeply.

Under this consideration, rural principals cannot conduct place-based education in a rough and fast way, and they need to talk with teachers and parents more often about what the education is, which can help those stakeholders accept the fact that low-quality rural education should be changed to obtain their support. In addition, rural principals can give spiritual and technical support to teachers who want to do innovation and try to be patient with teachers who stick to traditional education. The best way to change people's behavioral patterns is to "watch, feel, and change" instead of "analyze, think, and change" (Lan, 2009). Therefore, the best way to obtain support from teachers and parents is to enable them to see the changes derived from the reform rather than only explain the theories.

3.3 Innovating Practical Methods for Place-Based Education in Rural Schools

The role of rural principals in the process of promoting place-based education is more like the gardener, the protector of nature, rather than the engineer, the designer for the industry. As gardeners, rural principals need to cultivate and wait for what they want carefully and patiently. Some specific measures for performing place-based education are summarized as follows.

First, rural principals need to know who teachers with reform motivation are, and then they can collect those teachers to organize a reform group aiming for promoting place-based education. The group can explore the nature near the school and walk into communities to glean the possible education resources and discuss the exact teaching topics, methods, and outdoor-education management strategies related to place-based education. The whole process can be seen as the reform of place-based education and as a kind of professional development for teachers.

It is worth noting that moving the classroom to communities, nature (such as riversides and forests), and farmland may cause risks, so how to fulfill the teaching goal designed in advance in an uncertain environment can be a huge challenge for teachers. Rural principals may not have such experience as well, and they can ask experienced community members for help and even invite them to take part in those activities. Everyone, including rural residents, could be the person full of professional ideas and knowledge since human activities cannot be organized without thinking, which means everyone could be a philosopher and artist who have their idea about the world and follow their moral path even when people do some activities different from their profession (Apple & Buras, 2005). Rural principals and teachers can learn something (such as survival philosophy and ecological consciousness) from community members in a humble way and enable students to know the contribution of the older generation and respect them by inviting residents to participate in activities.

Second, the curriculum framework of place-based education can be explored and designed. There are many ways to organize this kind of curriculum, namely, making national-standard courses, school-based courses, subject-based courses, and other general courses place-based. Rural principals, as leaders in place-based education, need to design a curriculum framework with teachers that can be shared across grades (or school year), subjects, and even space. In detail, the teaching plan for some specific topics can be extended into serial lectures for different grades and subjects, and the general topics based on seasons or places can also be extended in various ways. The theoretical dimensionality within the curriculum, the basic tool for education, should contain aspects related to the local context as much as possible, such as history, politics, economy, society, culture, architecture, nature, soil, crop, infrastructure, and so forth. Students' knowledge studied from books can be linked to the local context and become the power to motivate local development.

Third, the management mechanism of place-based education should be created. Conducting place-based education requires cooperation among teachers, the integration between students' demands and the supply of educational resources from

teachers, and cooperation with other schools. It causes tremendous work that most teachers may feel too tired to afford. Hence, the management mechanism is called for meeting those demands when place-based education develops at a certain level that makes schools change from traditional education to a new educational pattern. Some relevant management innovation is also required, such as designing the website, preparing education resources, and using techniques of the Internet, to make management more efficient.

Fourth, cooperation with community members can be enhanced. The basic idea about place-based education is to open the classroom and schools and connect education to nature and local communities. The connection to local communities and community members is highly important. Schools can invite community members to take part in students' activities associated with place-based education, by presentation, show, exhibition, ceremony, and so on, to share students' positive feelings derived from the successful reform. Meanwhile, schools can discuss some plans with residents, which can help teachers find unexplored education resources, i.e., unsolved social and environmental problems in rural communities. These measures can achieve win–win results regarding the development of students and communities.

3.4 Developing Students' Key Competence and Emotional Support for Place-Based Education

The reason why place-based education is regarded as the future development direction of modernized rural education is that its target is set under the consideration of modernity and solvability. The twenty-first century is filled with challenges and changes, so schools need to educate new-generation students who need to be fully developed in terms of morality, intelligence, fitness, art, and working skills and help them take responsibility for national profits and the future unknown world. Many researchers have discussed the basic and compulsory personalities and abilities of new-generation students.

The practical problem is how to enable rural teachers to fix education targets to the personalities and abilities required by the new-generation student instead of the increase in students' test scores. Compared to traditional education, place-based education is strongly associated with modernity education aiming to provide opportunities for students to exercise their critical thinking, creative ability, cooperative ability, social responsibility, and digital skills. Modernity characteristics do not entirely conflict with academic performance, and even they can improve students' performance on exams. However, it cannot be denied that sometimes there are some conflicts between them, which need to be solved over a while. Thus, rural principals are recommended to analyze the latent mechanism between ability and academic performance and the latent relationship between knowledge from books and its application in the real world. In addition, the student's learning experience should be considered. Those are all difficult and important problems.

Additionally, studying outside of schools is not appropriate for all students, and studying in schools only works for some students. Based on this view, schools should conduct various kinds of education for students, and place-based education is an option but is not the only selection. Students' personal feelings and attitudes always need to be taken into account, and schools can take care of them by considering the gap between the positive and the negative. They are all positive for developing students' emotional support for place-based education.

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The Impact of Industry 4.0 on the World of Work and the Call for Educational Reform

Jin Yang

Abstract Industry 4.0 has become a heated topic of debate from international scholars and practitioners. To date, however, international research institutions have merely given a conceptual description of its prospects, core technology and application. They have failed to give a clear, accurate and generally accepted definitions. This study expounds the essential features of technological development in the context of Industry 4.0, such as interoperability, virtualization, decentralization, real-time capability, service orientation, and modularity. It analyzes the impact of Industry 4.0 on the labor market, the labor organizations within enterprises, and workers' skills. This paper clarifies the superstitions and misunderstandings of society and explores the cultivation of human resources expected to meet the demands of Industry 4.0 by means of developing ability-oriented basic education, reforming teaching models in vocational education, reforming higher education, and establishing learning organizations.

Keywords Industry 4.0 · The world of work · Educational reform

In January 2011, the "Industry-Science Research Alliance" initiated and set up by the Ministry of Education and Research of the German Federal Government, took the lead in proposing Industry 4.0 as the "Future Project" of Germany's high-tech development strategy. In April 2013, it published the "Securing the Future of German Manufacturing Industry: Recommendations for Implementing the Strategic Initiative Industry 4.0 - Final Report of the Industry 4.0 Working Group" (GTAI, 2019). In April 2015, the French Ministry of Economy and the Ministry of Industry and Digital Affairs announced the launch of the "Industry of the Future initiative", proposing the transformation and upgrading of industrial production through digital technology transformation and the modernization of existing industrial production tools to help companies transform their business model, organizational model, research and development model and business model, thereby driving the transformation of economic

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growth and establishing a more competitive French industry. This plan is also known as the French version of Industry 4.0 (Institut Montaigne, 2018).

In theory, however, Industry 4.0 has also become a topic of heated discussion among international scholars and practitioners in recent years. Numerous academic publications, practitioners' articles, and various conferences have focused on this topic (Li Da Xu et al., 2018; OECD, 2017; PwC Network, 2016).

The charm of the concept of Industry 4.0 is twofold. On the one hand, this is the first time that humanity has predicted the occurrence of the new industrial revolution a priori rather than summarizing the observations afterwards. This provides companies and research institutions with various opportunities to actively shape the future. On the other hand, the impact of the new industrial revolution on economic and social development is undoubtedly large.

Although various stakeholders pay much attention to the concept of Industry 4.0, international research institutions have essentially remained at the conceptual description of the vision, core technologies and application status of Industry 4.0 and have not yet given a clear and succinct, concrete and accurate, and generally accepted and recognized definition of Industry 4.0. This paper attempts to summarize and analyze the essential features of technological development within the context of Industry 4.0, analyze and discuss the impacts of Industry 4.0 on the world of work, and discuss how to develop human resources to meet the demands of Industry 4.0 in the future through reform in education.

1   The Essential Features of the Technological Development of Industry 4.0

The first industrial revolution (from the 1840s to the 1860s) was marked by the introduction of the steam engine and the construction of railways, which brought about mechanized production and the first wave of automation. The second industrial revolution (from the 1870s to the early twentieth century) was marked by the use of electricity and the emergence of production lines that made standardized mass production possible. The third industrial revolution (from the 1960s to the present) was marked by semiconductor technology, mainframe computers, personal computers, and internet technology, hence it is also known as the digital revolution. Today, we are entering the era of the fourth industrial revolution, Industry 4.0, marked by the ubiquitous use of mobile internet, small but strong sensors, artificial intelligence and machine learning. With the ongoing complexity and completeness of digital technology, society and the global economy are undergoing tremendous transformation. Based on a literature review (Hermann et al., 2015), the following six aspects can be summarized to describe the essential features of the technological development of Industry 4.0.

The first is *interoperability*. As an important feature of Industry 4.0, so-called interoperability refers to the ability of decentralized control system devices to coordinate their work through the digital exchange of related information to achieve a common goal. In Industry 4.0 companies, through the internet of things (IoT) and the internet of services (IoS), the cyber-physical system (CPS) and humans are connected. Technical standards become a key factor for connecting the cyber-physical systems of various manufacturers. In a smart factory, interoperability means that all cyber-physical systems (including workpiece carriers, assembly stations, and products) are able to communicate with each other, supported by hardware, networks, operating systems, database systems, application software, data formats and data semantics.

The second is *virtualization,* which means monitoring the production process through cyber-physical systems. The data collected by a series of sensors is well connected with the virtual production model and the simulation model. This way, a virtual physical world is created. The significance of virtualization is that a virtual model can enable humans to grasp all necessary information, such as the current condition of the ongoing manufacturing process and the ensuing processes and safety arrangements, to provide support for humans to deal with increasingly complex technical issues.

The third is *decentralization.* As the demand for products continues to grow, it becomes increasingly difficult for production systems to be centrally controlled. Embedded computers enable cyber-physical systems to make their own decisions. However, to ensure the quality and traceability of the production process, it is necessary to track and record the operation of the entire system at any time. Decentralization means that the radio frequency identification device (RFID) tags will "tell" the machine which working steps are necessary, eliminating the need for centralized planning and control.

The fourth is *real-time capability*. In the organization of work tasks, it is necessary to collect and analyze production data in real time. The timely collection and analysis of production data provides great potential for the optimization of the production process. Smart factories can continuously track and analyze the production status and optimize the production process in time. This way, based on the real location of the workpiece, the carrier system can be activated to pick it up for processing, which can significantly reduce downtime. It is also possible to use sensors to monitor vibration signals in machine parts in real time to predict the failure of a machine and schedule maintenance. In the event of a problem with one machine, the production system can immediately adjust the production route and send the product to another machine for processing. To fully use to the potential of the real-time system, it is necessary to select the appropriate real-time technology and integrate it with other systems in the production process.

The fifth is *service orientation*. Through the internet of things (IoS), one company can use the services another company can provide, including cyber-physical systems and humans. Such service exchange can occur within and between companies. The smart factory is based on a service-oriented architecture. All cyber-physical systems can offer their functionalities as enclosed web services. This way, the smart factory

can design the specific process operation according to the specific needs of customers provided by the RFID tags.

The sixth is *modularity*. To adapt to changing requirements, the modular system can flexibly replace different modules or expand the functions of a single module. In this way, the modular system can be easily adjusted according to seasonal fluctuations in demand or changes in product characteristics. Smart factories can use the "plug & play" principle to add new modules flexibly. Based on standardized software and hardware interfaces, through the use of the internet of service (IoS), the production system can automatically identify and utilize new modules. The development and application of the abovementioned technologies will bring a series of new opportunities for technological transformation in production; it will increase production efficiency and improve people's lives.

In summary, the features of Industry 4.0 are mainly manifested as follows: the real-time networking of industrial processes will make production cheaper, more sustainable and more efficient; digital networks will allow the production process to directly adapt to customer needs and enable customers to efficiently order customized products and services; the world of work will become more humane; Industry 4.0 will provide a huge potential for new products, new services and new solutions to enrich people's daily lives.

2   The Impacts of Industry 4.0 on the World of Work

In contrast to the previous industrial revolutions, Industry 4.0 will have a stronger impact on the economy and society. The reason is that the changes brought about by Industry 4.0 show a trend of faster, wider and deeper impacts. The abovementioned technological developments have an important impact on the economy and society. In terms of labor, some obvious trends have been or are currently emerging: work organization will become increasingly flexible in time and space; work processes will become increasingly digital, decision-making power will be lowered or dispersed, and management levels will continue to decrease; the work process becomes increasingly transparent; and routine production activities are increasingly digitized and automated (Picot & Neuburger, 2014). In this way, for all stakeholders, it is very important to grasp the future employment trends and the knowledge and skills requirements of employees in a rapidly changing work environment. The following is the analysis from the macro, meso and micro levels.

1.   On the macro level: the impact on the labor market

Industry 4.0 will drastically change the nature of future work. Future work will include physical systems and humans to collect, store and process intelligence data. The use of digital technologies and application programs provides operators with more information and timely analysis. The use of information enables operators to effectively monitor and optimize the production process. In addition, the equipment

can also help operators reduce or even eliminate physically heavy, monotonous, repetitive and dangerous tasks. The tasks of the operators and knowledge workers on traditional production lines will be integrated to a higher degree. Industries in the future will make more use of humans' cognitive abilities: intelligence, the ability to understand and judge complex situations, and the ability to flexibly adopt appropriate response strategies.

In this way, a kind of polarization will appear in the labor market. On the one hand, the market's demand for employees with a high level of knowledge and skills is increasing. At the same time, employees will have a variety of flexible options to balance their work and life in terms of the time and place to work. On the other hand, the market's demand for employees with intermediate and primary levels of knowledge and skills will be relatively reduced. Traditional workers would become the first group to be laid off due to the automation of production within the context of Industry 4.0.

It needs to be emphasized that although the short-term impact of automation on employment is negative, improvements in productivity, competitiveness, and quality will win new shares in the market, thereby creating new demand for employment. The research result of the Council of Orientation for Employment shows that although the German automotive industry has been one of the industries with the most robots in the world in the past two decades, it still had more than 800,000 employees in 2015, at the same level of 10 years ago, whereas 20 years ago, the entire German automotive industry had only 100,000 employees (Conseil d'orientation pour l'emploi, 2019). Moreover, the proportion of German and South Korean companies adopting robots is much higher than that of France, but their unemployment rate is lower than that of France. To be sure, the application of digital technology can create employment opportunities in R&D, design, production, marketing or maintenance of automation. In France, for example, the current number of computer engineers and telecommunications was much larger than that in the early 1980s.

2. At the meso level: the impact on the internal labor organization of the enterprise

In the context of Industry 4.0, Kreinsen, H. suggests redesigning the entire production system and labor organization and trying out different forms of production and labor organization. This organization may be a polarized organization, it may be a swarm organization, or it may be somewhere in between (Hirsch-Kreinsen, 2014).

Polarized organizations will tend to differentiate in terms of job tasks, qualification requirements, types of work, and occupations. One possibility is a production system that only undertakes simple production tasks with little or no flexibility, while the other pillar is the production system using an increasing number of new high-quality technical experts who cannot only handle various technical problems (such as troubleshooting, etc.), but also undertake different production management tasks.

Swarm organization is a loose organization composed of high-level and highly motivated employees. It no longer undertakes simple and low-skilled production activities because this kind of production activity has been largely replaced by automation. In such an organization, each employee does not have a definitive task

but takes a self-organized and highly flexible way of working according to the tasks and situations that may appear. The formation of swarm organizations relies on the process of informal social communication and cooperation and requires employees to have strong abilities and specialized knowledge of the production process.

In the process of advancing Industry 4.0, regardless of the form of labor organization, employees should participate in the design of the labor organization from the beginning, become co-designers and co-decisionmakers of labor organizations throughout the process. They will become the driving force for technological and organizational innovation.

3.   At the micro level: the impact on workers' skills

As the cyber-physical systems in Industry 4.0 are interconnected, all production processes in the factory can be observed in real time. Therefore, employees involved in production planning and management will come across a large amount of information and data. They are faced with the challenges of preparing and interpreting data, as well as analyzing and summarizing data, which will increase the complexity of their work. As employees' reliance on data increases, they must become well-informed decision makers. The complexity of work also involves workers working on the workshop floor. As simple tasks will become increasingly automated, the remaining tasks are primarily composed of solving problems in the production process in time. The complexity of machines and equipment in smart factories is increasing rapidly, and thus the problems that arise in the production process will become further complex. For field operators, dealing with this complexity requires more knowledge and capabilities than ever before.

Traditionally, we rely on the level of professional education and a set of predetermined competency standards to define skilled employees. With the acceleration of technological change, Industry 4.0 will enhance the requirements for employees' professional skill, social skill, methodological skill and personal skill, and place greater emphasis on the ability of employees to adapt to changes and learn new skills and methods in a diversified working environment. The "Future of Jobs Report" published by the World Economic Forum summarizes the results of a survey of large employers in 10 industrial sectors in 15 economies. The main conclusion is that by 2020, the world of work will require the ten most important skills, which include complex problem solving, critical thinking, creativity, people management, coordinating with others, emotional intelligence, judgment and decision making, service orientation, negotiation, and cognitive flexibility (World Economic Forum, 2019).

3   Clarification of Superstitions and Misunderstandings About Industry 4.0

Industry 4.0 is an all new concept, and therefore our current analysis and judgments on Industry 4.0 will be a priori and predictive, which will inevitably lead to misunderstandings of various kinds. It is indeed necessary to clarify some frequently

occurring fallacies, to form an understanding that is as realistic as possible and to avoid misleading the formulation of relevant policies and the adoption of measures.

1. Industry 4.0 cannot bring about unmanned factories in the true sense

It is an undeniable fact that industrial revolution and technological innovation in the past has eliminated some jobs, but at the same time, they created new jobs through different production activities. Take agriculture in the United States as an example. In the early nineteenth century, 90% of the labor force in the United States was engaged in agricultural production, but now, this accounts for less than 2%. Taking the development of the American banking sector in the past 50 years as another example, although automation has changed the entire sector, the banking sector has not done away with onsite employees. The first automated teller machine (ATM) was installed 50 years ago, and there are now 420,000 in the United States (McKinsey Global Institute, 2017). According to the analysis of the International Monetary Fund, the number of employed tellers working in the US banking industry has not decreased as a result but has actually increased slightly. What can be converted to automated work are the routine tasks that humans originally engaged in, but people have become more engaged in service and knowledge oriented jobs such as customer service and financial project marketing in bank branches (International Monetary Fund, 2017).

As Schwab explained, Industry 4.0 has had two competing effects on the labor market. On the one hand, capital- and technology-intensive automation brought about by automation technology, the so-called destructive effect, has caused the unemployment of previous employees or transferred them to other jobs. On the other hand, with the destructive effect, a new capitalization effect has been created. The increase in demand for new products and services has spawned new jobs, new occupations, new companies and even entire new industries (Schwab, 2016).

When considering the phenomenon of automation and "machine replacing humans", we should resist the temptation of bi-polar theories about the impact of new technologies on employment and future jobs. Industry 4.0 does not necessarily mean that we are facing a dilemma of competition between man and his technological creation. Industry 4.0 cannot bring about a real unmanned factory but hands more responsibilities to employees because they need to use data systems to control increasingly complex production processes.

In recent years, reports of "machines replacing humans" have made increasing appearances in the media. However, a basic fact that cannot be ignored is that to achieve "machine replacing humans", what is ultimately needed is still humans—high-quality technical and skilled talents, including on-site programmers, robot installation and maintenance technicians and workers, production line installation improvement and maintenance technicians and workers, workstation developers, workstation program engineers, and sales and production line operations and management personnel. The advancement of Industry 4.0 directly generates demand for data administrators, network security engineers, robotics technicians, mechatronics, virtualization engineers, supply chain managers and other personnel.

In the service industry, the incident of Japan's Henn Na Hotel's dismissal of robots requires close examination. The hotel's first branch opened in Nagasaki, Japan, in

2015 and was certified by the Guinness World Records as the world's first hotel with a robot in 2016. In less than three years, the number of robot employees has increased from 80 to 243. However, the frequent failures of robots have substantially increased the workload of the hotel's human employees. After receiving a large number of complaints from human employees and customers, the hotel has phased out more than half of the robots (Gale & Mochizuki, 2019).

2.   The Realization of Industry 4.0 Is a Gradual Process

From a global perspective, the second industrial revolution has not yet been completed. In 2017, 16% of the world's population, or nearly 1.2 billion people, did not have access to electricity. Most parts of the world have not yet had the conditions to advance to the third industrial revolution. More than half of the world's population, 4 billion people (most of whom live in developing countries), still cannot connect to the internet (UN, 2017). Under such circumstances, the advancement of Industry 4.0 worldwide can only be a long and gradual process. The Boston Consulting Group conducted a sample survey of 1500 companies in the U.S., U.K., Germany, China and France in 2016, and the results showed that only 5% of the companies were at a mature stage in implementing Industry 4.0. This means that they had utilized the technologies of Industry 4.0 in their production process. Most companies (40% to 60%) are still in the early stages of research, exploration and implementation of new technologies (BCG, 2016). The replacement of outdated technologies with new technologies is an eternal theme, but the era of complete intelligence in all fields is still some ways off. On the occasion of China's release of the "Made in China 2025" initiative, unlike developed countries that are moving towards Industry 4.0 on the basis of Industry 3.0, a considerable part of China's manufacturing industry remains at Industry 3.0 or even Industry 2.0, and only some leading industrial sectors are comparable to the level of Industry 4.0. By implementing the "Made in China 2025" initiative, it is necessary to advance in a balanced way to promote the popularization of Industry 2.0, the supplementary development of Industry 3.0, and catch-up with Industry 4.0 by strengthening basic industrial capabilities, improving comprehensive integration levels, promoting intelligent manufacturing as a starting point, cultivating new production methods, and promoting digital, networked and intelligent manufac-turing" (Miao Yu, 2015). These statements show that realizing the vision embodied in the concept of Industry 4.0 is still far off and a long process for most industrial enterprises in China. In regard to Industry 4.0, some may always worried about the imminent wave of unemployment. However, the situation on the ground is not that bleak for neither in the present nor the distant future.

3.   Industry 4.0 is not only a technological issue but also a social issue

The most influential challenge facing Industry 4.0 are demographic changes. In most industrialized countries, due to the decline in birth rates, an increasing number of young people are entering the labor market to replace those who are retiring. With the changes in the social environment and the expectation of a quality life, the younger generation brings with them some values that are different from those

of the older generation of employees. For example, they often value good work-life balance. With changes in work organization and technology, the flexibility of work among the young generation continues to increase. The industrial organization of the future encourages employees to continuously develop their talents, improve their efficiency of production and creativity, and encourage them to contribute by making decisions regarding production related matters. With the automatic increase in production done by machines and robots, the direct operational tasks of employees are decreased, which provides employees with opportunities to make better use of their personal and collective intelligence to contemplate strategic issues. In this case, enterprises need to develop strategies to attract young people while retaining the experience and spirit of the older generation of employees. Enterprises also need their employees to be more strategic, coordinated and creative and take on higher responsibilities.

What needs to be clarified here is that the future of the industrial production system cannot be solved by closing or relocating factories, reducing the labor force and creating unemployment; this has become a serious social problem in the advancement of economic development in developed countries. In this sense, Industry 4.0 is not only about technological advancement; it is a human issue. In the operation of Industry 4.0, humans' knowledge often needs to be applied in the form of practical knowledge. After all, humans are the carriers and innovation drivers of this kind of knowledge. The French Future Industry Initiative provides some good ideas. One of the main political goals of the initiative is to maintain and develop strong, innovative, wealth-creating and job-creating industrial activities (Bedard-Maltais, 2017). The future industry is built around people and their know-how. It focuses on the well-being of employees, the development of their skills, and their cooperation in production and the growth of their "human capital".

The application of artificial intelligence is an important technological field of Industry 4.0, and the social impact of artificial intelligence is diverse. It has positive effects on stimulating the economy, serving people's livelihood, and benefiting society and may also cause loss of cybersecurity, lawlessness and moral degradation. Social issues such as loss of privacy, as well as legal and ethical issues caused by artificial intelligence, have become increasingly prominent, which brings unprecedented new challenges to the existing social order and public management system (Tieniu, 2018). In addition, the phenomenon of seeking of improper economic benefits by deliberately hyping the concept of Industry 4.0 and artificial intelligence is also occurring. Therefore, the academic research community is obliged to popularize the essence of Industry 4.0 and artificial intelligence to the public and guide enterprises and the general public to understand Industry 4.0 and artificial intelligence in a scientific and objective manner.

4 Industry 4.0's Call for Educational Reform

Similar to the industrial revolution in the past, quality employees have always been at the core of the advancement of Industry 4.0. Without quality employees, it will be difficult for companies to develop and apply new technologies. In a production system based on advanced technology, the quality of human resources must be continuously improved to quickly adapt to the needs of technological development. With rapid changes in products and production processes, employees need to continuously improve their responsiveness. A series of studies show that entrepreneurs report that a lack of skilled human resources ranks first among the greatest difficulties that must be overcome when implementing digital technologies (Bedard-Maltais, 2017). The challenge facing Industry 4.0 is not a lack of new job opportunities but a severe shortage of skills needed for new jobs. Therefore, to advance the development of Industry 4.0, practitioners must not only receive a good initial education before employment but also pursue continued education throughout their careers. This puts forward imperative requirements for vigorously developing and improving the education and training system.

1. To develop flexible competence-oriented basic education and to lay a solid foundation for the entire career

To prepare for future flexible working models, flexible and personalized learning methods need to be promoted. It is imperative to provide pupils and students with the opportunity to learn anytime and anywhere and extensively promote and use interactive learning tools in the new digital environment to enable them to master theoretical knowledge. Meanwhile, it is also necessary to transform knowledge into practical experience through project-based activities in or out of the classroom. In other words, students need the opportunity to apply what they have learned to actual projects, not just write them on paper. Through project-based learning, they will be capable of improving their ability to solve practical problems, teamwork skills, time management skills—which will lay a solid foundation for their entire career.

It is crucial to transform the practice of curriculum development arranged by subject experts and teachers, to adjust a large amount of curriculum matter that is unfit for real scenarios, to develop and maintain a modern and useful curriculum system and to engage professionals who truly understand modern production and management in the curriculum development team. It needs to be emphasized that with the advent of Industry 4.0, mathematics will play a more important role in our future work and life. Students must acquire the ability to set up, manage, develop, collect, process and interpret data, have the ability to identify trends in data and make recommendations based on the data. This requires more attention to the development of the mathematics curriculum and mathematics education at the basic education stage.

As the learning process of students will become more personalized, it will become increasingly important for teachers to not only deliver knowledge but also play the role of tutors and provide guidance for students' learning so that they can continuously

improve their learning in a healthy manner and obtain a higher level of academic performance and practical ability. Teachers could also use online data to track and assess students' performance and then provide personalized guidance based on each student's strengths and weaknesses.

It is also imperative to bring innovation to the education quality evaluation method, abandon the practice of having a single exam decide a person's future, and to encourage students to make continuous improvements. The evaluation shall be based on the entire education and learning process, not just the result of an examination. Students should continue to carry out project-based practice activities and put the knowledge they have learned into practice to help them transform theoretical knowledge into practical experience and form long-term memory. This way, students will be able to effectively use the knowledge they have gained when they enter their careers.

2. Implementing the integration of production and education and promoting the reform of vocational education and didactic teaching

Different from basic education, vocational education undertakes the mission of "enabling the unemployed to have jobs and those who have jobs work happily". It adheres to the employment-oriented paradigm, implements the integration of production and education, and truly helps learners master employability and entrepreneurship. Practices at home and abroad have proven that promoting the deep integration of production and education is the most effective and fundamental way to improve the quality of teaching and learning in vocational education. The government should establish a new mechanism for promoting the integrated development of vocational education and industry and promoting school-enterprise collaborative education so that industries and enterprises can participate in education and teaching from multiple angles, such as setting training goals, course development, curriculum plans, evaluation standards, practical skills teaching, and internship opportunities for students. In this way, it will be able to incorporate new technologies, new techniques and new methods used in the workplace into the teaching and learning content, effectively promote the close integration of vocational education teaching with production practice, technology promotion, and social services, and improve students' employment and entrepreneurial capabilities.

Future automated production lines are closely linked with design, logistics, marketing, etc., and become systems that could be adjusted at any time. Operators should interact with humans and machines to make analysis, judgments and flexible decisions based on changing customer needs. Therefore, in the development of majors and courses, there is a need to step out of the pitfalls of discipline-based education and enhance the advancement, relevance, and applicability of the curriculum content. In the domain of education and teaching/learning process, it is imperative to vigorously promote the action-oriented didactic to allow students to "learn by doing" and "do by learning". It is important to achieve the integration of work and learning, as well as the unity of knowledge and action, to motivate learners' interest in learning, and to promote the transformation of the teaching and learning process from focusing on dissemination of knowledge to focusing on learners' construction of cognitive

abilities. Instead of paying attention to students' memorization emphasis needs to be placed on the students' mastering of analysis, summarization and application, and from emphasizing knowledge to more emphasis on developing skills and abilities, so as to effectively improve the quality of education and teaching/learning.

3. Transforming higher education and cultivating innovators and leaders in the Industry 4.0 era

The knowledge workers required by the Industry 4.0 environment ought to be rigorously trained in emerging technologies, but just as importantly, they also ought to be rigorously trained in the values related to the use of these technologies. They must not only have the ability to develop and apply technologies but also know whether, when, and where to appropriately use these technologies. They must be able to see both the technologies at work and the impact these technologies have on society.

The capabilities required by Industry 4.0 are both reflective, critical, and interdisciplinary. The results of various studies on innovation show that innovations are not just a matter of the R&D department in an enterprise. Innovative products increasingly require knowledge from different engineering stages (from development to maintenance) and engineering disciplines (mechanical, electrical, and software engineering). Innovation occurs in the interaction between a wide range of disciplines and departments throughout the entire product life cycle. Institutions of higher learning must quickly reinvent themselves. They are obliged to get out of their own silos and try to create a conducive environment so that students can master compound skills to establish, adapt, manage and utilize Industry 4.0. They need to become thinkers, problem solvers, innovators and communicators to obtain value-based leadership.

At the same time, it is also necessary to reform the governance of universities and colleges, vigorously strengthen the communication and dialogue between universities, technology research/development centers and industries. One must attach importance to the role of engineering and business experts in the development of undergraduate, master and doctoral courses, and develop course content and competence standards with industry companies to respond to the needs of industries in promoting changes in production organization and technological innovation in Industry 4.0. All of this will effectively improve the relevance and effectiveness of university education. Drawing lessons from the experience of implementing apprenticeship in higher education in Germany, France and the United Kingdom, it is necessary to explore ways to train technicians and engineers through apprenticeship schemes, to comprehensively utilize the knowledge and technical resources of both universities and enterprises and to cultivate innovators and leaders who have both high academic qualifications and rich on-site practical experiences.

4. Vigorously establishing learning organizations and promoting the lifelong learning of employees

With the advancement of Industry 4.0, the abilities of employees in the workplace need to be continuously improved and developed. Employees' knowledge, skills, and work motivation are all obtained through education and learning. This means

that education and learning must be continuous and permanent and should reflect the needs arising from various changes in production. In companies that promote Industry 4.0, lifelong learning is essential for employees, but its nature, level, and intensity can vary according to the specific needs of the company and employees' jobs. To this end, companies need to establish a regular, well-organized, systematic and effective lifelong learning system for all employees. The effectiveness of learning depends to a large extent on the selection of appropriate education and training methods (lectures, seminars, video conferences, project work, tutoring, e-learning, etc.) to ensure that employees continue to acquire knowledge, skills, attitudes and experiences.

Historical examples show that a purely technology-centric paradigm or a completely humanized paradigm cannot significantly and continuously improve the competitiveness of enterprises, and in some cases, it may even have a negative impact. In contrast, systematic constructive thought centered on organizations has achieved important results in improving the competitiveness of enterprises. This means that the success of Industry 4.0 depends to a large extent on whether it is continuously "anchored" in the organization and carried out and implemented in a targeted manner. Therefore, both human factors and technical factors should be adapted and consistent with the structure and process of the organization (Kopp et al., 2016). In this way, for the promotion of Industry 4.0, the establishment of a learning organization is particularly important.

Learning organizations need to be done at all levels, such as individuals, teams, and organizations. The key factors within a learning organization are trust, communication, a high degree of participation and an environment of challenge, competition, and creation that promote learning and sharing the results of this education. This sharing will include acquiring, processing, organizing, and transferring knowledge within the organization to ensure that all employees in the organization can obtain knowledge. Knowledge sharing is essential for the development of human resources and the entire organization since it enables the organization to improve its innovation performance and reduce excessive investment in learning. It needs to be further explained that the sharing of knowledge itself should be kept not only within the scope of the organization but also through the participation of external partners (business partners, educational and research institutions) to improve the human resource development process of the enterprise.

In summary, Industry 4.0 is not only about "machines" but also about "humans". Humans' education is one of the main goals and achievements of modern society. To promote the development of Industry 4.0, it is necessary not only to promote the reform of basic education, vocational education, and higher education but to also establish learning organizations that cultivate high-quality human resources which meet the needs of the development of Industry 4.0. These organizations also need to continue to build technical skills, scientific and technological innovation talent and management talent.

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The Modernization of Education in China Over the Past Century

Tianjun Cheng and Nan Chen

Abstract Education modernization plays a strategically important role in the process of China's education reform and development and can even be regarded as a portrayal of pursuing the dream of being a powerful country through the development of education. In the past century, China has produced many words and texts in the exploration of education modernization. By investigating the writing background and generation process of the concept of 'education modernization', we can roughly divide it into three stages: the birth period of education modernization from the May 4th Movement to the foundation of the People's Republic of China, the flexuous exploration period of the thirty years after the foundation of the People's Republic of China, and the all-round advancement period since the Reform and Opening-Up starting from 1978 and especially with socialism with Chinese characteristics entering a new era since 2012. Looking back at history and looking forward to the future, we could understand education modernization in China in the face of 2035 by exploring the modernization of educational ideas, education systems, talent training modes, educational governance systems and governance abilities.

Keywords Modernization of education · Education reform and development · Archeology of knowledge · China's Education Modernization 2035

Education modernization and the earnest pursuit for it are perhaps the most common and representative educational consensus around the world. Since the foundation of the People's Republic of China, especially since the Reform and Opening-Up starting in 1978, China's education reform and development have increasingly taken 'modernization' as the core of policymaking and program design, while *China's Education Modernization 2035* and *Implementation Plan of Accelerating Education Modernization (2018–2022)* (hereinafter referred to as the *Implementation Plan*) have even taken 'education modernization' as the main theme for medium- and

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long-term strategic planning for the first time in history. However, since its birth in China, 'education modernization', as a foreign word, has been used in different contexts at the same time. Throughout history, from the May 4th Movement in 1919 to the new era of socialism with Chinese characteristics since 2012, China's education modernization has been evolving with the occurrence of important moments and events with special significance. Therefore, carrying out 'knowledge archaeological' research on the concept of 'education modernization' to clarify its evolution process and to observe the corresponding social and cultural context will not only be conducive to summing up the historical experience of China's educational development and changes since modern times but also help to grasp the overall direction and basic principles of China's education reform and development in the next 15 years.

1   Research on the Modernization of Education in China: Topics and Methods

The study of education modernization is a distinguished school in the field of education. There are rich knowledge production activities and discourse system constructions regarding this theme, that displaying a gorgeous picture of the interweaving of educational ideals and educational reality. The existing research on this topic in China has adopted various methods, such as theoretical construction, empirical study, historical probing. At present, education modernization, as 'a process of transforming traditional education into modern education' (Gu, 1997), is the 'general term of everything regarding modern education reform and development' (Feng, 1999). 'The history of China's education reform and development since the Reform and Opening-Up is a history of education modernization exploration' (Yuan, 2018b). Researchers have basically reached a consensus on these viewpoints. However, there are few studies on education modernization from the perspective of texts and discourses in each historical period, especially on the social formation process of this concept. Therefore, a review of the birth process of the concept of 'education modernization' in China and a clarification of its basic concepts and logic of practice will not only fill in the gaps of the 'text-to-text' philosophical research but also help to carry out and reflect on the empirical research of education modernization and to summarize and draw lessons from the past experience, modes and paths.

1.1   The Research Perspectives of the Concept of 'Education Modernization'

The actual process of education modernization is inconsistent with its recording. The beginning of education modernization and the emergence of this concept in the text did not correspond in time dimension. From the text alone, different people might

have different opinions about the historical process of education modernization. The reason is that different researchers have different understandings of the concept of 'education modernization', and there is a lack of analysis of the birth and discourse change of this concept from the perspective of the archeology of knowledge. In this regard, the present paper maintains to understand and grasp it from the following three dimensions.

First, the meaning of 'education modernization' keeps changing with the advancement of social modernization and the reform and development of education. There is no stable and 'overall concept' that can consistently refer to the whole process of education modernization. In this sense, with the current connotation and usage, the term 'education modernization' will have difficulty reflecting the development process of education back in history. It is easy to cover up the key break-offs while historical analysis of long-term trends is made, especially when some concepts are used to inspect the past society, and the investigation is usually unhistorical or de-historicized, that is, people ignore the fact that concepts and historical facts themselves are also the products of historical construction. Then, they will make the mistake of 'misplacement of the time' (Bourdieu & Wacquant, 2015). This reminds us that it is necessary to discuss the birth of the concept of 'education modernization' in society and then to inspect the core characteristics, the focus of attention, the evolutionary model and the historical periodicity and discontinuity it symbolizes of China's education modernization in the past century.

Second, although a general historical investigation of the concept of 'education modernization' could better grasp the overall context of the development and change of things, we still need to pay attention to at least two types of time because the change of its connotation was not strictly arranged in chronological pattern: one is the 'historical time' that records the occurrence of 'education modernization', and the other is the 'current time' that describes the development of 'education modernization'. When writing historical works, we first need to coordinate the contemporary culture with the historical culture, determine the common points between the contemporary concept and the historical concept, and then use the contemporary language to interpret the historical language (Burke, 2015). Although the connotation of the concept of 'education modernization' has changed several times and various concepts have even been used as substitutions for each other on different occasions, this does not mean that researchers will not be able to explore the content of this concept and will need us to understand the word only in a broad sense.

Third, 'education modernization' is difficult to be independent of the context of 'modernization' and is usually the centralized reflection of the latter in the field of education. Therefore, different understandings of 'modernization', an 'imported' word, will bring more complexity to the study of education modernization. Needless to say, tradition and modernity are not completely dichotomous, just as there is a 'saddle period' in the transition process from modern times to contemporary times.

The concept born in the 'saddle period' has many characteristics, such as historicalization, democratization, politicization and ideologicalization, so it can be seen as the signpost of structural change and social transformation (Richter, 1995). This way of examining the concept evolution in the long-term trend of social change provides a

good perspective for us to understand the emergence and development of 'education modernization'.

1.2   The Core Structure of the Writing of Education Modernization

The discourse and text of education modernization are closely related to reality and have certain social attributes, which makes it to be common-sense and basic work for readers to establish the social background and conditions of writing. Hence, the analysis of the writing of education modernization means that the development of education and social change can be examined in the same logical framework to discover the meaning of 'education modernization' and the evolution process of its content. In terms of its structure, education modernization can be broadly understood as the modernization of education in three aspects: material, system and concept. Since modern times, the 'Westernizationist', 'Reformist' and 'Revolutionaries' who have gradually appeared on the stage of history have had disputes over 'Chinese learning' and 'Western learning' and 'substance' and 'function', which not only made all walks of life hesitant about China's development path but also made the whole country hesitant about the development direction of politics, economy, culture and education. With the failure of the war and the signing of unequal treaties, 'Chinese learning as substance and Western learning as function', especially 'Chinese learning as substance', became a compromise and a conservative excuse and eventually lost its aura. The reform of 'utensils and 'system' finally failed, and it aroused resonance among intellectuals and social elites that 'the remolding of people is the basis of reform of everything' (Huang, 2006). It was under this special background of 'saving the nation from subjugation and striving for survival' and 'unprecedented change for thousands of years', 'modernization' for people of that time meant 'westernization'.

The core of education modernization writing is to explain 'modern', so modern society, modern education and modern people all should be investigated (Chu, 2013). However, it should be noted that when researchers discuss 'modern', a 'pre-modern' seems need to be presupposed to correspond with it, and the differences between them are listed by researchers 'unconsciously and collectively'. From another point of view, modern is just a moment in the long history. As time goes by, 'modern' itself is quietly changing. It can be said that, similar to the development of everything of human beings, the development of educational theories has never followed a stable and orderly procedure. The whole history is mingled with numerous tragedies and rises and falls. The changes in the educational ideological system synchronized with those of society itself. While exploring changes in the educational ideological system, researchers will also gain acute sensitivity and carry out an objective investigation to fully show its complexity (Durkheim, 2016).

In terms of research methods, the present study starts with the analysis of the concept and writing of China's education modernization; and tries to establish the

basic framework of education modernization and points the way of its future development by reviewing it. Of course, due to the vast amount of relevant literature, this paper does not intend to carry out a 'panoramic' study of the history of education modernization but to depict the critical points by examining the writing background and birth process of the concept of 'education modernization' in different historical periods. In terms of the research guiding concept, it is not limited to the research of educational thought, nor does it especially investigate the educational system and educational content. Instead, by taking the educational development of Western developed countries as a reference system and taking the traditional and still 'backward' (nonmodern) educational facts of China in different periods as the reference point, this research tries to show the dynamic process of education reform and development, and trying to reveal the core content of China's education modernization, not just to establish a fixed index and framework.

2   The Exploration of Education Modernization in China: A Review of the Past Century

Although in the past century, the social environment in China has undergone earth-shaking changes and the career of education has experienced arduous and turbulent processes, the exploration and writing of education modernization has never stopped. From the May 4th Movement in 1919 to the foundation of the People's Republic of China in 1949, some educational pioneers began to introduce Western educational ideas, held civil educational activities, and spread modern educational thoughts to transform society and implement new-style education. They tried to set up modern education by learning from the advanced experience of developed countries and performing self-examinations. The concept of education modernization was born in China. Thirty years after the foundation of the People's Republic of China in 1949, the construction of socialist education and the realization of the 'Four Modernizations' (modernization of agriculture, industry, national defense and science and technology) have become the major development strategy of the country. However, with the beginning of a new round of education modernization, the 'Cultural Revolution' from 1966 to 1976 also encountered difficulties, which demonstrated the flexuous exploration of education modernization. After the Reform and Opening-Up and the 'Bo Luan Fan Zheng Movements' (bring order out of chaos movements), China took a new step in promoting the modernization of education. At present, socialism with Chinese characteristics has entered a new era since 2012, and the main social contradictions are also reflected in the field of education, that is, the contradiction between the people's growing demand for quality education and the unbalanced and inadequate development of education. These requires that the education reform not only 'put the people first' and meet the people's desire for high-quality education but also vigorously promote education equity and solve the realistic problems of

unbalanced and inadequate education development. Therefore, the modernization of education has entered a period of comprehensive promotion.

2.1   The Birth Period of the Concept (1919–1949)

Education modernization refers to the historical process of transformation and transition from traditional education to modern education. Researchers have different concerns at different periods. Regarding education modernization in China, academic circles generally take the 1860s as the starting period of this process. The period from the starting point to the foundation of the People's Republic of China in 1949 is called the early stage of modernization (Tian, 2006). In fact, as a specific concept, 'education modernization' refers to different contents before and after the foundation of the People's Republic of China. The main reason for this might be that the so-called early modernization stage of China's education lacks a solid and powerful authority system and is always in a decentralized state and left alone, which makes it difficult to achieve active, integral and designed 'national overall planning' (Tian & Li, 2002). The latter, however, is the focus of socialist education modernization with Chinese characteristics in the past 70 years.

If we are going to analyze the process of the writing of 'education modernization' from the perspective of knowledge production and discourse change, it seems necessary to subdivide the 'early modernization stage of Chinese education' into two phases. The first stage is the 'prewriting' stage of 'education modernization', which is generally between the Westernization Movement from the 1860s to the 1890s and the May 4th Movement in 1919. At this stage, although the ideology of education modernization emerged in the educational practice of church education, enterprise education, and overseas education, as well as in the educational activities among missionaries, new intellectuals, political elites and other groups in the late Qing Dynasty (Li & Yang, 2011; Tian & Chen, 2009; Dong & Zhou, 1997), it is apparent that there was no written record or discussion of the practice of 'education modernization'. The exploration for education modernization was still carried out at the level of utensils and systems. The second stage is the 'formal writing' stage of 'education bmodernization'. Since the May 4th Movement, there was a widespread of the modern spirit of democracy and science in China, and the concept of 'education modernization' was born with a stable meaning. At that time, a large number of texts and written records of 'education modernization' emerged, and here came the new chapter of Chinese education modernization in essence. Although the May 4th Movement was not the beginning of China's education modernization in the ordinary sense, as the starting point of China's modernity and a critical point of historical transformation, it directly promoted the birth and writing of the concept of 'education modernization' and was a landmark for that. Although the Westernization Movement, the Reform Movement of 1898 and the Revolution of 1911 all facilitated education modernization, the facilitation was substantially different from that of the May 4th Movement (Ma, 2019; Tang, 1989; Wang, 2007; Xiang, 1999). Based on these, this

paper is committed to investigating the social formation process of the concept of 'education modernization', and at the same time, the last 'century' is employed as the specific 'long period' of the writing of education modernization.

The birth and writing of the concept of 'education modernization' is closely connected with the educational thoughts of John Dewey and promoted by a group of educational researchers with the background of studying abroad in Western countries. In 1923, Zhang, Pengchun, an overseas student supported by the 'Boxer Indemnity funds' and guided by Dewey, put forward the need to cultivate the modern spirit of Chinese people and promote the modernization of Chinese society through education, especially curriculum reform (Chang, 1923). Some researchers believe that Zhang is the first Chinese educator to put forward the concept of 'modernization' (Hu, 2011). In early 1930, Tao, Xingzhi put forward at the National Rural Teacher Seminar held at Xiaozhuang University that people had been hog-tied by many traditional thoughts advocated by traditional education for thousands of years in China. The traditional thoughts, which stood for killing off human desires, conflicted with the principle of 'life is education' because it stressed human emancipation and must be overturned. 'We' are modern people. We must receive modern education to live a modern life (Tao, 2005a). In 1935, Tao clearly put forward the idea of 'modernization of life education', that is, to change the situation of 'modern people living an ancient life' through the life education movement. He believed that 'to be a modern person, we must acquire modern knowledge, learn modern skills, find out modern problems, and give play to our strengths in a modern way…. Therefore, we must hold the key to modern civilization to continue exploiting the treasury of modern civilization and to guarantee the proceeding of modernization' (Tao, 2005b). Because of this, some researchers believe that the life education theory of Tao is based on that age, puts practice at the first place, and focuses on modernization; therefore, Tao should be regarded as one of the pioneers of China's education modernization (Hu, 1997). In addition, on the basis of his defense for 'total westernization', Chen, Xujing clearly put forward the concept of 'China's education modernization'. 'In our opinion, all Chinese culture should be modernized thoroughly, especially the whole education…… If Chinese people do not want the new education of life, it cannot be helpful. But if they want, modernization should be implemented quickly, seriously and completely' (Tian, 2015). Since then, the concept of 'education modernization' was no longer unfamiliar to the common people and basically replaced the concept of 'education westernization'. However, with the full-blown outbreak of the War of Resistance against Japan in 1931, the discussion on the modernization of education gradually stopped. In other words, the birth of the concept of 'education modernization' was based on the actual needs of 'saving the nation from subjugation', and its discourse was originally marked with the nature of imitation and revolutionary character. At the same time, it was closely related to the bottom-up 'folk' education reform (such as civilian education movements and life education movements), which was called by social development and reform. Some scholars believe that China's education reform in the 1920s plays an important role in the process of China's education modernization, and the Renxu School System (the 1922 New School System), promoted by the New Culture Movement, is just the landmark

achievement of this education reform. It has also laid the foundation for China's modern education system. Even to this day, the 633 system is still one of our basic educational systems (Wang, 2012). Some scholars also pointed out that during the period of the Republic of China from 1912 to 1949, which is an important historical stage in the process of China's early education modernization, the 'education system had made two important transitions: one is the transition from the Japanese mode to the American mode, and the other is the transition from borrowing foreign education system as the major mode to establishing the education system with our own characteristics by integrating our own reality' (Yu, 1999).

It can be seen that the discussion in this period did not involve the question of 'what is modernization on earth', and 'modernization' even had become the synonym for 'westernization' or 'evolution'. The theories and topics of discussion of researchers were more concerned with the question of 'whether' to implement education modernization or not, which seems to be in line with some basic situations of the newborn concepts from formation to the beginning of being accepted. Questions such as 'what is education modernization' seemed insignificant, while establishing the general direction and principle of China's education modernization had become the focus of attention at that time. 'Education modernization' was more like a mechanical combination of two independent fields which are 'education' and 'modernization'. It emphasized the interest and dominance of the country, which demonstrate a distinguished feature of social standard.

2.2 The Tortuous Exploration Period (1949–1978)

After the foundation of the People's Republic of China in 1949, restoring and developing people's education careers became the focus of the government's work. The modernization of education has also become an integral part of the socialist construction of our country. According to the general division of academia, the educational development process in the 30 years after the founding of the People's Republic of China can be roughly divided into two stages: the first was the transition period from neo-democratic education to socialist education, or the 'completely Sovietized' period of education, and the second was the period of independent construction of socialist education during which there was an isolated exploration of the modernization of socialist education (Wu, 2002).

In the first stage, our country began a comprehensive study of Soviet educational theory and practice. Based on the experience of new democratic education in old areas during the War of Resistance Against Japan from 1931 to 1945, China developed cultural education of 'nationality, science, and masses' and criticized the bourgeois education thought represented by Dewey's 'pragmatism'. Compared with the beginning of the founding of the People's Republic of China, this stage focused on eliminating illiteracy and cultivating specialized talent. The number of students at all levels and types of schools had increased significantly, and the goal was to have the world's top education. It can be said that the use of the "Soviet education model" for

reference and hard experience of running schools under war prioritized the development of science and technology education in China's education modernization in this period. It is emphasized that education should be associated with practice and meet the needs of national construction, such as industrialization and national defense in particular (Yang, 2000).

In the second stage, with the Soviet breaking down with China, China began to explore socialist education modernization independently. In 1956, after deep analysis of the domestic situation, the 8th National Congress of the Communist Party of China (CPC) put forward that 'the main contradiction in our country is already the conflict between the people's requirements for the establishment of an advanced industrial country and the reality of a backward agricultural country, and is the conflict between the people's needs for the rapid development of economy and culture and the current situation in which economy and culture cannot meet the needs of the people' ("Resolution of the Eighth National Congress of the Communist Party of China on the political report", 1956). To resolve the conflicts, we need to concentrate on developing the productive force and education should be the basis. However, at the 3rd Plenary Session of the 8th Central Committee of the Communist Party of China, the judgement was changed, and it was held that the main conflicts in our society were still the contradiction between the proletariat and the bourgeoisie and the contradiction between the socialist road and the capitalist road. The change in political principles had a direct impact on the development of China's education. With the fierce criticism and deviation of the education principle in the early days of the founding of the People's Republic of China, the exploration of socialist education modernization in this stage was particularly tortuous, and the development was 'misled' (Jin, 2000).

The writing of education modernization, at this time, was closely related to the 'Four Modernizations' put forward then, while the emergence of the latter was gradual and its concept experienced an evolution until it was fixed. Around 1960, after reading a Soviet Union's book called *the Textbook of Political Economy*, Mao, Zedong said: 'the original requirements for building socialism were industrial modernization, agricultural modernization, scientific and cultural modernization, but now we also need national defense modernization' (Literature Research Office of the CPC Central Committee, 1999). Then, in early 1965, Zhou Enlai formally put forward the 'Four Modernizations' in his *Government Work Report*: 'in a short historical period, we need to build China into a powerful socialist country with modern agriculture, modern industry, modern national defense and modern science and technology' and since then, it became the shared goal of our nation.

Roughly speaking, education modernization was not mentioned in the 'Four Modernization', but we could find its reflection in the formulation changing from 'modernization of science and culture' to 'modernization of science and technology'. The reason to call it 'reflection' was that according to the view at that time, education, as the superstructure, could be directly connected with 'science and culture' but hardly connected with 'science and technology', which was a social idiom and referred to productivity. It also reflected that the backwardness in 'science and technology', which was a 'fixed target', was a problem demanding prompt solution for

New China. In other words, modernization was the requirement of national construction development, such as the development of the economy and defense; however, its relation with culture and education was vague.

Therefore, unlike the specific claim for 'education modernization' in the previous stage, at this time, although a wide-range official and folk discussion on 'education modernization' was not conducted in our country, by investigating the socialist education movements with the standard of 'sticking to the correct political direction' of the past 30 years and analyzing the relevant policies and texts issued at that time, the development context and basic appearance of education modernization started to show.

2.3   The Comprehensive Promotion Period (1978 Until Now)

After the 3rd Plenary Session of the 11th Central Committee, China entered a new period of reform and opening up. Deng, Xiaoping, as the chief designer of the socialist modernization construction, rooted in the development of industrialization and economic construction, insisted on taking the 'Four Modernizations' as the goal, established the role and status of education in the realization of the 'Four Modernizations', and advocated a 'Chinese style modernization' route. In this context, in September 1983, Deng, Xiaoping wrote an inscription for Beijing Jingshan School: 'education should be geared toward modernization, toward the world and toward the future'. Since then, 'education modernization' started to appear officially at the stage of China's education reform and development in the new era.

In 1985, in *The Decision of the Central Committee of the Communist Party of China on the Reform of Education System*, the 'Three Orientations', as the starting point of the reform of 'improving the national quality, producing more talents, producing good talents', officially entered the text of the national education policy, and 'education serves the socialist modernization' had also become the education policy in the new historical period. In 1992, Jiang, Zemin put forward in the report of the 14th National Congress of the Communist Party of China that education must be given priority in development, which was the fundamental plan to realize China's modernization. In this regard, researchers believed that 'giving priority to the development of education' was a major change in the guiding ideology of China's modernization and could even be regarded as an important part of the 'Chinese model' of education modernization (Yuan, 2018a). Subsequently, the CPC Central Committee and the State Council issued the *Outline for China's Education Reform and Development* (hereinafter referred to as the *'93 Outline'*) in 1993. Different from the previous specific statement that 'education serves the socialist modernization', the modernization of education itself has become an independent development goal in this outline. According to the 'three-step' strategy of socialist modernization construction in China, it has been clearly proposed that 'after a few decades of efforts, a relatively mature and perfect socialist education system would be established and education modernization would be realized'. Education modernization, as the national will and

social consensus, has become an integral part of the reform and development of education in China.

As the guiding principle of education planning from the end of the twentieth century to the first ten years of the twenty-first century, the '*93 Outline*' basically led the development direction of education modernization in this period. During this time, with the extensive attention from the government and all walks of life to the modernization of education, the education field had the responsibility to investigate topics in this area. Various theoretical studies and practical explorations have been carried out on this topic, showing a favorable situation of one hundred schools of thought contending and one hundred flowers blooming. In 2007, Hu, Jintao, the president of China, specifically proposed in the report of the 17th National Congress of the Communist Party of China, to 'give priority to the development of education, improving the level of education modernization, and run education satisfactory to the people'. In 2010, the *Outline of China's National Plan for Medium and Long-term Education Reform and Development* (2010–2020) (hereinafter referred to as the *Outline*) was issued, and 'education modernization' was taken as the core idea notably mentioned in the policy text. The preface not only emphasizes that 'giving priority to the development of education and improving the level of education modernization are of decisive significance to the construction of a prosperous, strong, democratic, civilized and harmonious socialist modern country' but also clearly points out that 'by 2020', the 'strategic goal' of education reform and development in the next decade is to 'basically realize the modernization of education, basically form a learning society, and become one of the powerful countries in human resources. In January 2017, the State Council issued the *13th Five-Year Plan for the Development of National Education*, proposing that by 2020, 'significant progress will be made in the modernization of education, and the overall strength and international influence of education will be significantly enhanced, so as to facilitate China to become a powerful country in human resources and talents, and lay a solid foundation for realizing the long-term goal of *China's Education Modernization 2030*. In October of the same year, the general secretary Xi, Jinping made an overall action plan around the principle of 'giving priority to education development' in the report of the 19th CPC National Congress. He explicitly stated that 'the construction of a powerful country in education is the foundation work of the great rejuvenation of the Chinese nation. We must give priority to education, speed up the modernization of education and build satisfactory education of the people'.

Since the publishment and implementation of the *Outline,* policies on 'education modernization' have sprung up one after another. Unfortunately, there was no medium- or long-term strategic plan with 'education modernization' as the core topic. In this context, in February 2019, the CPC Central Committee and the State Council issued *China's Education Modernization 2035*, and 'education modernization' became the development goal of the next 15 years. It has been stated in the text that 'to 2035, we will realize education modernization in general, become one of the powerful countries in education and facilitate China to become a powerful country in learning, human resources and talents, which even made education modernization the guiding philosophy and evaluation criteria for China's education development.

Overall, based on the top-level design of the government, the modernization of education in China entered a new stage of comprehensive development in this period. Education modernization had richer content, and its writing space was no longer limited to the political and academic fields. The construction of the discourse system of education modernization oriented to serve socialist modernization was gradually completed, which gave rise to a complete system consisting of the concept, content, implementation and evaluation of education modernization. So far, after more than a hundred years of trials and hardships, China's education had discarded the original model of imitating and copying the Western education modernization, and a road of education modernization with Chinese characteristics was coming into being.

3 The Future of China's Education Modernization: The People-Oriented Mode

By reviewing the writing process of education modernization in the past century, we can see that it is periodic, and the main problems concerned in different periods are different. Some scholars have pointed out that the mode of China's education modernization is characterized by 'late occurrence and exogeneity', and two key points in the process of 'secondary modernization' should be paid attention to: first, in the transition process from agricultural society to industrial society, the rapid development of industrialization and urbanization relies on the popularization and scientization of education to cultivate qualified talents for various construction of the country, which is mainly reflected in improving the level of science and technology through education, and then promoting the modernization of the country; second, in the transforming process from industrial society to the information society, the 'liberation' of human beings has become the development consensus in all fields of society, and the service properties of information and knowledge have been particularly emphasized, which is reflected in the realization of human modernization through more diversified and personalized education (Hu, 2010). Therefore, the modernization of education has double attributes: it not only lays the foundation for the development of the country but also helps the growth of individuals. 'To serve both the national economy and the people's livelihood is the overall contribution of education to the construction of socialist modernization and the promotion of people's all-round development' (Zhang, 2019). In short, as a higher level of educational development, educational modernization involves the transformation of ideas, training mode, structural system, system operation and other aspects. However, its essence still lies in the realization of man's all-round development and modernization. Based on the historical development context of China's education modernization and the current global education reform and development trend, we can grasp the future process of China's education modernization from four basic, correlated and sequence aspects after comprehending the spiritual crux of *China's Education Modernization 2035* and the *Implementation Plan*.

3.1 The Modernization of Educational Ideas with 'Human Modernization' as the Core

They are undoubtedly the leading question that our country must answer in the process of promoting education modernization, which standards should be used to measure the development level of education modernization and what the basic ideas that guide education modernization are.

Many scholars in history have made theoretical contributions to the analysis of '(education) modernization'. Durkheim used the concepts of 'differentiation' and 'integration' to understand modernization. Under the basic background of the social division of labor, on the one hand, with the refinement of labor and the specialization of occupations, people gradually break away from the traditional 'role aggregate' and then obtain their own free space for development; on the other hand, because the anomie and forced social division of labor might bring social chaos and disorder, people increasingly rely on mutually beneficial cooperation – organic cooperation – to achieve 'social integration' (Durkheim, 2000). Regarding education modernization, the differentiation of education is mainly reflected in the inequality of education development between urban and rural areas and interschools. The integration of education constantly falls behind the differentiation; thus, the theoretical exploration and practice promotion of educational fairness target realizing integration in the field of education by closing the gap among the 'three differentiations'. In this respect, Eisenstadt, an Israeli expert on modernization, believes that the best starting point for analyzing education modernization is to examine the 'supply and demand model' of education (Eisenstadt, 1988). As far as the modern school education system is concerned, the specialization of education organizations, the popularization of education activities and the increasing connections between education systems at different levels are the main structural features.

At present, the construction of education index systems in world-developed countries and organizations are usually used to embody their own ideas. Based on investigations and surveys, the index systems, which are deployed for evaluating the development level of education, will be regularly formulated by UNESCO, the OECD, the World Bank. These index systems, as the specific application of education philosophy, have gradually become the reference standards of education modernization in various countries.

We believe that the starting point and ending point of 'education modernization' cannot be separated from 'human modernization'. In this regard, we need to review the sixteen Chinese characters written by Deng, Xiaoping in Beijing Jingshan School in 1983, and the inscription in English means 'education should be geared toward modernization, toward the world and toward the future'. As some scholars pointed out, this overall policy of China's education development has two implications. First, it has made some new amendments to China's modernization strategy. It not only claimed that contemporary education should face and adjust itself to China's modern industry but also advocated that modernization of education should be added to the previous 'Four Modernizations'. Second, the aim of education is

to cultivate people, and the essence of education modernization is to cultivate new modern people oriented towards the world and the future construction as soon as possible, which means that China's modernization strategy gains a deeper and wider extension, that is, to realize the modernization of human beings (Ye, 1998). With the 'Three Orientations' being put forward, the transformation of Chinese society towards modernization is accelerating daily. In the following 20 years, research on human modernization or 'the fifth modernization' once became a 'prominent science' in the fields of sociology and social psychology (Zhou, 2012). Furthermore, the 19th National Congress of the CPC formed the developed idea of 'continuing to put people first', made the action request of 'ensuring satisfactory education for the people', and put forward the new idea of 'developing quality-oriented education' and the new strategy of 'promoting education equity'. In addition, the 'eight basic principles' of promoting education modernization, advocated by *China's Education Modernization 2035,* emphasized 'more attention to all-round development and more attention to every person'. All these results demonstrate that the philosophy of education modernization is related to people.

3.2 The Modernization of the Talent Training Mode with the Aim of 'All-Round Development of Human Beings'

Talent training is the most important task in school education. Advanced educational ideas are often presented by the modernization of the training mode. The talent training mode is an educational operation mode under the guidance of a certain educational concept to achieve the goal of talent training. Its essence is to build a relatively stable structure of knowledge, ability and quality for the learners, as well as the organizational form and operation mechanism to achieve this structure. Therefore, it mainly focuses on related questions, such as 'who to cultivate' and 'how to cultivate' (Yang, 2012). From this point of view, the modernization of the training mode not only needs to establish modern educational concepts and goals but also should rely on the curriculum and teaching reform with core characters of the times and diversity and take the 'all-round development of human beings' as the purpose to continuously promote the modernization of educational content and methods. First, the objective of education should be modernized. At the beginning of the new century, the dispute between exam-oriented education and quality-oriented education was the focus of all walks of life in our country, especially in the field of education. Although they could not be regarded as a group of opposite concepts, they could vividly represent two different educational positions of the two sides. At present, quality-oriented education, which attaches importance to all-round development in morality, intelligence, sports, esthetics, and labor education, is more in line with the development trend of modern education. The modernization of educational objectives also requires all kinds of schools at all levels to cultivate students' key

competence, develop quality education, and cultivate socialist builders and successors, and this should be the fundamental task and evaluation criteria for those schools. Second, the educational content should be modernized. Historically, there were a number of heated discussions about the order and number of 'scientific knowledge' and 'humanistic knowledge' in school education in academic circles. Questions such as 'what is the most valuable knowledge' have attracted researchers' attention. In this era of information society and 'knowledge explosion', various forms of education need to constantly eliminate the 'outdated' and 'obsolete' knowledge caused by the advancement of society and absorb the 'classic' and 'new' culture in line with the spirit of modern education, properly handling the relationship between tradition and modernity, and internationalization and localization, and ensuring that the content of education keeps pace with the times. Third, educational methods should be modernized. Modern education is based on modern industrial production. With the update and advancement of science and technology, the methods of education are constantly changing. In reality, automation and information methods have been popularized and skillfully used in teaching activities, big data and artificial intelligence are gradually becoming new popular applications in the field of education, and the transformation and upgrading of education methods from simple informatization to comprehensive intelligence are no longer far away. Currently, we need to make full use of modern technology to speed up the reform of the personnel training mode and organically combine personalized training with large-scale education, promoting education modernization by education informatization.

3.3 The Modernization of the Education System Guided by the Principle of 'Running Education to the Satisfaction of the People'

The foundation of the modernization of the talent training mode lies in the construction and integration of the modern education system. At the same time, the education system also constructs the 'main frame' of the whole process of education modernization. Over the past 40 years since the Reform and Opening-Up, under the continuous guidance of the strategy of 'giving priority to the development of education', the overall development level of education in China has leaped to the top of the world. In this regard, some researchers believe that China has built the world's largest modern education system. The number of schools and students of all kinds and at all levels rank in the top of the world, and the popularization and development level of education is also above the average in the world. In the future, China will move from a great education country featuring a large quantity to an education country that pays more attention to quality and realizes the second leap in education development (Peng, 2017). From this point of view, the realization of the ideal of a powerful country in education needs to be based on the systematic planning of the institutional framework of education modernization and fully arouses the initiative and enthusiasm of

the government and all sectors of society in education development. We should take the reform and innovation of the system and mechanism as the fundamental driving force, take the principle of 'running education to the satisfaction of the people' as the guidance and soul, and take the goal of providing 'suitable education' to every learner as the struggle direction, focusing on building a life-long, diversified and open modern education system for the people in the new era.

First, we need to improve the school education system. On the whole, China's existing education system cannot fully adapt to social development and people's needs, and the shortcomings of all kinds of education at all levels are still obvious. Among them, the quantity and quality of preschool education need to be improved, the integration of urban and rural compulsory education has not yet been realized, the structural contradictions caused by the popularization of higher education have become increasingly prominent, and the social influence of vocational education is not strong. All these problems need to be solved by continuing to promote the modernization of education. Second, we should pay attention to everyone's career development and build a learning society. Since the end of the twentieth century, with the continuous improvement of social requirements for individuals to adapt to modern life, the concept of lifelong education has become the guiding ideology of education reform and development in the world (Yu, 2001). Generally speaking, life-long education system can break through the institutionalized and phased framework of the school education system and organically integrate education in different fields, such as education at school, education at home and education in society. It can meet the diversified learning needs of learners in different stages and adapt to the actual needs of social development in different periods. Therefore, the establishment of a 'learning society' requires us to break down the barriers in education through the modernization of the education system, to allocate educational resources reasonably and to build an 'overpass' to organically associate school education with 'out-of-school education' (Wu, 2014). Finally, we should break through the time and space constraints of traditional education faced by learners and form an open education system with the theme of 'co-construction and sharing'. Strictly speaking, the open education system cannot be regarded as an independent category. It is just because of the lack of openness of the current education system that it is emphasized here. On the one hand, the internal opening of all kinds of education at all levels is insufficient: it is difficult to integrate general education with vocational education or with adult education. Schools, families and society are independent and separated from each other in the process of education reform and development, and the joint construction and sharing situation of 'opening school resources to society and opening social resources to schools' has not been formed. On the other hand, the opening up of all kinds of education at all levels is not enough. The service system for studying abroad needs to be improved, the depth and breadth of global education cooperation still need to be expanded, and the establishment and improvement of the mechanism for mutual recognition of academic qualifications worldwide and the integration with international education rules still need to be done. Therefore, the construction of an open education system should also become an important part of the process of education modernization.

3.4   The Modernization of the Governance System and Governance Capacity of Education Guided by the Principle of 'Developing People-Centered Education'

Since the 18th CPC National Congress, the modernization of the governance system and governance capacity of education has gradually become the focus of comprehensive and in-depth education reform. Some researchers have pointed out that the educational governance system, as a supporting system centered on the educational system, and the educational governance ability, as a comprehensive ability with understanding, implementation and innovation as the basic elements, are not only the key contents of education modernization but also the important guarantee for the realization of education modernization, reflecting the institutional and cultural advantages of China in the educational field (Chen & Wan, 2016). The development process of education reform in recent years shows that we must adhere to the people-centered development idea, reform those education systems and mechanisms that do not meet the needs of social development and the people, and improve those talents and abilities that are not suitable for the management of all aspects of education. Only in this way can we make great progress in education. However, due to many deep-seated problems and conflicts, it is impossible to promote the modernization of the education governance system and governance ability in one move.

The modernization of educational governance systems and governance ability relies on the reform and innovation of educational systems and mechanisms. The key point of this is to promote the separation of management, operation and evaluation of the education system, while the foothold is to build a new relationship among the government, school and society. First, the government should perform macro-management according to the law. Although the decentralization of education was promoted in the 1980s, management methods that make differentiated and offside use of the public power of education, for example, 'micro-management' and 'direct management', are still common. The modernization of education governance requires the government to change its functions, to 'let go of what should be left out and manage what should be managed well' and to establish a 'service-oriented government' with planning, guidance and supervision as its content. Second, the autonomy of schools run under the law is essential. Schools, as the educational 'intermediary' between the government and society, are the main areas of education reform. With the development tendency of decentralization by the government to schools and autonomy of running schools with their own characteristics, it not only means that the autonomy of schools will be further increased but also indicates that schools will further improve their internal governance structure and their ability to run school independently by making better use of various educational and teaching resources, such as human resources, financial resources and material resources. Finally, society participates in the evaluation under the law. Education is not only connected with national policy but also related to people's livelihood. In the past, the evaluation of education was often carried out by the government and schools, but it was difficult for

the masses to express their views on education effectively. At present, as an important goal of the education modernization project, 'running education to the satisfaction of the people' actually means that 'the quality of education should be subject to social evaluation, the achievements of education should be subject to social inspection, and the decision-making of education should be subject to social supervision' (Yuan, 2014). The joint efforts of the government, schools and society are the essential to build and share the education system. Overall, education reform and development based on the modern spirit of scientization, democratization and legalization will lay a solid foundation for the modernization of China's education governance system and governance ability and will open up a road of socialist education modernization with Chinese characteristics along with the modernization of education concepts, education systems and talent training modes.

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Educational Strategies and Policies for Alleviating Relative Poverty

Jian Wang

Abstract China has finished building a well-being society in all respects and completed the task of poverty alleviation. The major task will be shifted from the elimination of absolute poverty to the governance of long-standing relative poverty. As a fundamental approach to dealing with multidimensional relative poverty and cutting off the intergenerational transmission of poverty, education is supposed to establish an anti-poverty strategy targeting the improvement of people's sustainability. We need to build a lifelong educational system, offer equal services of basic public education, take other coordinated and mutually complementary measures with education to shake off poverty, mobilize multiple participants in anti-poverty, and quicken the step of formulating a policy framework for relative poverty alleviation through education to avoid the re-emergence of poverty.

Keyword Building a well-being society in all respects · Educational anti-poverty · Relative poverty · Rural revitalization

In 2020, China will have achieved the goal of lifting the rural poor out of poverty under the current standards, removing the hats of all impoverished counties, and basically solving regional overall poverty, which means that after 2020, the focus of poverty alleviation and development work will shift from eliminating absolute poverty to alleviating relative poverty. In the speech at the Symposium on Decisive Victory over Poverty Alleviation held in Beijing in March 2020, President Xi Jinping pointed out that it would be necessary to continue to promote the effective connection of comprehensive poverty alleviation to rural revitalization, promote the smooth transformation of poverty reduction strategy and work system, to integrate all these into the rural revitalization strategy, and establish a type of system and mechanism that takes the short and long term into consideration and treats both symptoms and root causes (Jinping, 2020). Based on the fundamental, prerequisite, and critical role of education in overall poverty alleviation and development strategy, the education

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anti-poverty strategy should be implemented in depth, focusing on solving problems such as capability poverty, regional development gaps, policy inconsistency and mismatch, and speeding up the policy system for alleviating relative poverty through education. All these factors will lay a solid foundation for starting a new journey of building a socialist modern country in an all-round way.

1 The Strategic Direction and Focus of Poverty Reduction after the Establishment of a Well-off Society in an All-round Way

Since the Reform and Opening-up Policy was carried out in 1978, China has not only created a miracle of economic growth but also achieved a poverty reduction miracle in the history of world development. *The Communique of the Fourth Plenary Session of the 19th Central Committee of the Communist Party of China* (CCCPC, 2019) proposed, 'Resolutely win the fight against poverty, and establish a long-term mechanism for solving relative poverty'. After China eliminates absolute poverty in 2020, the focus of anti-poverty work will shift to solving relative poverty with higher standards, richer contents, and wider populations.

1.1 The Form of Poverty Has Changed from Absolute Poverty to Relative Poverty

Since the 18th National Congress of the Communist Party of China held in 2012, under the strong leadership of the Party Central Committee with Comrade Xi Jinping at the core and the joint efforts of the whole party and the whole society, China has made decisive achievements in poverty alleviation. According to the present rural poverty standard of ¥2,300 per person per year (2010 constant price, equivalent to an international standard daily average of $1.5 to $2.0), by the end of 2019, the rural poor population reduced from 98.99 million in 2012 to 5.51 million people, and the incidence of poverty dropped from 10.2% to 0.6% (National Bureau of Statistics, 2020), which showed that the goal of poverty alleviation for the poor in rural areas would almost have come true. However, the relative poverty caused by unbalanced and inadequate development still exists for a long time, specifically showing the large gap among regions between urban and rural areas, and among groups. In 2019, the ratio of per capita disposable income between urban and rural residents was 2.60:1; the ratio of 20% of high-income households to 20% of low-income households reached 10.35:1 grouped by income quintiles (National Bureau of Statistics, 2020). Therefore, income inequality has become a prominent problem in China. Narrowing the income gap and creating more opportunities for the bottom population has become the new goal of poverty reduction after 2020.

Relative poverty as a reference concept to the average level of society, generally a certain percentage of the average or median income of residents, is usually used to draw the poverty line. For example, regarding 30% of the average or median income of residents as the 'extreme poverty line', 40% as the 'severe poverty line', 50% as the 'moderate poverty line', and 60% as the 'regular poverty line' (Xingqing & Haodong, 2019). To date, China has not formulated a uniform national relative poverty line standard. If the poverty line was set at 40% of the national median disposable income of residents in the previous year, the national median per capita disposable income of residents in 2019 was ¥26,523, and there was an increase of 9% over the previous year. On this basis, calculated with a growth rate of 9% for two consecutive years, the national relative poverty line in 2021 will be ¥12,605, which is equivalent to $4.9 a day per person and basically close to the middle-income countries' poverty line of $5.5 a day per person. According to the estimates, regarding 40% of the median income as the relative poverty line standard, there will be approximately 105.55 million poor rural people with an incidence rate of approximately 9.3% and an urban poor population of approximately 26.78 million people, with an incidence rate of approximately 6.4%. Thus, there are approximately 132.33 million poor people nationwide, with an incidence rate of approximately 9.6% in 2021.

Relative poverty is a phenomenon of development differentiation, a large number of relatively poor people and a high incidence of poverty reflect the reality of a large income gap and unbalanced development, and show the long-term complexity and arduousness of the task of reducing relative poverty in China.

According to the modernization and common prosperity blueprint for the development of socialism with Chinese characteristics in the New Era outlined in the report of the 19th National Congress of the Communist Party of China (CPC), by 2035, socialist modernization will be basically achieved, people's lives will be more affluent, the proportion of middle-income groups will increase significantly, the gap between urban and rural regional development and the gap in the living standards of residents will significantly reduce, the equalization of basic public services will be basically achieved, and all people have taken solid steps to achieve common prosperity. By 2050, a modern socialist country will have been built, the common prosperity of all people will be basically achieved, and the people of whole country will enjoy a happier and healthier life. All these contain the medium- and long-term strategic goal of solving relative poverty; that is to say, by 2035, there will be significant progress in solving relative poverty, and by 2050, relative poverty will be basically solved. A poverty reduction strategy should shift from storming governance to conventional governance and strive to establish a long-term mechanism for solving relative poverty.

1.2   The Goal of Poverty Reduction Has Shifted from Achieving "Two No Worries and Three Guarantees" to Improving Development Capabilities

Poverty is not only a problem of insufficient income or consumption, but also a problem of lack of opportunities and abilities such as housing, education, and medical care. Poverty is a complex and comprehensive social phenomenon. Many international organizations, including the World Bank and the United Nations Development Programme (UNDP), have constructed poverty indicator systems that include income, infrastructure, education, health and nutrition, security, employment, and other multidimensional factors. For example, the Multidimensional Poverty Index (MPI) proposed by the World Bank is not only based on consumption or income, but also directly measures the accessibility to education and public utilities. For a few countries with a large amount of data, the measures can be extended to other well-being such as health care and nutrition, crime prevention and natural disasters and other important aspects (Table 1). According to the World Bank's multidimensional poverty measurement standards, 11.8% of the population in 119 economies around 2013 was in monetary poverty, and meanwhile inaccessible to education, water, and electricity. The multidimensional poor population reached 18.3%, so the measurement based solely on currency could not cover all aspects of well-being (Jolliffe et al., 2018).

The China Rural Poverty Alleviation and Development Program (2010–2020) promulgated by the Central Committee of the Communist Party of China and the State Council put forward poverty alleviation standards and targets by 2020. The standards and targets were comprehensive, 'No need to worry about food, no worry about clothing' and 'Guarantee compulsory education, basic medical care and housing'. However, although the poverty standards have been adjusted several times, they are still single with income poverty to calculate and announce the number of rural poor people. The Institute of Statistics attached to the National Bureau of Statistics modified the Global Multidimensional Poverty Index made by the UNDP to measure multidimensional poverty by means of survey data on the income, expenditure and living conditions of 160,000 households in 1650 counties in 31 provinces of China. The results showed that in 2016, 3.3% of the population was in a state of multidimensional poverty, and 38.1% of the poor population did not meet the requirements in terms of education, health, and living conditions. Among them, the incidence rate of multidimensional poverty among the urban permanent population was 1.1%, and the population number was 7.86 million; the incidence rate of multidimensional poverty among the permanent population in rural areas was 5.9%, and the population number was 37.05 million; the rural deep and multidimensional poverty population in the central and western regions totaled 4.06 million people, accounting for 76.2% of the total deep multidimensional poverty population (Yilin & Jianliang, 2017).

Although the absolute income poverty for the population in rural areas, especially in deeply impoverished areas, has been solved, there is still a lack of education,

medical care, culture, and development opportunities, which manifests in the multi-dimensional form of poverty of capacity, poverty of health, poverty of information, and poverty of the rights. Therefore, the poverty reduction strategy after 2020 should focus on alleviating relative poverty, meeting the needs of multidimensional development on the basis of guaranteeing the basic right to subsistence of the poor, and taking the improvements of the poor's education, housing, employment, pension, and medical care as the work goal, namely expanding from the level of income and consumption to the level of development capabilities. Poverty reduction strategies and governance mechanisms have correspondingly been transformed from poverty alleviation to prevention of poverty and prevention of return to poverty.

1.3 The Scope of Poverty Reduction Has Shifted from Focusing on Solving Rural Poverty to Overall Planning Urban and Rural Poverty Alleviation

The poor population in China is mainly concentrated in rural areas; in recent years, poverty alleviation has greatly improved the infrastructure and public services there. However, with the acceleration of urbanization, an increasing number of farmers have gradually moved to cities and towns. Due to the restriction of individuals' abilities and dual urban–rural systems, many migrant workers are in a state of urban–rural mezzanine, and their right poverty, ability poverty, education poverty and other multidimensional poverty problems are prominent. Moreover, technological change and economic transformation are leading to a high incidence of poverty among the low-income groups in urban areas. According to the '2019 Migrant Workers Monitoring Survey Report' released by the National Bureau of Statistics, the total number of rural migrant workers nationwide reached 290.77 million in 2019, of which 72.3% had a junior high school education level or below; the number of rural migrant workers living in cities and towns reached 135 million at the end of the year, and 50.9% of the respondents reported that their children faced difficulties attending local public schools and enrolling schools and still paid high costs when they went to school in the city. It can be said that educational poverty increases the possibility of intergenerational continuation of poverty.

After the goal of building a well-off society in an all-round way comes true, the poverty problem will become more complex in both breadth and depth in China. Not only will it exist in rural areas, but urban poverty will also become increasingly prominent, and both rural poverty and urban poverty will be a long-term trend. To coordinate and promote the comprehensive management of urban and rural poverty reduction, it is necessary to expand the scope of poverty reduction from rural to urban areas, to solve the 'vacuum zone' of poverty governance of the floating population, to break the "fragmentation" of poverty alleviation work, and to form a system and mechanism of urban–rural integration and departmental coordination.

2   The Status and Role of Education in the Strategy of Alleviating Relative Poverty

After absolute poverty is eliminated in rural areas in 2020, the problem of complex relative poverty has become the main goal of anti-poverty. Of course, absolute poverty and relative poverty are not simple dichotomies; relative poverty includes certain 'absolute' factors, and relative poverty has the core of absolute poverty and the characteristics of relative deprivation (Xuewen, 2020). Generally speaking, insufficient capacity is the main cause of both absolute poverty and relative poverty. The control of absolute poverty and relative poverty can be regarded as two consecutive stages in the historical process of anti-poverty, most of the previous poverty reduction methods still have useful value for use, although they need to be given new connotations and expand or enrich the policy toolkit combined with the characteristics of relative poverty and governance goals.

International practice provides experience in solving relative poverty. For example, the 'Europe 2020 Strategy' put forward a clear goal of alleviating relative poverty. By 2020, the population at risk of poverty, that is, the per capita income level is 60% lower than the EU's per capita disposable income, would be reduced by 20 million from 80 million people. At the same time, it proposed three strategies for smart growth, sustainable growth and inclusive growth, including policy measures such as increasing employment, guaranteeing education, improving medical services, and improving social protection (Rong et al., 2014). The World Bank has long been committed to eradicating absolute poverty in developing countries and has proposed a 'three-pillar' strategy for inclusive growth (opportunity), basic public services (empowerment), and social security (protection) since the 1990s (Gill et al., 2016). Based on China's national conditions, domestic scholars put forward a 'three-pillar' strategic framework for solving relative poverty, specifically, including inclusive growth, equalization of basic public services and social protection (Xuewen, 2020). Therefore, the new poverty reduction strategies must focus on increasing employment, social inclusion, and social safety nets. Among them, labor employment services belong to the common field of inclusive growth, basic public services, and social protection; social insurance belongs to the common field of basic public services and social protection; basic public services include public education, employment and entrepreneurship, social insurance, medical and health, social services, housing security, culture, and sports. In addition to social insurance and social assistance, social protection includes training and employment promotion, employment assistance and other labor market intervention measures that constitute important parts of social protection. As the basic form of human capital investment, education investment can increase income levels, productivity, and employability and promote economic growth. It is a key factor for inclusive growth. As an important part of basic public services, the supply of public education not only increases individuals' assets but also gives individuals the feasible ability to transform these assets into welfare. It is an effective mechanism to resist vulnerability and build a social protection network under risky social situations. For individual, family, community,

and society, the benefits of education are extensive, including both monetary and nonmonetary benefits. It is the common field and foundation for inclusive growth, basic public services, and social protection (Table 2).

Education for anti-poverty alleviation is a fundamental policy for poverty alleviation in poverty-stricken areas. 'Poverty alleviation, intellectual aid first' determines the basic status of education for poverty alleviation; 'poverty alleviation, eliminating ignorance first' determines the leading function of education for poverty alleviation, and 'poverty alleviation, preventing return to poverty' determines the fundamental role of education for poverty alleviation (Chuantie, 2016). The mechanism of education for anti-poverty strategy is to improve the cultural quality and employment skills of the poor by empowering people to activate, develop and cultivate various potentials and form a multidimensional synergy of human capital, material capital, and social capital for a long-term mechanism to help reduce poverty.

2.1 Education Investment Is an Important Way to Achieve Inclusive Growth and Block the Transmission of Intergenerational Poverty

Inclusive growth is the 'pro-poor growth' that advocates equal opportunities and aims to completely break the vicious circle of poverty and the development pattern of polarization (Longlong & Jie, 2012). Human capital theory believes that economic growth depends on the level of human capital and is supported by education. Specifically, the human capital formed by education expenditure, health care expenditure, labor migration expenditure, etc. can promote the sustainable development of the national economy, it can be said that the main source of poverty lies in people's insufficient human capital investment. 'The current poverty is largely the result of setbacks in human capital investment opportunity' (Schultz, 1990). From a social point of view, insufficient public investment in human capital of the poor is one of the root causes of the poverty problem for a long time. From a family point of view, insufficient parental investment in education of their children is one of the reasons why the next generation continues to fall into poverty. The Indian economist Sen (Yangyang et al., 2018) believes that poverty is not only a low level of income but also a deprivation of basic feasible capability. He defines the feasible capability as a combination of various possible functional activities that an individual may achieve, mainly including a series of functions, such as the function of avoiding hunger and disease, the function of meeting nutritional needs, receiving education, and participating in social activities in the community. The loss of the functions mentioned above is the cause of poverty, and it is also a manifestation of poverty. Income poverty and ability poverty reflect the essence of poverty from two aspects: basic needs, which mainly reflect economic welfare, and basic ability, which shows what people can and can do. The ability perspective reveals the root of poverty and the path to poverty reduction from a deeper level. If low-income people do not have the

Table1 Dimensions and indicators for measuring poverty

Dimension	World Bank[a]	United Nations Development Programme(UNDP) [b]	Institute of Statistics [c]
Money(living standards)	Daily consumption < $1.9	·At least one of the household's three dwelling elements— floor, walls or roof—is made of inadequate materials ·The household does not own a car or truck and does not own more than one of the following assets: radio, television, telephone, computer, animal cart, bicycle, motorbike or refrigerator	·At least one of the household's three dwelling elements— floor, walls or roof—is made of inadequate materials ·The family does not own the corresponding assets
Infrastructure	·No access to basic-standard drinking water; ·No access to basic-standard sanitation ·No access to electricity	·The household has no electricity ·The household does not have access to improved sanitation ·The household does not have access to an improved source of drinking water ·The household cooks with dung, wood, charcoal or coal	·The household has no electricity ·The household does not have access to improved sanitation ·The household does not have access to an improved source of drinking water ·The household cooks with dung, wood, charcoal or coal
Education	·Any school-aged child is not enrolled in school ·No adult has completed primary education	·No household member of school entrance age(six years) or older has completed six years of schooling ·Any school-age child is not attending school up to the age at which he or she would complete class 8	·No household member of school entrance age(six years) or older has completed six years of schooling ·Any school-age child is not attending school up to the age at which he or she would complete class 8
Health and nutrition	·No facility delivery; No DPT3vaccination ·Any child is stunted; Any female is malnourished	·Any adult under age 70 years or any child for whom nutritional information is available is undernourished ·Any child under age 18 has died in the five years preceding the survey	·Some family members are unhealthy/cannot take care of themselves ·No labor among family members

Table 1 (continued)

Dimension	World Bank[a]	United Nations Development Programme(UNDP) [b]	Institute of Statistics [c]
Security	·Experienced or in threat of crime ·Affected by natural disaster		

Source a. Jolliffe et al., 2018; b, c.Yilin & Jianliang, 2018

Table 2 The benefits of education

	Individual/family	Community/society
Monetary	·Higher probability of employment ·Greater productivity ·Higher earnings ·Reduced poverty	·Higher productivity ·More rapid economic growth ·Poverty reduction ·Long-run development
Nonmonetary	·Better health ·Improved education and health of children/family ·Greater resilience and adaptability ·More engaged citizenship ·Better choices ·Greater life satisfaction	·Increased social mobility ·Better-functioning institutions/service delivery ·Higher levels of civic engagement ·Greater social cohesion ·Reduced negative externalities

Source World Bank (2018)

ability to increase their incomes, especially the ability poverty caused by low levels of education becomes an important limiting factor that hinders the poor from getting rid of poverty, even if they escape absolute poverty, they may return to poverty due to their lack of viable ability to resist new risks.

The establishment of a long-term mechanism for solving relative poverty requires China's poverty alleviation strategy to shift from 'poverty alleviation' to 'prevention of poverty', that is, to prevent the production and reproduction of poverty and block the intergenerational transmission of poverty. Because intergenerational transmission involves two groups, children and parents, intergenerational transmission of poverty is not only the inheritance of poverty but also the transmission of disadvantages that lead to poverty. The World Bank's report, *Fair Progress? —— Intergenerational Economic Mobility in Countries in the World*, based on a global database, found that intergenerational mobility summarized three channels between education and intergenerational mobility of income. First, parents' education affects their children's education levels and in turn affects their children's income; for example, educated parents are more inclined to invest in human capital for their children. Second, parental education affects the noneducational characteristics of their children; for example, educated parents help their children obtain better noncognitive skills, thereby increasing the income level of children. Third, the non-educational

characteristics of parents also have a continuous impact on children's income, such as the area where relatively wealthy parents live and the social capital they possess are better, which can provide better economic opportunities for their children (Xinbo et al., 2019). Parents obtain employment opportunities through education, supplemented by minimum wages and employment subsidies to ensure that employment income can help them eliminate poverty. At the same time, the increase in parental income provides a material basis for children to receive education. In addition, the governments provide cash subsidies such as child allowances to further ensure that the children successfully complete the accumulation of human capital, which is possible to reduce their ability poverty from an early age.

2.2 Equalization of Basic Public Education Services Is a Core Element for Advancing the Equalization of Basic Public Services and Eliminating Multidimensional Poverty

Education is an integral part of a broader economic, political, and social system that constructs and shapes the investment and return of education. Education can not only improve people's employment, income, and health, promote social participation, and increase social trust and tolerance but also may deepen the gap between advantageous and disadvantaged groups and widen social inequality. An educational anti-poverty strategy that equitably allocates educational resources empowers the poor the desire and ability to earn a living and helps them consciously get out of poverty and no longer return to poverty, thereby promoting social justice and harmony. Therefore, the equalization of basic public education services is one of the key elements of the equalization of basic public services set as institutional arrangements to ensure that all citizens have fair access to basic public services. These basic public services involve certain needs from birth to death, such as education, labor, employment and entrepreneurship, social insurance, medical and health care, social services, housing security, culture, and sports, which are regarded as citizens' basic rights enjoyed and the government's important responsibilities provided. In particular, educational equity is an important foundation for social equity, so as to achieve the equalization of basic public services, it is necessary to take the lead in achieving the equalization of basic public education services, and strive to improve the balanced allocation mechanism and service quality of public education resources supported by taxation and finance, more children from poor families can receive the best education to better achieve the effect of promoting social equity.

Due to the important relationship between education and the labor market, education is constructed as an important part of multidimensional poverty measurement. According to the data provided by *China Rural Poverty Monitoring Report 2019*, grouped by the education level of the head of the household, the incidence of poverty is inversely proportional to the education level of the head of the household, and the

incidence of poverty is relatively higher for groups with lower education levels of the head of the household. In 2018, the education level of rural household heads classified as illiterate, elementary school, junior high school, high school and above, and their poverty incidence rates were 6.5%, 2.4%, 1.2%, and 0.9%, respectively. The improvement of education level can effectively reduce the incidence of poverty of farmers, and it has a particularly significant effect on increasing the participation rate of non-agricultural work and income level of low-income groups. By using the 2015 data of the China Comprehensive Social Survey (CGSS), Hua and Mei (2019) constructed a relative poverty measurement indicator system that includes four dimensions and 15 indicators, such as health, education, living standards, and social identity, and found that the degree of multidimensional deprivation declines with the increase at education level in China, and education level and multidimensional poverty are inversely related. After decomposing the poverty index, they found that education has the largest cumulative contribution rate to multidimensional poverty and has a significant reduction effect on multidimensional poverty; more importantly, compulsory education has the largest effect on poverty alleviation, and high school education becomes the turning point in the elimination of multidimensional poverty. It is worth mentioning that poverty funding and compensation mechanisms of basic education and higher education can avoid the phenomenon of 'returning to poverty by education' or avoid the expected cost of higher education for the people who have been lifted out of poverty and can increase the probability of the multidimensional poor people getting out of poverty through education. By using public education investment to solve multidimensional poverty and to break the vicious circle of poverty caused by insufficient education, it also has fundamental and sustainable advantages for solving relative poverty. With the continuous improvement of the poor's education levels, workers are more likely to choose higher-income occupations and improve their individual economic capabilities, which makes it possible to reduce multidimensional poverty to a greater extent.

2.3 Educational Assistance Is an Effective Mechanism to Improve People's Sustainable Development Ability and Build a Social Protection Network

With the development of the social economy and technology, the connotation of the basic needs of human life continues to expand, and the sustainable livelihood, vulnerability, and social exclusion of the poor have become increasingly prominent. At the same time, with the emergence of fiscal expenditures and welfare dependence crises in the traditional welfare state system, a series of new changes and characteristics have emerged in anti-poverty policies worldwide, especially in the developed countries. For example, the anti-poverty policy objectives have ranged from overcoming income poverty to opposing social exclusion; anti-poverty contents have been extended from anti-material poverty to anti-cultural poverty and anti-spiritual

poverty; anti-poverty subjects have increased from government as the main body to a combination of multiple entities such as government, enterprises, and social organizations ; Anti-poverty methods range from providing life assistance to strengthening capacity, building assets, and offering education assistance and employment guidance. Compensatory welfare policies are substituted by active labor market policies (Yingsheng & Qi, 2009). In sum, a social safety net with security, relief, and assistance as the main contents, including minimum living security, medical security, old-age security, disaster relief, life assistance, education assistance, employment promotion, and risk management, requires or even compels all beneficiaries with labor capacity of participating in education and training to enhance their willingness and ability to obtain employment and to establish a 'welfare-to-work' system based on the improvement of the self-development capabilities and sustainability of the poor, which is not only conducive to relieving temporary poverty and eliminating welfare traps but can also reduce the risk of cyclical intergenerational transmission.

Education is essential for alleviating poverty, economic growth, and sustainable development. The United Nations General Assembly Document 'Transforming Our World: the 2030 Agenda', promised to 'eliminate poverty in all its forms and manifestations', and ensured inclusive and fair quality education and opportunities for life-long learning provided for all people. Therefore, it is imperative to design an educational anti-poverty strategic framework with the improvement of people's sustainable development capabilities as the core. In China, under the context of the in-depth development of modernization, informationization, marketization and urbanization, farmers, especially poor farmers, encounter natural risks, market risks, technological risks, and social risks during market transformation and social changes, and the weakening of their capabilities, loss of power, social exclusion, relative deprivation, etc., will have a great internal impact on the anti-poverty process and political and social stability. Regarding implementing the anti-poverty strategy, the key is to guide poor people into the process of marketization and modernization and involve them in the poverty alleviation policy system and social protection mechanism, especially for new types of poor groups such as left-behind farmers, land-lost farmers, rural migrant workers and new citizens in the city in a timely and orderly manner with education and training empowerment. By continuing to strengthen the role and function of 'Developing Education to Alleviate Poverty', which will empower the poor with productive human capital such as knowledge and skills, as well as comprehensive human capital such as habits, vision, resources, and belief, it is to achieve long-term anti-poverty effects.

3 The Construction of an Education Policy System for Alleviating Relative Poverty

After the well-being society in an all-round way comes true, relative poverty, multidimensional poverty, and both urban and rural poverty have become the main manifestations of China's poverty problem, the root cause and crux of the new type poverty lie in insufficient and unbalanced development. Therefore, the establishment of a long-term mechanism for solving relative poverty requires accounting for poverty lines, defining and identifying multidimensional poverty, and designing social protection mechanisms, which will more fully reflect and meet the multilevel and diversified needs of the people. At the same time, according to the changes in the attributes of poverty and the characteristics of poor groups, the focus of implementing the education antipoverty strategy is to establish and improve the education public service system with universal coverage, inclusive sharing, and urban–rural integration, and promote the equalization of basic public education services, so that the poor can obtain anti-risk capacity and sustainability to achieve endogenous development in poverty-stricken areas.

3.1 Building an Education System that Serves the Lifelong Learning and Development of People

To date, China's national education system based on formal school education has become increasingly perfect, and all levels and types of education continue to increase access to people. For example, compulsory education has been universal overall, pre-education and up-secondary education have been nearly universal, and higher education is entering the popularization stage. All these achievements have laid a solid foundation for alleviating poverty and promoting social equity. *The Communique of the Fourth Plenary Session of the 19th Central Committee of the Communist Party of China* (CCCPC, 2019) proposes that it is necessary to accelerate the development of a more open and flexible education system that is oriented to everyone and suitable for everyone, which is leading to a learning society.

Building a lifelong learning system not only needs to improve the whole life cycle education service system but also needs to provide unique and flexible solutions for the special needs of different groups. The focus is to improve the coordinated development mechanism of basic education, vocational education, higher education, and continuing education. The key is to improve the system of enrollment, flexible learning, and the certification and transfer system of learning achievements, so as to provide students who leave school prematurely and lack skills with the second opportunity to receive continuing education, to guide and persuade over-aged students and junior high school graduates to receive secondary vocational education in the compulsory education stage, and to encourage more high school graduates who have not admitted, veterans, laid-off and unemployed workers, rural migrants, and new-type

vocational farmers to enter vocational schools and higher education institutes and rely on skills to achieve higher quality and fuller employment and get rid of poverty.

To eradicate poverty from its root causes, the most effective intervention should focus on early childhood development and education, which opens a window of opportunities for children's human capital investment. Increasing research results in various disciplines, including neuroscience, developmental psychology, economics, and other disciplines, show that the earlier interventions for children from low-income families are made, the better the effects produce. Early education investment has extremely high economic and social benefits, not only is the human capital investment rate of return the highest but also can reduce the cost of solving social problems, play an early preventive effect on reducing poverty, crime, various social contradictions, and conflicts, improve children's academic performance in the short term, and in some cases, improve children's lifetime opportunities (Cancian & Danziger 2014). Therefore, increasing investment in early childhood development and education, especially preschool education interventions for poor children, should be listed in the national anti-poverty strategy as soon as possible. What we should do next is to accelerate the completion of shortcomings in care services for infants and children under 3 years of age, to popularize quality preschool education, to build a family education guidance service system covering both urban and rural areas, and to establish a public service system for preschool education with wide coverage, basic protection, so as to ensure children grow with physical and mental health, and to prepare for enrollment and lifelong learning and development.

3.2 Implementing Regional Education Policies that Promote the Development of Underdeveloped Areas and Rural Revitalization

In China, poor areas, especially contiguous and extremely poor areas, have poor geographical conditions and resource endowments. Even after achieving the goal of alleviating poverty, there is still a gap in the level of economic and social development with other regions, and they may still be relatively poorly concentrated areas. Although it is no longer appropriate to continue to adopt the method of identifying poor counties to implement support policies, it is still necessary to formulate and implement development policies for underdeveloped regions, taking comprehensive consideration of relative poverty incidence, basic public service levels, per capita income of residents, per capita fiscal income, and other indicators to delineate the underdeveloped areas. To promote the integration of poverty alleviation and rural revitalization, it is necessary to extend the current poverty-stricken county policies into the development policies of underdeveloped areas to quickly reduce the gap in social public services such as education and health and to use rural education to drive rural industries and cultural and social revitalization.

Establishing and improving public education service systems should focus on the equalization of basic public education services. The first is to give priority to the development of rural education. It is extremely important to quickly fill the shortcomings of rural education, strengthen the construction of inclusive and affordable kindergartens, do a good job in improving small-scale rural schools and township boarding schools, and support the construction of ordinary high schools and county-level vocational education centers so that the poor can obtain sustainable livelihoods and reduce the return to poverty.

The second is to strengthen the construction of rural teachers in underdeveloped areas and the degree of co-sharing of public resources. What we should do is to better the systems and mechanisms of coordinating the development of regional education and the integrated development of urban-rural compulsory education, prioritize the reduction of regional and urban-rural education quality gaps, pay more attention to the improvement of software elements such as teacher qualifications and school management and greatly increase the level of rural teachers' remuneration. To strengthen the capacity of the teams of rural teachers, an effective way is to promote the co-construction and sharing of high-quality educational resources between urban and rural areas, developed regions and underdeveloped through all forms of cooperation, such as counterpart assistance, school alliances, teacher exchanges and 'Internet + Education'. In addition, it is imperative to promote the full coverage of basic education public services and realize the same right of enrollment for the children of migrant workers in cities.

The third is to pay attention to the endogenous development of rural education. As part of rural communities, rural schools should be integrated and become cultural centers in rural communities. Rural teachers will not only take on the responsibility of rural education but also become the backbone of rural social and cultural construction. At the same time, the function of rural schools should be extended to develop rural-oriented vocational education and training for urgently needed talent and new-type professional farmers that adapt to the need for local economic development to guide the transfer of the rural labor force to city for employment and promote agricultural and rural modernization.

3.3 Improving the Developmental Social Policies of Mutual Promotion between Education and Multidimensional Poverty Alleviation

Education is a key factor that constitutes social policies, and educational anti-poverty strategy is a kind of developmental social policy that enhances the role and ability of humans. On the one hand, education has an effect on reducing multidimensional poverty. Better education can promote employment, increase income, improve health, expand political participation, accumulate social capital, and improve the natural environment to achieve multidimensional welfare improvements. On the other hand,

due to the lack of materials and resources, the unbalanced food supply, malnutrition of children, growth retardation and other prominent problems in poor areas, systematic and inclusive social policies are adopted to provide poor children with a full range of health and care. Such supporting policies as nurture, parenting, education, and employment will help break the vicious circle of poverty-stunting-ability poverty-lifelong poverty-intergenerational transmission.

Influenced by complex factors such as resources, abilities, and circumstances, the needs of poor people of different ages and types of education are often very different, and it is necessary to implement policies for different groups of people. The first is to select more diverse and accurate relative poverty identification indicators and adopt corresponding poverty alleviation policies. Considering the comprehensive consideration of regional development, interschool differences, health status of family members, housing conditions, physical and mental conditions of the school-age population, etc., we construct a dynamic multidimensional poverty identification system and registration system. While focusing on children from poor families in general, we should also pay more attention to those special rural children who have psychological, autistic, and frailty problems, as well as speech, emotional, and learning obstacles, and establish a sound support system for students with learning difficulties, including differentiated allocation of educational funding for schools or individuals with special needs.

The second is to expand the content and projects of basic public education services. We should continue to increase education funding for students from families with financial difficulties, implement the nutrition improvement plan for rural compulsory education students, moderately expand to a wider range of rural and urban students with financial difficulties, and provide school bus services or transportation subsidies in areas where financial conditions permit. Moreover, it is necessary to provide comprehensive professional care in nutrition, health, and psychology for students with financial difficulties, disabled children, left-behind children, children of migrant workers in cities, and students with learning difficulties. Considering the importance of pre-education, we should improve the pre-school education subsidy system, take the lead in implementing free pre-school education in rural areas and the central and western regions, and encourage local governments to implement pre-school education and infant nutrition improvement plans.

The third is to strengthen the implementation of developmental assistance policies. We should continue to implement the special plan for targeted enrollment of higher education in rural and poor areas, more importantly, ensure the preferential enrollment policies should focus on precise population positioning, and target the beneficiaries based on multi-dimensional standards such as student family income, parents' education status, and education quality of the school. In addition, expand the population coverage sharing the policy benefits from rural to urban areas, and from impoverished areas to all areas. It is necessary to increase the effective linkage of enrollment, training, and employment, improve the financial assistance policy system for students with financial difficulties from families, and provide employment guidance, counseling and employment assistance for their chances of obtaining quality

jobs. For low-income groups with working ability, production bonuses, labor subsidies, relief-for-work, training subsidies and other methods should be brought to help them through training and work in exchange for assistance and to eliminate poverty and become rich through hard work.

3.4 Improving the Education Poverty Alleviation Governance System with the Collaborative Participation of Multiple Subjects

Eliminating relative poverty is destined to be a protracted war, and we should learn and fully use the experience and system formed in the fight against absolute poverty. What to do next is to improve the poverty governance system with Chinese characteristics, including the responsibility system, policy system, investment system, work system, mobilization system, supervision system and assessment system. In China, it is an important prerequisite to strengthen the Party's leadership over the governance of relative poverty and give full play to the leading role of the government, which effectively assumes the responsibilities of target integration, policy making coordination and overall planning, and supervision and accountability. Obviously, increasing financial investments in alleviating poverty is the main task of the central and local governments to build an educational welfare system combining inclusive and preferential policies. The objects of educational supply cover more social groups, expanding from the rural poor groups to the physically and mentally handicapped, ethnic minority groups, migrants and their children, urban low-income people, and other disadvantaged people. Fundamentally, the country should invest greatly in education to provide all members of society with fair and quality education to the greatest extent.

The improvement of social governance efficiency is an important guarantee for alleviating poverty. The new poverty reduction governance pattern should not mainly rely on governments but a variety of social forces, especially the poor themselves, who are the mainstay of solving the problem of relative poverty. We must focus on stimulating the willingness of low-income families to invest in human capital so that they can invest in their children's education earlier and with higher priority. We should continue to implement education 'counterpart support', 'east-west collaboration', 'designated assistance' and other measures, encourage and support social groups, nonprofit organizations and various enterprises and institutions to participate in the educational development of underdeveloped areas, and strengthen the combination of education and industry, social organizations to provide more flexible and diverse public education services, in which society, markets, schools, and individual citizens cooperate and complement one another under the leadership of the governments.

4   Conslusions

With the resolution of absolute poverty in 2020 and the new pursuit of a better life, the problem of relative poverty has become prominent and will exist for a long time. Compared with absolute poverty, relative poverty shows new characteristics, for example, it emphasizes not only meeting the most basic living standards but also reducing the gap with the average living standards of society, focusing on solving the problem of unbalanced development and insufficient development. It is not enough to count on welfare at the economic level only but essential to take into consideration the relative inadequacy of nonmonetary public services and social protection. Thus, we should build multidimensional poverty standards that meet people's living and development needs, such as food, clothing, housing, transportation, education, medical care, social security, and development opportunities, and they are compatible with the realization of socialist modernization and the goal of common prosperity. The new poverty reduction strategy will alleviate social inequality by gradually achieving inclusive growth, advancing the equalization of basic public services, and establishing social protection mechanisms.

Education has a basic, leading, and continuous role in poverty alleviation. Investment in education has a wide range of benefits to individuals, families, communities, and society. These benefits can be divided into economic returns and noneconomic returns in form, including explicit returns and implicit returns in nature. The essence of the education anti-poverty strategy is to provide the poor with knowledge, skills, habits, vision, beliefs, and other comprehensive human capital to fundamentally cultivate and strengthen the viable and sustainable development capabilities for preventing poverty or preventing the return to poverty, in which the key is to establish the poor's rational perception and expectation of the return on education and then to develop the willingness to participate in education.

Among the three strategic pillars for solving relative poverty, education is the common field and foundation for inclusive growth, basic public services, and social protection. Educational investment is an important way to achieve inclusive growth and block the intergenerational transmission of poverty. The equalization of educational services is the core element of advancing the equalization of basic public services and eliminating multidimensional poverty. Educational assistance is an effective mechanism to improve people's sustainable development ability and build a social protection network.

Under the framework of the poverty reduction strategy focusing on prevention of poverty, the educational policy system can be established as follows: to construct an education system that serves the lifelong learning and development of the whole people at the entire life cycle and the critical period of growth and development; to implement policies to promote the development of underdeveloped areas and revitalize rural education; to focus on the construction of a comprehensive social assistance system that promotes education and multi-dimensional poverty improvement each other; to focus on poverty reduction governance changed from centralized to conventional with the coordinated participation of multiple subjects.

To establish a long-term mechanism by means of education for alleviating relative poverty, it is necessary to deepen academic research and the development of new policy tools and to clarify the boundaries of the anti-poverty function of education, what can be done and what cannot be done. More importantly, we should strengthen the quantitative measurement of the impacts of educational poverty alleviation on multidimensional poverty, strengthen the empirical research on the intergenerational transmission of poverty by education deprivation and education level, and strengthen the experimental research on random intervention of policies in the field; thus, we can only provide empirical evidence and reference basis for relevant policy formulation, implementation, and improvement.

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Poverty Alleviation Through Education: China's Approach and Its Significance to the World

Liping Yuan and Yashi Ding

Abstract Poverty alleviation through education is an important part of poverty alleviation with Chinese characteristics. Since the founding of the (PRC), the country's poverty alleviation through education has experienced periods such as policy formulation, top-level design, connotation transformation, and the consolidation of the results of poverty alleviation based on exploration. In terms of the implementation plan, China has taken action to ensure that poverty-stricken people have chances to receive education, can afford to receive education, receive good education, and reap rewards from education. In practice, China has gained experience in poverty alleviation through education with Chinese characteristics, such as the combination of institutional and political advantages, positive interactions between poverty alleviation and intellectual and ideological support, the integration of targeted poverty alleviation and educational equity, and the connection of institutional innovations with strategic reforms. China thus makes new contributions to the global governance of poverty, demonstrating its new charm, new modes, new ideas and new approaches.

Keyword Poverty alleviation through education · Chinese approach · Chinese experience · Significance to the world

Eliminating poverty is the common mission of all human beings. China's poverty management is a great feat in human history. Since the founding of the People's Republic of China, the Communist Party of China (CPC) has led the Chinese in a continuous war against poverty. By the end of 2019, China's rural poverty-stricken people had been reduced from 98.99 million at the end of 2012 to 5.51 million, which is a cumulative decrease of 93.48 million. The poverty incidence rate dropped from 10.2% in 2012 to 0.6%, a cumulative decrease of 9.6 percentage points. China become the first country to achieve the UN Millennium Development Goals (MDGs), which has accelerated the process of global poverty reduction and makes an outstanding contribution to the cause. Over the past 70 years, China's poverty alleviation cause has undergone a historic transformation from "crossing the river by feeling the stones" to

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form a unique new chapter of poverty alleviation historic transformation. Education is a powerful tool for poverty alleviation and remains a direct attack on the source of poverty. The project of poverty alleviation through education has been continuously developed and improved in the process of exploration, creating a magnificent new prospect for poverty alleviation in China. As one of the few countries has managed to eliminate the poverty trap, China's successful experience in poverty alleviation has inspired many countries. Summarizing China's approach and experience of poverty alleviation through education and explaining its significance to the world are important measures to tell the story of poverty alleviation through education and construct the discourse system of poverty alleviation through education, so as to contribute China's wisdom and strength to the global cause of poverty alleviation.

1 The Course of History of Poverty Alleviation Through Education in China

Poverty alleviation through education is one of the key tasks of poverty alleviation in China and an important part of poverty alleviation caused by Chinese characteristics. Poverty alleviation through education combines education with poverty alleviation and endows it with double connotations. From the perspective of education, poverty alleviation through education means helping poverty-stricken areas in education eliminate poverty by means of policy allocation and resource tilt, which sees education as the main position. From the perspective of poverty alleviation, poverty alleviation through education means eliminating poverty through education, which opens a new path for poverty-stricken people to ultimately feed their families and return society by mastering knowledge and developing ability, which sees education as the fundamental way of poverty alleviation. With the deepening of China's poverty alleviation cause, the fundamentality, leading and sustainability of education playing a role in the targeted poverty alleviation system have become increasingly significant. Poverty alleviation through education has gradually developed from a supporting role to a fundamental solution. It has mainly experienced four historical stages.

1.1 Out of Survival Poverty: the Period of Poverty Alleviation Through Education Policy Formulation in Poverty-Stricken Areas

When the People's Republic of China was founded, China's total social production value was only 55.7 billion yuan, of which 59 percent was agricultural output value. At that time, national income per capita was only 66 yuan (National Economy Balance Statistics Division, 1987). It was an indisputable fact that the citizen was in a state of

marked poverty. In the face of poverty and backwardness, there is an urgent need for China's development to vigorously restore production and solve the universal poverty problem. In this social and economic background, China's education urgently needed to be revitalized: educational levels were low, with only 20 percent of school-age children enrolled. The cultural quality of the population was poor. More than 80 percent of the country's population was illiterate, and the illiteracy rate in rural areas was close to 95 percent (Gao, 2019). There was a huge gap in the reserve of talent needed to revive the national economy. Since the founding of the People's Republic of China, the state has attached great importance to the concept of poverty alleviation through education in its governance measures. Before the reform and opening-up, the policy of poverty alleviation through education was designed, and it was mainly combined with the development of rural education and literacy education.

First, the educational aim of serving for people provides a legitimate basis for poverty alleviation through education. In December 1949, the first National Conference on Education was held in Beijing, and the conference clearly stated that education must "serve for people, for workers and peasants, and for the current revolutionary war and construction" (Ministry of Education of People's Republic of China, 2019). This purpose and nature of education provides a fundamental direction for poverty alleviation through education, clarifies the historical mission and responsibility of education in poverty alleviation cause and establishes that the core of poverty alleviation cause in education during this period is to universalize education and focus on serving the masses of workers and peasants.

Second, literacy education should be promoted to provide approaches for poverty alleviation through education. Literacy education is the basic right of every citizen to receive education (Research Group of Literacy Education in China, 1997). National cultural quality restricts the development of countries and individuals, and a high illiteracy rate is a symbol of low national cultural quality. In September 1950, the Ministry of Education and the All-China Federation of Trade Unions (ACFTU) jointly held the First National Conference on Education for Workers and Peasants in Beijing, calling for vigorous efforts to carry out literacy education, which set a precedent for literacy education in China. Therefore, the illiteracy rate among young adults in China dropped sharply from 80% to 18.5% in 1978. The Chinese successfully won the battle against illiteracy, and the improvement of farmers' educational level alleviated rural poverty to some extent (Liu & Liu, 2018).

Third, basic rural education should be universalized to point out the focus of poverty alleviation through education. In the founding of the People's Republic of China, there are hundreds of millions of educational people, and inadequate state finance directly leads to the insufficiency of funds for the development of education. To meet more educational needs in a poor country, China created a mode of running education for all in rural areas, which was subsidized by the government and shared by the public funds of the communes. By 1978, the average enrollment rate of school-aged children have reached 95.5%. Compulsory education in rural areas has been developed, and the level of human resources in rural areas has been raised. During this period, the state regarded education as the right of people to be their own masters and devoted itself to providing the workers and peasants and their children

with the opportunity and right to receive education. This measure of China contains a profound idea of poverty alleviation through education.

During this period, poverty alleviation through education primarily made remarkable achievements in universalizing education, which enhanced the development ability of poverty-stricken people and laid a solid foundation of talent for social and economic development in poor areas. It should be mentioned that although China had not issued a special policy or action program for poverty alleviation through education in this period, it creatively put forward a series of universally beneficial guidelines for education development in the process of exploration. These guidelines promoted education in rural areas and expanded people's opportunity to receive education. The preliminary accomplishment of universalizing education enhanced the development ability of poverty-stricken people, laid a foundation of talent for social and economic development in poverty-stricken areas, and laid a foundation of a system for alleviating poverty through education. This was the design period for the policy of poverty alleviation through education.

1.2 Eliminating Subsistence Poverty: The Period of Poverty Alleviation Through the Education System Is Embedded in the Top-Level Design (1979-2000)

The problem of universal poverty in China has been significantly improved by the broad poverty alleviation cause in the early years of the founding of the People's Republic of China. By the end of 1978, 250 million poverty-stricken people in rural areas in China had not yet gained enough food and clothing (Rural Social and Economic Survey Team, 2004). Solving the problem of subsistence poverty, characterized by basic survival, has become the primary task of anti-poverty in this period. A key turning point in China's economic and social development took place in 1978. The Third Plenary Session of the Eleventh CPC Central Committee opened the prelude to the reform and opening-up. China's economic construction made great achievements, which laid a necessary material foundation for the development of poverty alleviation through education. In the impetus of economic development, China's poverty alleviation through education officially causes lands and ushers in the first development peak, beginning to enter the period when poverty alleviation through the education system is embedded in the national top-level design.

First, poverty alleviation through education has officially become the national will. In September 1984, eliminating poverty was first proposed as a special national policy in the *Notice on Helping the Impoverished Areas to Change their Appearance as Soon as possible* (hereinafter referred to as the *Notice*) jointly issued by the CPC Central Committee and the State Council. The *Notice* clearly pointed to developing and universalizing primary education in poverty-stricken areas to increase intellectual investment in poverty-stricken areas and improve the quality of poverty-stricken

people. This is the first time that the concept of poverty alleviation through education clearly appeared in the official document, which indicates that the construction of poverty alleviation through the education system has attached great importance (Zeng, 2018). In May 1986, the Leading Group for Economic Development in Poverty-stricken Areas of the State Council was established, which was officially renamed the Poverty Alleviation and Development Group of the State Council in December 1993. It is jointly carried out by the Ministry of Education, the General Office of the State Council, the National Development and Reform Commission, the Ministry of Finance, the Ministry of Science and Technology and other relevant departments. To date, the organizational structure of poverty alleviation through education in China has been basically completed.

Second, China formally defines the objection of poverty alleviation and plans the technical path of poverty alleviation through education. As the distribution of poverty in China gradually evolves from universal to subregional, the national strategy of poverty alleviation through education is also adjusted in time. In the *Notice,* the pointed out that the current situation in rural areas is good, so it is of great significance to solve the poverty problems in remote and poor areas. At the same time, the *document* clearly put forward the guiding ideology of concentrating efforts to solve a dozen contiguous impoverished areas. In March 1994, the State Council issued the *National Seven-year Plan for Poverty Alleviation* (hereinafter referred to as the *Plan*) as a programmatic document for the stage of China's poverty alleviation and development project. In the *plan,* the state designated 592 key poverty-stricken counties to be supported, made it clear that the focus of China's poverty alleviation through education caused in 1994, and laid out a technical roadmap for improving the development potential of poverty-stricken areas and the development capacity of poverty-stricken people from 1994 to 2000, starting with specific programs such as basic popularization of primary education, elimination of illiteracy and carrying out technical education and training. The *plan* outlined a substantive operational mechanism for the formal implementation of poverty alleviation through education.

Third, focus on quantity and continue to improve the popularization of basic education. For poverty-stricken people, ability poverty acts as a shackle that causes them to sink into poverty. To guarantee poverty-stricken people access to resources and rights out of poverty, the key to China's poverty alleviation through education at this stage focused on universalizing basic education and guaranteeing compulsory education. In December 1980, the Central Committee of the Communist Party of China and the State Council issued the *Decision on Several Issues Concerning Universalized Primary Education*, which clearly set the historical task of basically achieving universalized primary education throughout the country and universalized secondary education in areas where conditions permit in the coming ten years. In May 1985, the *Decision of the Central Committee of the Communist Party of China on the Reform of the Education System* (hereinafter referred to as the *Decision*) was issued, which stated that all efforts should be concentrated to implement nine-year compulsory education step by step. The *decision* provided an institutional guarantee for increasing education coverage. From 1995 to 2000, the Ministry of Education and

the Ministry of Finance launched the first phase of the National Compulsory Education Project in Poverty-stricken Areas, successfully implementing the largest scale of poverty alleviation project for basic education since the founding of the People's Republic of China in two phases in more than 800 poverty-stricken counties in 22 provinces and municipalities.

During this period, China's poverty alleviation through education was able to operate in the framework of the national top-level system and achieved unprecedented achievements. Data from the *China Rural Poverty Monitoring Report 2000* show that in the 1999 poverty standard, the incidence of poverty among those with less than primary school education was 48% and that of those with a high school education or above was 25.7%. (Rural Social and Economic Survey Team, 2000) The incidence of poverty decreases obviously with increasing education level. By 2000, the problem of food and clothing for poverty-stricken people had been basically solved, nine-year compulsory education had covered more than 85 percent of the population (Hao & Yang, 2010), and education had contributed significantly to poverty alleviation. However, poverty governance in this period was mainly based on resource input to guarantee the absolute right to life of the poor, and poverty alleviation through education focused on achieving popularization of different degrees at the level of basic education, while the emphasis on quality and other aspects of education development remained to be strengthened.

1.3   Responding to Development-Oriented Poverty: A Deepening transformation Period of the Connotation of Poverty Alleviation Through Education (2001-2012)

To solve the problem of subsistence poverty of the rural population during the period of reform and opening-up, China has carried out the development strategy of letting Some Be Rich First then Most. By 2000, the problem of food and clothing for poverty-stricken people in China was basically solved. But there was still room for improvement. During this period, the poverty situation in China presented new features. During this period, the poverty situation in China presented new features: the gap between the rich and poor was widening, and the relative problem of poverty was prominent. These are reflected in the field of education. With the basic right of education for the poverty-stricken people guaranteed in China, the poor are seeking to receive high-quality education to achieve better self-development. The goal of poverty alleviation through education in China began to leap from ensuring poverty-stricken people to achieve survival to promote their development.

First, the connotation of poverty alleviation through education has transformed and upgraded. The measure of reducing living poverty is based on people's living line, which directly points to the problem of people's survival. The measure of development-oriented poverty is based on the standard of the average living and

development level of society and directly points to the problem of human development. As the development-oriented poverty legitimate demands for education have long been unable to be met, the lack of knowledge and skills restricts the development space of the poor population, making them gradually marginalized by society. Therefore, poverty alleviation through education attaches great importance to relieving the problem of development-oriented poverty and is devoted to providing the poor with better treatment in terms of access to educational resources through more favorable policies and other means to strengthen their sense of gaining and happiness and meet their demands of pursuing development.

Second, the development type of poverty alleviation is the basic strategy for reducing poverty. Different from relief poverty alleviation, which solves the most basic living conditions of the poor, development-oriented poverty alleviation solves the problem of how to promote the development of poverty-stricken people and narrow the living gap between them and society. Therefore, at this stage, China adopted the strategy of development-oriented poverty alleviation through education, which is based on improving the quality of schools and providing students in poverty-stricken areas with more opportunities to receive high-quality education. We regard education as the main means to stimulate the endogenous force of poor people and pay attention to the development and accumulation of the ability of poor people to develop themselves so that they could eventually get rid of poverty and become rich by their own efforts.

Third, prioritize quality and promote education equity. Equity and quality are the core themes of global educational development. During this period, China's education on reducing poverty focused on improving the quality of education in poverty-stricken areas, expanding the supply of high-quality educational resources, and promoting the balanced development of education. During this period, China's poverty alleviation through education focused on improving the quality of education in poverty-stricken areas, expanding the supply of high-quality educational resources, and promoting the balanced development of education. In September 2003, the State Council formulated and issued the *Decision on Further Strengthening Rural Education*, emphasizing the important position of rural education in the construction of a well-off society in an all-round way. With the obvious existence and widening trend of the educational gap between urban and rural areas at that time, the paper proposes to deepen the reform of education and teaching in rural areas, improve the quality of education, and strives to improve the conditions of running schools in poverty-stricken areas.

In 2005, the government gradually carried out the policy of Two for Free and One for Supplement for key poverty-stricken counties. In 2006, the Leading Group Office of Poverty Alleviation and Development of the State Council launched the Rain and Dew Plan for poverty-stricken areas, which helped to improve the education and literacy level of poverty-stricken people at various levels. To date, the focus of China's poverty alleviation through education has changed from support to development. The policy of poverty alleviation through education focuses on the promotion of education quality and education equity with balanced development as the core and considers the general improvement of the education level and development potential of the

poor. During this period, China was in the stage of transformation and upgrading of the intention of reducing poverty through education. Education is regarded as the goal and means for the poor to achieve development, which is in harmony with the intention and needs of relieving development-oriented poverty. And this injects new and powerful vigour into the education development and poverty intention cause.

1.4 Cracking the Problem of Returning to Poverty: The Period of Consolidating Poverty Reduction Achievement (2013 so Far)

Poverty is a long-term problem. Therefore, eliminating poverty cannot be accomplished overnight. After the elimination of absolute poverty and the solution of basic living problems, the problems of relative poverty and development, as well as the problem of returning to poverty, still exist. Poverty is a complex problem, which means that its causes and distribution are complex and varied. The year 2013 was an important turning point for poverty alleviation through education in China. With the deepening of the poverty alleviation cause, the strategic role of education has become increasingly prominent. In addition, the development of poverty alleviation through education has entered a fast lane, and its legal status has been enhanced unprecedentedly. In this period, China was mainly devoted to establishing a precise and long-term mechanism for poverty alleviation through education.

First, poverty alleviation through education is seen as the key to eliminating the source of poverty. In September 2015, Xi Jinping replied in his letter to the Training Class of Teachers from Guizhou in Beijing Normal University, "Poverty alleviation requires intellectual support. Enabling children in poverty-stricken areas to receive good education is an important way to block the intergenerational transmission of poverty". Compared with exogenous poverty alleviation, education is an endogenous way to eliminate poverty because it can enhance the internal development motivation and ability of the poor. Poverty alleviation through education can effectively prevent people from falling into poverty again due to the interruption of resource input and block the intergenerational transmission of poverty culture. Therefore, education plays a long-term and fundamental role in poverty alleviation.

Second, targeted poverty alleviation through education is the fundamental principle for poverty reduction. In July 2013, the Ministry of Education, together with six other ministries, issued China's first special policy for poverty alleviation through education---Opinions on the Implementation of Poverty Alleviation Project through Education, in which the scope of the project is defined as contiguous impoverished areas. In December 2016, the Ministry of Education, together with five other ministries, issued the 13th Five-Year Plan for Poverty Alleviation through Education, which made it clear to use the concept of targeted poverty alleviation through education, created extraordinary policy measures, precisely targeted the weakest educational field and the most impoverished groups, precisely docked educational

resources to the actual demand of poverty-stricken populations and poverty-stricken areas, and implemented the policy of poverty alleviation through education according to different levels and objects.

Third, people should be put, and poverty alleviation should be promoted omnidirectionally through education. Targeted poverty alleviation through education is a comprehensive poverty elimination activity that aims at improving the human capital and productive skills of the population below the poverty line (Duan & Yi, 2018). People are the connecting point of education and poverty alleviation, and people in poverty are the starting point of poverty alleviation through education, and people with free development are the terminal point of poverty alleviation through education (Liu & Xu, 2016). Therefore, poverty alleviation through education in this period was centered on satisfying the demand of the impoverished population and focused on building their capacity. Additionally, to strengthen the contribution of education to individual poverty alleviation, education in this period mainly extended from vocational education and basic education to both ends of preschool education and higher education, including special education.

Since 2013, the status of poverty alleviation through education has risen to an unprecedented height in national poverty alleviation policies. Poverty alleviation through education takes the impoverished population as the subject and dynamic of poverty governance, is dedicated to stimulating the inner vitality of the poverty-stricken population, and successfully finds a way of poverty alleviation with Chinese characteristics by overcoming poverty on China's own with the attitude of development.

2 China's Approach to Educate Poverty Alleviation

Schultz's human capital theory regards people as the most important capital and clearly points out that the improvement of human resource quality is one of the important sources of economic growth (Schultz, 1990). As the development of education conforms to the essential requirements of human capital theory, the function of education in poverty alleviation is gradually justified and highlighted. Poverty alleviation through education is a policy of investing in people that aims to help the poor group get out of trouble through the increase of individual human capital. Poverty-stricken people are the object of poverty alleviation through education, policies of poverty alleviation through education are oriented to poverty-stricken people, and actions are implemented by poverty-stricken people. It is also the main force of poverty alleviation through education. The endogenous development capacity of poverty-stricken people is the main driving force of promoting poverty alleviation through education. The governance of poverty alleviation through education in China has gone through constant testing and modification in practice, and finally decided to take the needs of the poor population as the governance center, showing the logical operation of the governance action around the four action goals of "have chances to receive education—can afford to receive education—receive good education—and reap rewards

from education", that is, the action goals of poverty alleviation through education in China are also gradually upgraded. The above four action objectives do not exist completely independently but are in a state where the latter and the former blend and interact with each other. They grow and decrease in a specific historical stage and appear to take a specific target as the main action objective in that stage.

2.1 Accessibility

To realize the real needs of schooling for poverty-stricken people, we need to build a complete education system for poor areas and provide sufficient education resources for poverty-stricken people. We have to guarantee that students in poor areas have equal opportunities and rights to education to keep the bottom line of poverty alleviation through education.

In 1949, China's First National Conference on Education clearly stated that schools must be open to workers and farmers, which for the first time substantially guaranteed the rights of the people, especially students in rural areas, to receive education. During the 30 years from the founding of the People's Republic of China to the reform and opening up, the government has vigorously promoted the development of rural education with more outcomes, higher speed, better quality and less cost, and poverty alleviation through education has shown early results. The enrollment rate of school-age children (mainly rural students) increased from 20% in 1949 to 94% in 1978. With the promulgation of the Compulsory Education Law in 1986, China's education poverty alleviation action has gradually been carried out with the popularization of nine-year compulsory education as the main line. From 1995 to 2005, the National Compulsory Education Project in Poor Areas was carried out in two phases, and from 2004 to 2007, the thorny project of "two basic targets" in the Western part of China succeeded in its efforts to consolidate the rights of students in poor areas to receive basic education. At the same time, the coverage of poverty alleviation by developing education in China has been continuously extended, reaching preschool education, which plays a leading role in laying the groundwork for compulsory education. Research has shown that investing in early childhood development and education yields high returns and is an effective strategy to cut the intergenerational transmission of poverty (World Bank, 2013). In December 2014, the General Office of the State Council issued the National Program for the Development of Children in Poor Areas (2014-2020) (hereinafter referred to as the Program), proposing to vigorously promote preschool education in rural areas and increase central government funding for preschool in contiguous poor areas. Preferential support for education projects has expanded the resources of inclusive kindergartens in poor areas in various ways to ensure the rights of children with financial difficulties to receive preschool education. Under targeted poverty alleviation through education in China, work for children with special needs is also improving daily. The program clearly proposed increasing the support for various special groups to help them enter various corresponding schools. Moreover, at the operational level, it clearly stated that by

2020, the compulsory education enrollment rate of children with visual, hearing and intellectual disabilities in contiguous poor areas in China should reach 90%. So far, China has issued a series of policy documents, starting from the promotion of preschool education, consolidating compulsory education, developing high school education, promoting vocational education, encouraging higher education, etc., to build a complete system of poverty alleviation through education in poor areas (Yuan & Ding, 2019). We made a series of strategic deployments to guarantee pre-school education for the children in poor areas, compulsory education, ordinary high school or secondary vocational education, and more access to higher education for the students who need them, various forms of entrepreneurial skills training for the population of post-school age registered. We realized the full coverage of basic public services for education for the poor.

2.2 Affordability

To establish and perfect the education system in poor areas is to give poverty-stricken people the right to receive education from the level of fairness at the starting point so that they can get the ticket to enter education. However, they must pay certain direct costs and opportunity costs if they receive education and must also bear certain risks brought about by the uncertainty of future income. Due to the limited affordability of poor students' families to invest in education, poverty-caused dropout and schooling-caused vulnerability to poverty have become the key factors preventing students in poor areas from successfully completing their schooling. The establishment of a complete education funding guarantee system can effectively solve the problem of poor students' difficulty in schooling due to family financial difficulties, ease the greater economic pressure of poor students on the already poor families due to schooling, and ensure that poor students can afford access. This helps to continuously increase the confidence and expectations of poverty-stricken people in receiving education.

In 1985, the decision proposed implementing nine-year compulsory education in a step-by-step manner. In 1995, the Project of Compulsory Education in Poor Areas was initiated and lasted a decade of two phases. In 2011, a policy required compulsory education that waived tuition and miscellaneous fees, supplied free textbooks, and granted living allowances for borders from financially disadvantaged families. All these efforts have been made to effectively reduce or exempt the direct cost of education of student families during the compulsory education stage, providing more possibilities for children from poor families to receive education. Since 2010, China's education funding guarantee system for poor students has fully covered all levels of education. In the stage of general high school education, public schools implement the policy of exempting children from poor families from tuition and provide them with additional support through the national scholarship system. In the vocational education stage, vocational school students in poor areas are subsidized

by a combination of tuition exemption and state grants. In the stage of higher education, priority is given to poor students registered, and a combination of awards, loans, aid and subsidies is flexibly adopted to achieve the full assistance that poor students deserve. In 2017, the Ministry of Education, the National Development and Reform Commission and four other departments jointly promoted the implementation of the third preschool education action plan, which included the construction of inclusive kindergartens into the action system of poverty alleviation through education, and pointed out that the coverage rate of inclusive kindergartens should reach approximately 80% by 2020, with emphasis on ensuring that children in poor areas receive preschool education.

2.3 Quality

Structuralist poverty theory attributes poverty to the restriction of individual opportunities and resource acquisition by economic, political, and social systems. In the field of education, poverty-stricken people often need high-quality educational resources more than other people (Meng, 2016). However, the Matthew effect often occurs in the allocation of educational resources, which means that there are more high-quality educational resources in rich areas and fewer resources in poor areas. The lack of resources makes the development of poor students encounter obstacles to the poverty effect from both families and schools.

     To allocate high-quality educational resources in a macro-balanced manner and fully meet the practical demands of poverty-stricken people for quality, China's poverty alleviation through education mainly focuses on two aspects to improve the quality of education in poor areas. The first is to improve teaching quality and build educational power. Teachers are the foundation of educational development in poor areas, the key to the success of rural education, and a measure of the soft power of education in poor areas. Since 2006, China has successively adopted special actions such as the Special Post Program, National Training Program, Rural Teacher Living Subsidy Policy, Rural Teacher Honor System and other special actions to prevent teachers in poor areas from not going, not teaching well, not staying, and other issues. The second is to improve the conditions for running schools and create a hard environment for education. In November 2016, the Poverty Alleviation Plan for the 13th Five-Year Plan Period released by the State Council was an important basis for the formulation of action plans to alleviate poverty through education during the period. The plan proposed pushing forward actions such as comprehensively improving the basic conditions for running schools with weak compulsory education, strengthening the construction of rural boarding schools, and increasing the support for the reconstruction and expansion of ordinary high schools and secondary vocational schools. At the same time, accelerating the coverage of high-quality teaching resources to poor areas through education informatization is an effective way to improve the conditions for running schools in poor areas based on the education modernization strategy. As early as 2003, the remote education project for rural primary and secondary schools

was implemented to improve the quality of rural education by means of information technology. In December 2016, the State Council issued the National Informatization Plan for the 13th Five-Year Plan Period, reiterating the need to prioritize the improvement of educational informatization and achieve coverage of high-quality educational resources in impoverished areas to bridge the digital divide between urban and rural schools, ensuring that poor areas enjoy the dividends of educational modernization.

2.4 Reward

Although children from poor families have been given "tickets" to schooling, they still cannot become protagonists in the educational stage. With the development of society, poverty-stricken people are no longer satisfied with receiving good education. Instead, they want to realize reasonable social mobility through education, which has been an urgent need for poor families in the new era. However, the ultimate achievement of poverty alleviation through education should be measured by the return that poor people obtain from the increase in human capital. Among them, the improvement of cognition level and development ability is the long-term benefits of poverty-stricken people, and economic income, such as employment remuneration, is the obvious benefit of poverty-stricken people. The accumulation of social capital and the improvement of social mobility opportunities are the long-term benefits pursued by poverty-stricken people.

According to the UNESCO study, education raises the labor productivity of educated students at diverse levels in different numbers, by 300% for undergraduates, 108% for middle and high schools, and 43% for primary schools. The education level is also in direct proportion to labor productivity and income, which objectively determines that poverty alleviation through education is a shortcut for poor families to eliminate poverty. At present, China is committed to opening an effective educational channel to encourage poverty-stricken people to receive higher education, secondary vocational education and vocational technical training. To increase the opportunities for students in poverty-stricken areas to receive higher education, in March 2012, the Ministry of Education, the Poverty Alleviation Office of the State Council and other ministries and commissions jointly issued the Notice on the Implementation of the Special Plan for Targeted Enrollment in Poor Areas. The Notice required increasing the targeted enrollment of students from poor areas in key universities of the ministry and provinces and increasing the proportion of students from poor areas to key universities, which has achieved significant social benefits. At the same time, it is necessary not only to help poor students but also to help them go further. Vigorously broadening the employment channels for poor college graduates is the key. China has given priority to providing entrepreneurial loans to poor college students who start their own businesses and strengthened employment guidance for college graduates in deeply poor areas to effectively improve the employment competitiveness of poor graduates. The educational purpose of improving students' skill level through

vocational education coincides with the connotation of poverty alleviation through education to improve the personal development ability of poverty-stricken people, making vocational education the pioneer of poverty alleviation through education. In September 2016, the State Council issued the Decision on Accelerating the Development of Modern Vocational Education, proposing to strengthen the construction of vocational education in poor areas, to ensure that students enjoy high-quality vocational education and to build an employment-oriented modern vocational education system. The decision aimed to cultivate high-quality talent with practical vocational skills based on market demand so that poor students could get jobs after graduation and further get out of poverty. In addition, in the face of labor from poor families after school age, China has adopted specific measures such as the Spring Tide Action and the actions to alleviate poverty through job skill training to put the training into practice, eliminating the "skills panic" of the poverty-stricken people labor force and ensuring that everyone has a chance to excel in life.

3 Chinese Experience in Poverty Alleviation Through Education

Poverty Alleviation through Education is a conceptual discourse with Chinese characteristics, which is formed by gradually deepening the role of Chinese education in the process of poverty alleviation. The evolution of policies of poverty alleviation through education is due to the specific social and historical background of our country. Social needs are the driving force promoting poverty alleviation through education, and the social environment is a new vigor stimulating the reform and innovation of poverty alleviation through education. Summarizing Chinese experience in poverty alleviation through education is inseparable from the unique macrosocial background of China. In general, Chinese achievements in poverty alleviation through education are attributed to the combination of institutional advantages and political advantages, the positive interaction between poverty alleviation and intellectual and moral support, the dual role of targeted poverty alleviation and educational equity, and the two-way drive of institutional innovation and strategic reform.

3.1 Combining Institutional Advantages with Political Advantages

As far as Chinese education poverty alleviation project that it is indeed a grand project is concerned, it involves a wide range, the complex causes of poverty and a huge number of poor people. Practice has proven that the socialist system is the fundamental guarantee for eliminating poverty, and the CPC and (the state) have to shoulder their responsibilities in the process of advancing poverty alleviation through

education. Only by persisting in combining the institutional advantages of socialism with those of the CPC can China undertake such a large task of poverty alleviation.

First, adhering unswervingly to the path of socialism is the institutional advantage of Chinese poverty alleviation through education. Achieving common prosperity is an essential requirement of socialism, and the socialist system provides the fundamental guarantee for eliminating poverty. In the face of the huge scale of the poor population in China, the severe situation of the tight time and heavy task of poverty alleviation through education, the superiority of the socialist system achieving a national chess, has been obviously exerted, concentrating on the power and ensuring the key points (Deng, 1993). Over the years, under the unified leadership of the CPC and the State, various departments and units at all levels in China response positively to the call for the education policy of the central committee of the CPC. Based on the central policy, the local government will actively formulate various supporting policies and action plans, concentrate a large number of human and material resources, and organize poverty alleviation agencies at all levels from the central to the local to promote great progress in education poverty alleviation. The strong cohesion and creativity of poverty alleviation through education are inseparable from the superiority of the socialist political system, which concentrates all its forces to accomplish great cause.

Second, adhering to the leadership of the CPC is a political advantage in poverty alleviation through education. The CPC is the ruling party on behalf of the Chinese people, represents the Chinese people's interests, and adheres to the people-oriented governing idea. Regardless of how the external environment changes, the CPC manages to develop education in poverty-stricken areas to solve the poverty problem as a persistent pursuit of value. In China's long-term practice of poverty alleviation through education, the CPC organizations at all levels and the CPC members' representatives have gone deeply into the poverty-stricken groups and fully associated with the reality of poverty, led the excellent people in China open the road out of poverty through education with local characteristics based on the local conditions, and fully demonstrated the political advantages of the CPC.

Third, adhering to the combination of socialist institutional advantages and the political advantages of the CPC are an important feature of the cause of China's education poverty alleviation. The CPC firmly adheres to the path of socialism, takes the Chinese people's interests and their pursuit of a better life as its starting point, and has repeatedly included poverty alleviation through education in the CPC and government issues. Since the founding of the People's Republic of China, successive CPC and state leaders have taken anti-poverty through education as the basis of building the cause of socialist people's livelihood. Based on the Thought of Universal Education extended from Mao Zedong's thought of Common Prosperity, Education Development Priority Strategy set by Deng Xiaoping's thought of the First Rich Driving the Second Rich, Strategy of Rejuvenating the Country through Science and Education guided by Jiang Zemin's Three Represents, Educational Equity Initiatives extended from Hu Jintao's thought of Scientific Outlook on Development, and the Fundamental Solution of Blocking the Intergenerational Transmission of Poverty guided by Xi Jinping's series of important speech spirit and new ideas, new thinking and new strategies for governance, poverty alleviation through education

as the livelihood cause has been deepening and poverty alleviation through education that strategic role has been constantly improving, which shows that eliminating poverty and improving people's livelihood have always been the tireless mission and responsibility of the CPC and socialist.

3.2 Adhering to the Positive Interaction Between Poverty Alleviation and Supporting Intelligence and Ambition

The word "poverty" has rich connotations. In addition to the external meaning of income poverty, it also derives the multidimensional concepts of poverty, such as ability poverty. Among them, ability poverty refers to the lack of cultural quality and low development ability of poverty-stricken individuals, which is the fundamental cause of poverty. Practice has proven that poverty alleviation through education is the most fundamental and lasting way to eliminate the intergenerational transmission of poverty, although there is no immediate effect from such means as material assistance.

First, poverty alleviation through education gives poverty-stricken people the ability, opportunity, and courage to get out of poverty. "To cure poverty is to cure the foolish, to support poverty-stricken people is to support wisdom", which is the CPC and the state's understanding of the concept of poverty alleviation through education. "No matter how poor we are, we can afford education. No matter how hard we are, we can afford children", which is the majestic commitment to poor people from the CPC and the state. To develop education for poverty-stricken areas is to enhance poverty-stricken households' ability to develop themselves, which is the foothold of Chinese poverty alleviation through education. The rich practical experience of Chinese poverty alleviation through education fully proves that developing education is not only an important way to expand the self-development potential of the poverty-stricken population and improve the opportunity for poverty alleviation but also an important basis for the stabilization of effective poverty alleviation and the establishment of a long-term poverty alleviation mechanism.

Second, poverty alleviation through education can block the intergenerational transmission of poverty and alleviate the social class solidification of poverty-stricken families. Poverty-stricken parent generation passes on their own culture of poverty to their children, who cannot escape from the constraints of family conditions due to the lack of education and has to inherit and repeat their parents' poverty. Therefore, poverty, like genes, leads to poverty in poverty-stricken families from generation to generation, and education is an important support and path to crack the poverty gene. Xi Jinping has made many speeches on the topic that education is the fundamental way to block the intergenerational transmission of poverty, which means that from the perspective of governance (the State) recognizes the education is not only the foundation of eliminating poverty and becoming rich, but also the effective path to see the bright future. The idea of blocking the intergenerational transmission of poverty depending on poverty alleviation through education has been widely

recognized in China, and thus, a series of relatively mature ideological systems of poverty alleviation through education have been formed.

Third, poverty alleviation through education is the most sustainable way of poverty alleviation, which benefits the present and future generations. With Chinese poverty alleviation entering a runoff period, (the state) puts high emphasis on poverty alleviation through education, proposing that poverty alleviation should be combined with supporting the ambition and intelligence. (The state) upholds that poverty alleviation through education helps poverty-stricken people become intelligent and then economically rich, which effectively solves the hard problem that exogenous poverty alleviation is effective but endogenous poverty alleviation is not effective in poverty alleviation. This effectively changes the backward concept of "waiting, relying on and demanding" of poverty-stricken people under the mode of relief poverty alleviation and guides poverty-stricken people to get rich and enhance sustainability out of poverty. The system environment provides rooted and grown soil for poverty alleviation through education.

3.3 Adhering to the Dual Role of Targeted Poverty Alleviation and Education Equity

Rights poverty refers to the poverty caused by the deprivation of the right and viability of feasible ability of some social groups (Yue & He, 2016), which is an important cause of poverty and a social consequence of poverty. In the field of education, it is mainly manifested in the lack of education in some regions or groups caused by the uneven distribution of educational resources, which in turn constrains the mental development of the region and its population. Therefore, the realization of education equity has long been an unswerving value position of targeted poverty alleviation through education.

First, the concept of fairness is the action guide for targeted poverty alleviation through education in China. In 2015, General Secretary Xi Jinping stressed at the 11th Meeting of the Central leading Group on Comprehensive deepening Reform that "every rural child should receive a fair and quality education" (Xi, 2015a, 2015b). This has become an important guide for China to do a good job in targeted poverty alleviation through education under the new situation. Targeted poverty alleviation through education in China mainly focuses on the implementation of policies and resource investment in areas, such as making up for the shortcomings in education development in remote areas and improving the educational level of the poverty-stricken areas and ensuring the educational rights of special groups. "*Striving to ensure that every child can enjoy fair and quality education*" is a solemn commitment made in the report of the 19th National Congress of the Communist Party of China. It is also a practical action taken by the CPC and the state to make efforts to make the people satisfied with education. Education equity is the internal driving force for

China to carry out targeted poverty alleviation through education, and it also points out the right direction for China's targeted poverty alleviation through education.

Second, education equity is the value orientation of the targeted poverty alleviation policy in China. The policy of poverty alleviation through education in China is inclusive and compensatory, which fully embodies the principle of equality, difference, and compensation of education equity. The poverty alleviation policy of universal education is mainly presented in terms of inclusive education, "universal" and "compulsory" education, and in the form of policy text, it stipulates the right of poverty-stricken people to receive education to ensure that education benefits all poverty-stricken people. The policy of compensatory education poverty alleviation is mainly devoted to tilting education resources to poverty-stricken areas and poverty-stricken people. It is regarded as a corrective measure of educational injustice, which helps to eliminate the gap between urban and rural education development and to improve the poor in the field of education. Furthermore, it is also an important response to who and how to help education.

Third, the concept of equity is the logical starting point of targeted poverty alleviation through education in China. Education equity includes starting point equity, process equity and result equity. In the new era, the main task of China's targeted poverty alleviation through education is to achieve education equity by guaranteeing the equality of education rights, quality, and results. Specifically, the equity of the starting point requires equity that every child from a poverty-stricken family and special children can enjoy the right to receive all kinds of education at all levels. Process equity focuses on promoting the balanced development of educational quality and increasing educational support for poverty-stricken families, emphasizing that poverty-stricken children can enjoy high-quality education resources in the process of education to eliminate the impact of institutional and economic barriers on the education of poverty-stricken children. Outcome equity requires that poverty-stricken educators be provided with various development opportunities to meet actual development needs. Therefore, education equity is in line with the task of targeted poverty alleviation in China, which provides content and value guidance for the deepening of targeted poverty alleviation through education.

3.4 Adhering to a Two-Way Drive of Policy Innovation and Strategic Reform

Poverty alleviation through education is not a one-time achievement, but a systematic cause is both long-term, complex, and phased. A comprehensive survey of China's poverty alleviation experience shows that absolute poverty will emerge after the solution of universal poverty, and relative poverty will emerge after alleviation of absolute poverty, accompanied by the problem of people's returning to poverty after being lifted out of poverty. Looking at the course of poverty alleviation through education since the founding of the People's Republic of China, it is important for us to insist

on seeking truth from facts, keeping pace with the times, and constantly innovating the system of poverty alleviation through education, whereby the cause of China's "poverty alleviation through education" has always been full of such great vitality. During the in-depth promotion of poverty alleviation through education in China, poverty alleviation through education has been constantly adapted to the changing poverty alleviation situation and the changing education needs of the poverty-stricken population, showing distinct phase-related characteristics.

First, the task target of poverty alleviation through education has been continuously upgraded. In the early years after the founding of the People's Republic of China, the country's "poverty alleviation through education" was mainly aimed at carrying out wipe-our-illiteracy education and low-level universal education in rural areas. With the deepening of the poverty alleviation cause and the ever-changing demands for education, the top designing target in poverty alleviation has shifted from pursuing the quantity of education popularization to pursuing education equality featuring quality in education, from *"helping alleviate the poverty in education domain"* in underdeveloped rural areas to "rely on education to realize poverty alleviation", aiming at helping people get out of poverty by means of education. The year 2020 is not only the final year for China to finish building a moderately prosperous society in all respects but also a fateful year for poverty alleviation. However, poverty alleviation is always on the way, and the post-poverty-alleviation era has already arrived. In the new era, "poverty alleviation through education" will not stop at achieving the short-term goal of poverty alleviation; more importantly, it will be committed to meeting poor people's expectations for a better life. The policy goal of poverty alleviation through education in China has realized a step forward from a basic goal to a higher quality-oriented goal, and the development logic of the task target itself also reflects the deepened task and work of poverty alleviation through education guided by the CPC, the ruling party, and the state.

Second, the policy system for poverty alleviation through education has been continuously improved. In the early years after the founding of the People's Republic of China, the poverty alleviation policy through education mainly referred to the education content and policy content related to poverty alleviation involved in education policy. The fragmented distribution of relevant policies resulted in the loose effect of policy implementation. With the continuous reform and innovation of the education poverty-alleviation work in China, the education poverty-alleviation policy system has gradually become more structured and systematic, which is mainly manifested by the emergence of independent and special "poverty alleviation through education" policy texts. A multilevel and all-around policy structure system of poverty alleviation through education has replaced the previous single and partial policy structure of poverty alleviation through education. Specifically, Chinese education poverty alleviation policies have covered all levels of education and formed relatively independent "poverty alleviation through education" policy systems at different levels of education, which is a full reflection of the extensiveness and depth of the "poverty alleviation through education" policy system.

Third, the strategic concept of poverty alleviation through education has been constantly innovated. Adjusting the poverty alleviation strategy according to the situation is the key to achieving great benefits of poverty alleviation through education. In the early years after the founding of the People's Republic of China, the population base of poverty was large, the national economic conditions were limited, the overall education situation was poor, and the poverty problem was not systematically recognized by government, so a "relief" mode of poverty alleviation through education based on input was initially formed. In a specific historical period, this "blood transfusion" method of poverty alleviation played an important role. Because of the complexity of the causes leading to poverty and the long-time span of poverty alleviation work, it is impossible to achieve the best result of poverty alleviation by simply relying on relief, while development-oriented poverty alleviation is the most stable and vigorous way. Therefore, poverty governance in a new stage places more emphasis on the "hematopoietic" function of poverty alleviation through education. Since the 19th National Congress of the Communist Party of China (CPC), poverty alleviation through education has entered a decisive stage of poverty alleviation, and people's needs for poverty alleviation are diversified, which poses new requirements for targeted poverty alleviation through education. Based on this, with precision as the core guideline, China has launched an action to cover all poverty alleviation through education, covering the key poor areas and the poor people, and basically forming a policy loop to help poverty-stricken people throughout their grow-up in education.

4   Significance to the World of Poverty Alleviation Through Education in China

Poverty has always existed in various ways and troubled the survival and development of human beings. Poverty is an unavoidable reality problem in the march of human society towards a higher level of civilization and a severe challenge faced by the whole world. China used to have the largest number of poor people in the world, but now it has achieved the most remarkable results in poverty alleviation. Over the past 70 years, since the founding of the People's Republic of China, the international community has witnessed the development and achievements of China's poverty alleviation through education. After more than 70 years of efforts, China has transformed education from a supporting role to a leading role in the poverty alleviation system, making it a fundamental force for large-scale poverty alleviation and consolidating achievements in poverty alleviation. Poverty governance is the first major contributions that China has made to international affairs. In the new era, the practical and theoretical innovation of poverty alleviation through education in China has given birth to a series of new propositions in the field of poverty alleviation, which will provide an important value model and world significance for global poverty governance.

4.1   Poverty Alleviation Through Education Has Contributed New Strength to Global Poverty Governance

"It can be seen as a contribution for the world that China handles domestic affairs by itself" (Xinhua News Agency, 2019). The more China develops, the more contribution it will make to the world (Ministry of Foreign Affairs, 2015). This simple logical relationship has become increasingly clear in the course of China's poverty alleviation and has been recognized by an increasing number of international people of insight. Since the founding of the People's Republic of China, China has actively promoted large-scale poverty alleviation through education. A number of major education poverty alleviation projects have been organized and implemented, including the project for building rural boarding schools, the plan to upgrade rural schools with poor compulsory education, and the plan to support rural teachers, which have promoted the quality and balanced development of education in urban and rural areas. China increases funds to provide education subsidies to students from economically poor families and gives more preferential policies to groups with special difficulties to comprehensively achieve equality in education. Thanks to the pattern of poverty alleviation based on education, China's achievements in poverty alleviation are ahead of the world. Meanwhile, according to World Bank data, from the end of 1981 to the end of 2015, China's poverty incidence rate dropped by 2.6 percent on average, while the global poverty incidence rate dropped by 0.9 percent on average over the same period (National Bureau of Statistics, 2019). China is significantly ahead of the world in poverty alleviation. China has made a series of remarkable achievements in universal education and poverty alleviation and fulfilled the poverty alleviation goals set by the United Nations Millennium Development Plan ahead of schedule. Facts speak louder than words. The governance effect of poverty alleviation through education in China is not only a brilliant chapter on the road of poverty alleviation in China but also a major contribution of China to the cause of human rights and people's livelihood in the world. At the same time, China's achievements in poverty alleviation through education have accelerated the process of global poverty governance and added fresh strength to global poverty governance.

4.2   Poverty Alleviation Through Education Has Added New Charm to Global Poverty Governance

"We should live a better life and help others as well" (People's Daily, 2013). This demonstrates President Xi Jinping's proposition that China should stand from a global perspective and pursue common development. As a responsible major developing country, China has taken an active part in global poverty governance in various ways, supported and helped other developing countries eliminate poverty through education, which fully demonstrates China's broad vision and mind. With a view to building a community with a shared future for humankind, China has been committed

to deepening global cooperation on poverty alleviation. Through initiatives such as the "One Belt And One Road" and "South-South Cooperation", China has carried out poverty alleviation cooperation with other developing countries and provided educational assistance to other developing countries in any way that we can. The United Nations has selected ten countries that have made outstanding achievements in education development as initiators to mobilize the international community's wide support for education and implement the Millennium Development Goals, among which China is one of the initiators (People's Daily, 2013). China has unswervingly fulfilled its commitment to building a community of shared future for humankind, increased its cooperation with developing countries on human capital improvement and effectively promoted the internationalization of China's education poverty alleviation cause. These facts fully demonstrate China's responsibility as a major country in global education poverty governance, and China's strength has become a key force in promoting world stability and development.

4.3 Poverty Alleviation Through Education Provides a New Model for Global Poverty Governance

In the strategy of global poverty governance, our progress of poverty alleviation has advanced by other countries. China has made a leap from relief-oriented poverty alleviation in material to development-oriented poverty alleviation in education and has taken a lead in poverty governance in a new stage. China has redefined the relationship between development and poverty. Poverty has the characteristics of complexity and diversity and is mainly characterized by complex and diverse manifestations and causes of poverty. At the same time, poverty is also extensive and universal. Poverty is not a problem unique to a certain region but a problem that must be faced by all mankind. China can play an important role in the world anti-poverty cause because the CPC has already created a new cause of multi-dimensional poverty alleviation in practice when the international community is still in the theoretical discussion of multi-dimensional poverty (Zhu & Peng, 2018). Through the long-term practice of poverty alleviation, China has come to conclude that the "relief" mode of poverty alleviation cannot fundamentally solve the problem of poverty and has come to realize that development is the only fundamental way to eliminating poverty. Education and poverty alleviation were originally two separate concepts, but China pioneered the bilateral interaction between education and poverty alleviation. As the vital force of China's anti-poverty cause, poverty alleviation through education is committed to the accumulation of human capital for poor areas. It is a mode of poverty alleviation that promotes long-term poverty alleviation through human development. By practicing, China has formed pluralistic educational poverty alleviation models, such as the type of certificate, order, linkage, service, Internet plus and so on (Yuan & Wan, 2017), which has made innovative contributions to the construction of a new model of sustainable poverty alleviation worldwide. Under the background of uneven global

development, it is of positive significance for China's poverty alleviation through education to practice the concept of inclusive growth. Poverty alleviation through education can not only help to eliminate poverty but also provide more opportunities for human development. China is reshaping a new model of global sustainable poverty governance based on the concept of endogenous development, aiming to promote global poverty governance from promoting the economy to strengthening capacity.

4.4 Poverty Alleviation Through Education Has Broadened New Ideas for Global Poverty Governance

The contribution of China's poverty alleviation through education to global poverty governance is reflected not only in the reduction of the number of poor people but also in the formation of a fruitful theoretical system of poverty alleviation through education with universal value. Practice is the only criterion to test the truth. The theoretical system of poverty alleviation through education with Chinese characteristics follow Xi Jinping's socialist thought with Chinese characteristics. It has been continuously tried and innovated in the field of education poverty alleviation practice and finally formed a mature theoretical achievement system, which has greatly enriched the world's theoretical treasure of poverty alleviation through education. The CPC Central Committee with General Secretary Xi Jinping as its core attaches great importance to poverty alleviation through education. First, it emphasizes that poverty alleviation through education is a fundamental way to block the intergenerational transmission of poverty. President Xi Jinping described the relationship between education and poverty in his book *Up and Out of Poverty*, pointing out that "the poorer the place is, the more education it needs, and the less education it develops, the poorer it will be" (Xi, 2014a, b). In other words, education can cut the root of poverty. The intergenerational transmission of poverty is the key internal factor that causes the reproduction of poverty and increases the difficulty of eliminating poverty. Second, it points out the practical way to win the critical battle against poverty through education by "supporting people by cultivating their ambition and intelligence". To eliminate the poverty of ideology and mind is the first essence to help poor people eliminate poverty. Therefore, in the field of education poverty alleviation, the idea of "supporting people by cultivating their ambition and intelligence" is further put forward. "Supporting people by cultivating their ambition" means supporting aspiration and confidence and stimulating the subjective initiative of poor people to eliminate poverty. "Supporting people by cultivating their intelligence" means strengthening one's mind and technology to improve the quality and ability of poor people to eliminate poverty and become rich. Moreover, it highlights the connotation of the time of targeted poverty alleviation through education in the aspect of methods. As poverty alleviation enters a critical period, the marginal benefit of the old education poverty alleviation policy in China is diminishing under the new

situation. For this, the concept of "targeted poverty alleviation" is creatively proposed, which leads China's education poverty alleviation policy to focus on "points" instead of "areas", effectively improving the accuracy and effectiveness of poverty alleviation through education. Finally, from the perspective of value, poverty alleviation through education is the realistic response of the CPC and the state to people's demand for a better life. The actual need of poor people for education is the internal driving force for the development of poverty alleviation through education, and the CPC has always been the creator and guardian of people's better lives. The discourse system of poverty alleviation through education with Chinese characteristics has given rise to an important voice on the world stage of poverty alleviation.

4.5 Poverty Alleviation Through Education Has Created a New Path for Global Poverty Governance

The theoretical and practical experience of China's successful poverty alleviation through education provides a useful practical model for other poverty-alleviation countries, especially developing countries. The Chinese government attaches great importance to the exchange of experience in poverty alleviation through education around the world and takes the initiative to share its experience in poverty alleviation through education with Chinese characteristics with other developing countries to promote the enrichment and dissemination of global knowledge on poverty alleviation and contribute Chinese wisdom to global poverty governance. To introduce the concept of poverty alleviation with Chinese characteristics to the international community and promote the exchange of experience in poverty alleviation among countries worldwide, *Up and Out of Poverty* has been translated into English and French and released worldwide, attracting the attention of the international community. Mauritius's Prime Minister said that he strongly agreed with China's education and poverty alleviation work philosophy of "teaching one to fish is better than giving him fish" and "improving the self-reliance of poor families" (Li et al., 2017). Poverty is not a problem unique to developing countries. European and American countries are also confronted with the problem of poverty. The Chinese experience and efficiency of poverty alleviation through education are also worth learning from. Since 2016, China has held the "China International Forum on Poverty Reduction" for three consecutive years. In 2017, under the witness of guests attending the "China International Forum on Poverty Alleviation through Education", the "China and Foreign Poverty Alleviation Case Base and Online Case Sharing Platform" was officially launched. The platform is open to global users, and China's experience and specific cases of poverty alleviation through education are also presented to the world through this platform to help other countries find ways out of poverty.

China's brilliant achievements in poverty alleviation through education not only belong to China but also belong to the world. Poverty alleviation through education is a key path for China to eliminate poverty and achieve prosperity and development. It is

Table 1 Evolution of poverty alleviation through the education path with Chinese characteristics

stage	Characteristics	Objectives	key points
1949–1978	exploratory stage for poverty alleviation	change the situation of widespread poverty	universalize basic education in rural areas, promote literacy education
1979–2000	exogenous poverty alleviation stage	basically solve the problem of inadequate food and clothing	universalize compulsory education, guarantee the right to education for poverty-stricken areas
2001–2012	endogenous poverty alleviation stage	bridge poverty gap	improve education quality in poverty-stricken areas
Since 2013	targeted poverty alleviation through education stage	consolidate achievements in poverty alleviation	eliminate the source of thepovertythrough education

based on China's own conditions and embodies China's wisdom and solutions for the world's poverty alleviation cause. China's experience in poverty alleviation through education shows that the economy is not the only breakthrough to solve the problem of poverty, and the real focus of poverty alleviation lies in the field of education. China has always adhered to and strengthened the overall leadership of the Party, persistently innovated ideas and concepts for poverty alleviation through education, and adhered to the people-oriented approach to equity and justice. This generates great vitality for poverty alleviation through education and promotes anti-poverty in China and the world to forge ahead on a sustainable path Table (1).

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A Probe into Rural Education Revitalization—Based on a Theoretical Investigation into the Symbiosis of Urban–Rural Educational Resources

Dechao Sun and Yang Li

Abstract The flow of educational resources between urban and rural areas is an important way to promote the long-term development of rural education. Most previous theoretical research used the concept of sharing to guide the flow of educational resources between urban and rural areas and explored approaches to the flow of educational resources, preferably such physical resources as educational funds, teaching force, and teaching resources. However, the urban–rural structure leads to the one-way flow of educational resources from urban areas to rural areas, and high input and low output arise in rural education. In the background of rural revitalization, rural education, which lacks confidence, needs new ideas to reconstruct the road to revitalization. Symbiosis implies the inheritance and development of sharing. The units, models and environments for symbiosis in the theory of symbiosis apply to the research into the flow of educational resources between urban and rural areas. The "symbiosis" of urban and rural educational resources can help effectively solve such problems as the involution of rural education, the insufficient interactions between urban education and rural education, and the unstable flow of resources. In the process of rural education revitalization, to achieve mutual benefit-based symbiosis, urban and rural areas need to achieve symbiosis rather than share educational resources with each other and emphasize the transformation and optimization of the concept of development, content and modes.

Keywords Rural education revitalization · Urban and rural educational resources · Sharing · Symbiosis · Involution

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1   Introduction

The report of the 19th National Congress of the Communist Party of China pointed out, "Socialism with Chinese characteristics has entered a new era, and the major social contradiction in our society has been transformed into the contradiction between the people's ever-growing needs for a better life and unbalanced and inadequate development" (Xi, 2017). In regard to the field of education, there has been a long-standing problem of unbalanced and inadequate development of urban and rural education in China. Rural education is an important channel for rural students to change their own destiny and an important opportunity for rural bottom groups to move upward (Qi & Liu, 2020). In view of the current situation in the countryside, the imminent completion of the task of poverty alleviation and the follow-up and connection of the rural revitalization strategy both require education to provide fundamental support. In the long run, the future development of the countryside will require education to play a fundamental role in improving the quality of the rural population and fostering endogenous dynamic. However, with the expansion of urbanization and the increasing number of rural migrant workers, as well as the choice of rural students flocking to cities, rural education appears to be less confident.

   The backwardness of rural education has been a long-standing problem. Under the long-term national will of city-centrism, the dual division of urban and rural areas and the uneven flow of educational resources from the central government to capital of province to central city to county to township to village have kept rural education at the end of the educational system (Yao, 2014). This has led to the structural differences in the allocation of educational resources. The first is the regional differences, which are determined by the urban and rural economic and social environment (such as social groups, natural conditions, social and economic conditions, and so on), and it has an inherent impact on the distribution of educational resources. The second is the institutional gap, that is, the hierarchical system between urban and rural areas shown in the long-term development of education, with the important educational resources gradually being in the hands of the urban class and the power of discourse and decision-making in education being more concentrated in the urban class, which has an acquired influence on the allocation of educational resources (Liu, 2001; Wang, 2004). To improve the backward situation of rural education, China has been following the logic of making up the acquired institutional gap, advocating co-construction and sharing, and promoting the equitable supply of educational resources between the urban and rural areas, thus effectively promoting the development of rural education. The academic research has followed the same basic logic of promoting equity in educational resources between urban and rural areas. In the process of promoting the equalization of urban and rural educational resources with the concept of shared development, the educational funds, public educational resources and teacher resources have become the important content of sharing (Ren & Zhang, 2017). In addition, with the development of Internet, the high-quality network teaching resources have become the main content of urban and rural sharing about educational resources (Lei, 2019; Liu, 2017). Nevertheless, the

problem of involution of rural education is still difficult to solve fundamentally, and the rural education with high input and low output has become a major pain point in the process of educational modernization in China. Based on this, this paper examines the basic logic and main issues of sharing educational resources between urban and rural areas, embeds the concept of symbiosis into the relationship between urban and rural educational resources, and realizes the reconstruction of idea of the integration of urban and rural educational resources to promote the theoretical development and practical innovation of rural educational revitalization.

2 Sharing of the Educational Resources between the Rural and Urban Areas: The Past Logic of Rural Educational Development

Sharing means that all members of society share the economic, social, cultural and other welfare created by each other. The concept of sharing enables more individuals to share development opportunities and reform dividends. Specifically, the "sharing" of educational resources in urban and rural areas means that the educational resources and the fruits of reform will be shared by all members of society. From the current situation of educational development in China, the sharing of educational resources is mainly from urban to rural areas, which has become an important way to promote the development of rural education.

2.1 Educational Equity Reflected by "Sharing" Is the Value Concept of Rural Educational Development

The "sharing" of educational resources between urban and rural areas is an important initiative to promote educational equity and develop rural education in China. First, the sharing of education resources between urban and rural areas is conducive to the promotion of educational equity. The concept of sharing embodies the development demand of social equity and justice. The report of the 19th National Congress of the Communist Party of China declared, "China will ensure that all people have a greater sense of acquisition in the development of co-construction and sharing, and continue to promote the comprehensive development of people and the common prosperity of all people" (Xi, 2017). China has made the brilliant achievements in educational development in more than 70 years. Educational equity reflected by the "sharing" of urban and rural educational resources can be seen everywhere, such as the implementation of nine-year compulsory education, the realization of the "Two Exemptions and One Supplement" policy in rural areas, and the promotion of the integration of urban and rural educational reform. These policies are committed to promoting the flow and sharing of capital investment, teaching achievements, teachers and other

educational resources between urban and rural areas and constantly promoting the overall development of people with the concept of equity so that both urban students and rural students enjoy the same sense of educational acquisition. Second, the implementation of the concept of educational equity is helpful to promote rural education to be close to urban education. The long-standing urban–rural dual structure in China has led to an imbalance in the supply of educational resources between urban and rural areas. Cities have advanced educational concepts, educational equipment and faculty, which are beyond the reach of rural education. Making up for the shortcomings of people's livelihood and promoting social equity and justice in the course of development are all the important content of Xi Jinping's Thought on Socialism with Chinese Characteristics for a New Era. Therefore, rural education needs to develop in accordance with the value concept of educational equity and gradually approach urban education.

2.2 The Sharing of Funds, Teachers and Teaching Resources Are the Key Means to the Development of Rural Education

From the long-term sharing of educational resources between urban and rural areas, the carriers of resources mainly include educational funds, teacher resources and teaching resources, which are the three key means for the development of rural education.

First, educational funds are the primary resource for educational development, and their important role is mainly reflected in the construction of infrastructure, the payment of teachers' salaries, the educational subsidies for students, and the daily operation of educational institutions. According to the statistics from the Ministry of Education in China, the national financial expenditures on education were¥ 4.0049 trillion, increased 8.25 percent over the previous year, and accounted for 4.04 percent of GDP in 2019 (Ministry of Education, 2020). Since the national financial expenditures on education accounted for more than 4 percent of GDP for the first time in 2012, the expenditures on education have remained above 4 percent for eight consecutive years. The national financial expenditures on education come not only from central finance but also from local finance at all levels. Due to the different levels of economic development, the educational funds show different scales of investment and create a wide gap between urban and rural educational development in different regions. To achieve educational equity, educational funds are all allocated in favor of rural areas to promote the balanced development of urban and rural education from the central to local level, which reflects the sharing between urban and rural areas in the allocation of educational funds to a certain extent.

Second, teacher resources are an important subject in educational activities. The quality of the educational effect depends on the teachers. Due to the different levels of economic development and the constraints of the urban–rural dual structure, the

construction of teachers in urban and rural areas of China has different generative logic. Teachers in urban areas are mainly full-time teachers with rich professional knowledge and strong teaching ability who graduated from universities and normal schools. While teachers in rural areas are mainly rural intellectuals with weak professional knowledge and relatively poor teaching ability and have a large gap with urban teachers. With the increasing emphasis on rural education, China is increasingly strengthening its construction of rural teaching staff. In September 2014, the Ministry of Education and two other ministries jointly issued the Opinions on Promoting the Rotation of Principals and Teachers in Compulsory Education Schools within Counties (Districts) and proposed speeding up the establishment and continuous improvement of the rotation system for principals and teachers among compulsory education schools. In June 2015, the General Office of the State Council in China issued the Support Plan for Rural Teachers (2015–2020), further pointing out the need to promote the flow of excellent urban teachers to rural schools. In February 2018, the Ministry of Education and four other ministries issued the Action Plan for Teacher and Education Revitalization (2018–2022). In addition to continuing to adhere to the rotation to promote the flow of urban teachers to rural areas, this plan further pointed out that it is necessary to promote the localized training of teacher resources and gradually expand the public-oriented training scale of rural teachers in areas where it is difficult to replenish teachers. By means of publicly oriented training, China can reasonably allocate such potential high-quality teacher resources as normal university students, improve their quality, and achieve a centralized and dispersed sharing of teachers in the urban and rural areas.

Thirdly, teaching resources include the main content of the teaching process, such as high-quality courses, practical platforms, and teaching models. The quality of teaching resources is closely related to capital investment, teaching level and school management mode. The quality of urban teaching resources is relatively high due to the high level of economic development, the high investment in teaching funds, advanced teaching infrastructure and high level of teachers. The relatively backward economic development of rural areas and the insufficient investment in teaching resources have caused rural teaching to remain in the traditional "spoon-feeding" teaching mode for a long time, which seriously affects the acquisition of knowledge and improvement of skills of rural students. In recent years, with the continuous development of Internet, the level of information sharing of teaching resources has increased. High-quality teaching resources in cities have been extended to rural areas through MOOCs and live broadcast platforms, which effectively promotes the sharing of urban and rural teaching resources.

2.3 The Flow of Educational Resources from Urban to Rural Areas is the Main Direction of Rural Educational Development

In terms of the content and direction of urban–rural educational resource sharing, sharing is mainly a one-way flow from urban to rural areas. This is the result of the long-term imbalance in the development of educational resources between urban and rural areas. First, in the comparison of urban and rural educational resources, urban educational funds, teacher resources, teaching resources and other factors were significantly better than those in rural areas. Under the guidance of the concept of the fair value of education, if sharing is advocated in the allocation of educational resources, it can only be the unilateral flow of urban resources to the countryside. Second, in the actual process of allocating educational resources between urban and rural areas, the trend of educational resources moving from urban to rural areas is more obvious. During the 13th Five-Year Plan period, for example, the central government allocated 749.5 billion yuan in subsidies, with an average annual growth rate of 5.97%, of which approximately 90% was allocated to rural areas (Qu, 2020). Such a wide gap between urban and rural educational subsidy funding is a testament to China's strong support for rural educational development.

3 The Embedding of Symbiosis Theory: Improving and Perfecting the Sharing of Educational Resources between Urban and Rural Areas

3.1 The Applicability of Symbiosis Theory Embedded in Research On Urban–Rural Integration and Public Service Provision

The word "symbiosis" comes from the field of biology. First introduced in 1897 by the German biologist Anton de Bary in the study of biological science, symbiosis is the idea that different organisms live together in a long-term, inseparable relationship (Ahmadjian & Paracer, 1986). Since then, western scholars have conducted symbiosis theory research mainly from the field of biology and believe that there are widespread symbiotic behaviors among complex species, such as information transmission, win–win cooperation, material exchange, and energy transmission (Douglas, 1994). In the 1990s, some scholars gradually expanded the study of symbiosis theory to social economy, enterprise development, industrial development and other social science fields. In 1997, after American scholars John Ehrenfeld and Nieholas Gertle (1997) visited Kalenburg Industrial Zone in Denmark, they thought that there were many links among enterprises and they gradually evolved into an interdependent relationship, which are called "industrial symbiosis". In 1998, the publication of the book

"Symbiosis Theory - The Small Economy" marked a historic breakthrough in the field of social science in China. This book states that symbiosis is the formation among the symbiotic units in a certain symbiotic environment according to a certain symbiotic pattern. There are three types of elements in the symbiotic relationship, namely, symbiotic units, symbiotic environment, and symbiotic patterns (Yuan, 1998). The three kinds of elements influence and interact with each other, reflecting the direction and law of the dynamic development of the symbiotic system.

Embedding symbiosis theory in urban–rural relationship can open up new ideas for the study of urban–rural integration. According to Liang Qu and Yunhong Hao (2004), symbiosis theory has strong applicability in the study of urban–rural relations. The symbiotic units are formed in urban and rural areas, and there is a degree of symbiosis in terms of industrial structure. Urban and rural areas have gone through stages of separate symbiosis, one-way biased symbiosis and reciprocal symbiosis, with markets, policies and civil organizations as the medium of symbiotic interface. Yingli Zhao (2006) further pointed out the applicability of symbiosis theory in integrated urban–rural planning and argued that the urban–rural dual structure (including investment system, land policy, household registration system and agricultural product price system and other macro-institutional systems) is a limiting factor that affects the urban–rural symbiotic environment. Huping Luo and Youzhi Zhu (2011) believe that the symbiotic relationship between urban and rural areas in China has changed from the mode of separate symbiosis in the period of planned economy to a one-way biased symbiosis, in which the agriculture and rural areas have been in a disadvantageous position in the distribution of resources and national income and remain unequal in terms of development opportunities.

Since the reform and opening up, China's rural public service supply system has been continuously improved, but in the development process, there are also more administrative interventions and a lack of supervision in the market. The introduction of symbiosis theory, oriented to promote symbiotic energy generation, provides public service supply subjects with organizational and behavioral models of synergistic symbiosis, which can make public service synergistic supply more systematic and complete, enabling all parties to cooperate and evolve together (Zhao, 2012, 2013). According to Wu (2018), China's urban–rural relationship should develop towards symmetrical and reciprocal symbiosis, which is not a complete alignment but a functional differentiation while ensuring that the gap in public service provision between urban and rural areas has been gradually reduced. In addition, symbiosis theory has been studied and applied in specific public service areas, such as environmental governance, sports development, cultural tourism and social security. Among them, Ning Li and Fang Wang pointed out in the study of rural environmental governance that the symbiotic system of rural environmental governance is not a simple mechanical combination of governance subjects, and when the advantages of complementarity and cooperation among governance subjects occupy a dominant position, the symbiotic system of rural environmental governance will produce the systematic effect of "$1 + 1 > 2$" (Li & Wang, 2019). In summary, the symbiosis theory has been well applied in the existing studies of urban–rural integration and public service supply, but it has not yet been involved in the field of education as one of the

social public services, and this provides a broad space for this paper to carry out the study of the symbiosis relationship between urban and rural educational resources.

3.2 The Value Discrimination of "Symbiosis" and "Sharing" of Urban and Rural Educational Resources

To further clarify the breakthrough of the value concept of urban and rural educational resources from "sharing" to "symbiosis" and the practical problems that can be solved have a good guiding significance for the research on the embedding of symbiosis theory into urban and rural educational resources.

3.2.1 "Symbiosis" Is the Inheritance and Development of "Sharing"

The concepts of "symbiosis" and "sharing" of urban and rural educational resources are of great significance to the revitalization of rural education, but "symbiosis" has realized the inheritance and development of "sharing" with its more inclusive space and more perfect system.

Educational equity is the value pursued in the "sharing" of educational resources between urban and rural areas. In the process of 'sharing', educational resources such as urban teaching funds and teachers have realized the one-way flow to rural areas, and it is clear that the emphasis on equity to form a preference for rural education is the outstanding value of "sharing". The value pursuit of the "symbiosis" of urban and rural educational resources is more about "equality". Both "equality" and "equity" mean "balance", but "equality" refers to a higher sense of equity. While "equity" addresses the distribution of benefits and emphasizes the evaluation and recognition of the distributional outcome, "equality" is the affirmation of social status and social dignity of human beings and the equal recognition of fundamental rights (Yang, 2004). In view of the development direction of urban–rural integration in China, the introduction of the theory of "symbiosis" in the allocation of educational resources between urban and rural areas in China, emphasizing the synergy and reciprocity of all parties, will achieve a value breakthrough in the concept of educational development, further enhance the social status of rural education, and enrich and expand the relationship between urban and rural education, thus helping to solve the problem of lack of self-confidence in the development of rural education.

Sharing is the core way to realize the concept of shared development. In the sharing of educational resources between urban and rural areas, the old imbalance between urban and rural development has led to a unilateral supply of urban educational resources to rural areas, providing a "greenhouse" for the development of rural education. "Symbiosis" moves rural education out of the "greenhouse" and allows it to grow and develop itself, emphasizing not only the flow of urban educational

resources to rural areas but also the return of rural educational resources to the cities. More emphasis is placed on the cultivation of endogenous dynamic in rural education.

The concept of sharing embodies the development idea of "people-oriented" and integrates equity with efficiency. The more optimal theoretical guidance is needed in the face of rural education during the process of urban–rural integration. Symbiosis theory not only expands theoretically on rural education in terms of the pursuit of values and ways to explore the supply of urban and rural educational resources but also tries to promote the exploration of symbiosis rules between urban and rural educational resource systems and elements from macro and micro aspects and then guides them to cooperate and evolve together from the practical level to promote the comprehensive revitalization of rural education.

3.2.2 "Symbiosis" Can Effectively Solve the Problems Faced by the Development of Rural Education in "Sharing"

With the increasing level of sharing of educational resources between urban and rural areas, rural education in China has been improving in terms of school scale and quality, and rural students also enjoy modern educational resources. However, there are some urgent problems in "sharing".

First, the problem of the involution of rural education has become increasingly prominent. Rural education has developed externally with the support of the continuous "sharing" of urban and rural educational resources, such as infrastructure and teachers. The planned external blood transfusion makes rural education generate dependency and makes rural education follow the old road without innovation, resulting in excessive investment but insufficient development (Zhang & Huang, 2014).

Second, the interaction and communication between urban and rural educational resources are insufficient, and rural education presents a development situation of passive acceptance. In the process of sharing educational resources between urban and rural areas, the rural class cannot fully express their demands for education due to the strong control of the urban elites over most educational resources, which has created the problem of information asymmetry in the allocation of educational resources between urban and rural areas. In the long-term sharing of educational resources between urban and rural areas, the sharing process has gradually solidified into one-way sharing from urban to rural areas, which has actually become an abnormal sharing, and rural education is in the situation of passively accepting resources. This structural tilt of sharing leads to the serious lack of interaction between urban and rural educational resources and makes the development of rural education lack autonomy and endogeneity.

Third, the unstable flow of educational resources between urban and rural areas is mainly reflected in the sharing of teacher resources. Governments at all levels have issued a number of policies to promote the flow of high-quality urban teachers to rural areas, and some localities even promote the flow of teachers in the form of compulsory apportionment. However, in concrete implementation, the flow of teachers often

completes established tasks, and the attractiveness of the urban superior educational environment and social status makes it difficult for mobile teachers to focus on the development of rural education. Additionally, the original outstanding teachers in rural areas also leave the countryside because they are attracted by more generous treatment (Zhang et al., 2019).

The embedding of the "symbiosis" theory can effectively solve the above problems. First, the development of a symbiotic relationship between urban and rural educational resources will effectively enhance the endogeneity and autonomy of rural educational development. The "symbiosis" of urban and rural educational resources insists on the equality of the status of both sides and emphasizes the joint solutions, mutual cooperation, coordinated development and common progress of urban and rural areas on the issue of educational resources. Driven by a series of symbiotic policies such as urban–rural integration, the self-development of rural education will be accelerated, and it will experience a development process from passive acceptance to self-development and then to back-feeding city. Second, the development of a symbiotic relationship between urban and rural educational resources will effectively solve the problem of passive acceptance of rural education and lack of interaction between urban and rural areas. The embedding of symbiosis theory will enhance the effectiveness of mutual communication between urban and rural areas, effectively accomplishes the expression of both parties' demands through the symbiosis interface, and re-establishes the self-confidence of rural education through equal and reciprocal communication. Finally, the development of symbiotic relationship between urban and rural educational resources will effectively solve the problem of unstable mobility of educational resources between urban and rural areas. In the face of the instability of rural teacher resources, the embedding of symbiosis theory will bring a qualitative leap to rural educational culture and rural educational environment, which can effectively enhance the rural teachers' professional identity and make the rural teachers love the rural educational work very much, and pay more attention to the realization of their own life value. Therefore, rural society blended with modern culture can attract and retain an increasing number of people.

3.3 The Inner Mechanism of Symbiosis Theory Embedded in Urban and Rural Educational Resources

By introducing symbiosis theory into the study of relationship between urban and rural educational resources, we can analyze the applicability of three kinds of elements, such as symbiotic units, symbiotic models and symbiotic environments, as well as the symbiotic interface that influences and combines each other.

3.3.1 The Differences in Symbiotic Units Create a Gap in Energy Radiation Between Urban and Rural Educational Systems

The symbiotic unit is not only an important subject of symbiotic relationship but also the production and exchange unit of basic energy. Based on the previous research on "symbiosis" in urban–rural integration, the symbiotic units in urban–rural integration mainly include urban and rural areas. Accordingly, the main symbiotic units in the symbiosis of urban and rural educational resources can be defined as the urban educational system and rural educational system. Among them, urban schools, rural schools and educational departments become more scattered symbiotic units in the system. The symbiotic units transfer energy such as the teacher resources and teaching resources to each other in a symbiotic system, and the more advanced symbiotic models generate new energy - a new generation of human resources. On the one hand, the new generation of human resources can flow back to the symbiosis system of educational resources to improve the quality of urban and rural educational systems; on the other hand, it can also radiate beyond the educational system to provide the fundamental driving force for economic and social development.

In the symbiotic units, the symbiosis degree, correlation degree and symbiosis density are all very important. The symbiosis degree and correlation degree of symbiotic units reflect the relationship among various units. The "symbiosis" of urban and rural educational resources should be linked by the mutual transfer of energy and mutual synergy to generate new energy. In this link, the urban educational system and rural educational system always maintain a high degree of symbiosis and correlation. The rate of energy transfer is increasing, and an increasing amount of new energy is produced. The symbiosis density reflects the number of symbiotic units in the symbiotic system. With the differential development of urban and rural social economy, the density of the rural education system in the symbiotic system shrinks sharply. According to the Ten-Year Evaluation Report on Rural Educational Distribution Adjustment, from 2000 to 2010, an average of 63 primary schools, 30 teaching points and three middle schools disappeared every day in rural China, and four rural schools disappeared almost every hour (Li, 2012). According to the China Rural Statistical Yearbook-2019, from 2013–2018, rural elementary schools decreased from 140,000 to 91,000, and rural middle schools decreased from 18,485 to 14,792. On average, 24 primary and middle schools disappeared every day, and one rural school disappeared every hour (Department of Rural Social and Economic Investigation, National Bureau of Statistics, 2019). At the same time, the urban educational system continues to expand, with an ever-expanding range of energy radiation.

3.3.2 The Formation of the Symbiosis Model Has Led to the Interconnection of Urban and Rural Educational Resources

From the study of symbiosis theory, there is no relationship among some organisms or systems, which is shown as a non-symbiotic relationship, while the symbiosis modes

among related organisms or systems are mostly divided into separate symbiosis, one-way biased symbiosis and reciprocal symbiosis (Yuan, 1998). In regard to the field of urban and rural educational resources, it has roughly experienced three stages: non-symbiotic relationship, separate symbiotic relationship, and one-way biased symbiotic relationship.

The first is the stage of non-symbiotic relationship (from 1978 to 1992). Since the reform and opening up, the investment of national funds in education, the rise of rural intellectuals and the existence of rural-owned teaching methods have kept the rural educational system in a state of self-development and have not generated frequent resource flows with the urban educational system. In particular, the promulgation of the Decision of the Central Committee of the Communist Party of China on the Reform of the Educational System in May 1985 promoted the formation of "local responsibility and hierarchical management" in China's educational system. As a result, township governments were responsible for the educational system under their jurisdiction, and there was less flow of educational resources between urban and rural areas.

The second is the stage of separate symbiotic relationship (from 1993 to 2009). Separate symbiosis is a special mode of symbiosis that mainly involves the flow of energy from one side to another, but no new energy is generated. Specifically, in the field of education, the urban–rural dual system makes the development of disadvantaged rural education require the sharing of urban resources. Since 1993, China has gradually established a socialist market economic system. In 1994, the reform of tax-sharing system cut off the self-generated economic lifeline of township governments, making the rural educational system lose the basis of self-development (Wang, 2011). To develop rural education, local governments, especially county-level governments, promote cooperation and communication between urban and rural educational systems. During this period, rural education relied heavily on central and local financial support, and this reliance continued to grow. As a result, the rural and urban educational systems have entered a stage that tends to focus on the sharing of urban educational resources, but due to the low degree of symbiosis and correlation between urban and rural areas, no new energy has been generated in this stage.

The third is the stage of a one-way biased symbiotic relationship (from 2010 to now). The one-way biased symbiosis model is an evolution of the separate symbiosis model but is somewhere between the separate symbiosis model and reciprocal symbiosis model. In this model, although new energy is generated among symbiotic units, the new energy is only biased to one side and does not have a reciprocal effect on either. According to the Outline of the National Medium and Long-Term Education Reform and Development Plan (2010–2020), China will build an integrated development mechanism for urban and rural education and increase compensation for disadvantaged rural areas. This shows that the relationship between urban and rural educational resources will directly affect the development of rural education. At this stage, cities continued to transfer resources to the countryside. Since then, almost all the new energy, such as high-quality students and talents produced by "symbiosis" villages, has entered cities to receive vocational education or higher education, and the output has not returned to rural society and rural education but

has further improved the quality of urban human resources. Although this one-way biased symbiotic relationship has resulted in a steady stream of resource support for rural education, most of the new energy generated is biased towards cities and does not bring direct benefits to rural development, which further highlights the problem of the involution of rural education.

3.3.3 The Supply of a Symbiotic Environment Provides the Basis for the Development of Symbiosis Between Urban and Rural Educational Resources

The symbiotic environment is the external condition under which the symbiotic relationship can be maintained and the symbiotic mode can operate, and changes in the symbiotic environment can affect the development of symbiotic relationship. The symbiotic environment can be divided into a positive environment and a negative environment. From the perspective of a positive environment, the development of the symbiotic relationship between urban and rural educational resources benefits from two aspects. On the one hand, the comprehensive promotion of the rural revitalization strategy provides a favorable policy environment for the "symbiosis" between urban and rural educational resources. The rural revitalization strategy calls for giving priority to the development of rural education, "Promote the normalization of high-quality schools radiating to weak rural schools and strengthen the rotation of teachers between urban and rural areas" (the Central Committee of the Communist Party of China & the State Council, 2018). This is to support the exchange of educational resources between urban and rural areas from a national strategic perspective and to support the revitalization of rural education from economic and political perspectives. On the other hand, the introduction and development of Internet technology have provided a convenient technical environment for the "Symbiosis" of educational resources between urban and rural areas. The introduction and promotion of advanced educational technologies, such as MOOC, distance education and virtual simulation education, have enabled the symbiotic system between urban and rural educational resources to achieve long-distance and cross-regional coordination with the help of technology.

From the perspective of negative environment, there are also many factors restricting the formation and development of the symbiotic system between urban and rural educational resources. First, the urban–rural dual structure has existed for a long time. The formation of symbiotic relationship requires the symbiotic units to be in an equal position. China has always advocated and promoted the integration of urban and rural areas. However, the long-term imbalance between urban and rural development does not provide a good realistic basis for the formation of a symbiotic relationship between urban and rural educational resources. The second is the conflict between localism and modernity. Under the impact of modern educational culture, rural education is gradually "moving away from agriculture". Most of the children of peasant families are educated with the goal of escaping from the farm and countryside, which not only has had a powerful impact on the cultural purpose of

rural education as "for agriculture" but also has led to a gradual collapse of cultural confidence in the countryside (Tan, 2020).

3.3.4   The Construction of Symbiotic Interface Allows for the Mutual Transfer of Symbiotic Energy Between Urban and Rural Educational Resources

The symbiotic interface is the media, carrier and medium through which symbiotic units, symbiotic patterns and symbiotic environment interact and combine with each other. In the symbiotic interface, matter, information and energy are conducted among the symbiotic units. There are two main mediums for the symbiosis of urban and rural educational resources. One is the soft-medium interface, including policies and rules, and another is the subjective medium interface, including governments, schools, students, society and so on.

Soft-medium interfaces, such as policies and rules, are the superstructures that drive the functioning of symbiotic systems. Through the establishment of policies and rules, the energy of the symbiotic system of urban and rural educational resources, such as educational funds, teacher resources and teaching resources, can be transmitted in an orderly manner; in the continuous adjustment and optimization of policies and rules, new energy is constantly generated, and the model of the reciprocal symbiosis of urban and rural educational resources has also been established in this process. As the subjective medium interface, governments, schools, students and society are the main organizers and promoters of the development of symbiotic system between urban and rural educational resources. Specifically, governments, as the main player in the symbiosis of urban and rural educational resources, have a great influence on the formation and operation of the soft-medium interface, formulate and implement policies based on the realities of urban and rural educational development, and build a platform among the symbiotic units of the urban and rural educational systems. Schools, as the main carriers of the educational system, are responsible for the generation and transmission of energy. Students, as the recipients of energy, play a key role in generating new energy. All parties in society, as participants, assume their respective responsibilities for the "symbiosis" of urban and rural educational resources.

4 From Sharing to Coexistence: The Exploring Pathways for Rural Educational Revitalization

4.1 Change in the Concept of Urban and Rural Educational Resources Development: From the Emphasis on "Equity" to "Equality"

At a deeper level, the change from an emphasis on "equity" to "equality" is a reconstruction of rural status. In the case of the long-term imbalance between urban and rural economic development, the emphasis on "equity" in development ideas has already solidified people's thinking on rural education at the subjective level; that is, rural education is inferior to urban education. To achieve a real change in the status of urban and rural symbiotic educational systems, it is necessary to introduce the concept of "equality" in symbiosis theory, starting with promoting the status of rural education and achieving the equal status of symbiotic units.

First, we should promote the revitalization of rural education in a comprehensive manner while relying on the rural revitalization strategy. The word "revitalization" in rural revitalization has served as a shot of impetus to rural education and makes the development of rural education more dynamic and confident than before. Furthermore, the revitalization of rural education and rural revitalization are mutually dependent on each other. The revitalization of rural education provides high-quality human resources for rural revitalization, which is the basis of rural revitalization, while rural revitalization provides symbiotic educational resources for the revitalization of rural education, such as local culture, educational funds, excellent rural teachers and so on, which is extremely important for reshaping the status of rural education and raising its self-confidence. Rural education can use symbiotic resources to communicate and integrate with urban education. This is conducive to the psychological transformation of rural education from "I want it from the cities", "the cities gave it to me" to "we have it ourselves" and "all of us own it collectively".

Second, we should adhere to the principle of policy equality and build the values of the symbiotic system of urban and rural educational resources. China should integrate the awareness of educational equality into policy formulation and implementation, insist on the equal status of urban education and rural education, realize the equalization and integration of the allocation of urban and rural educational resources, and complete the construction of the concept of equality in the symbiotic system of urban and rural educational resources.

Finally, we should reconstruct the local culture and enhance the confidence of rural education. To establish the equal status of symbiotic units in the symbiotic system, it is necessary for the symbiotic units to establish cultural self-confidence. The impact of modern urban culture has made rural education deeply confused, often hesitant between drifting with the tide and asserting itself. As a result, the countryside lacks confidence in the exploration of its own educational resources and feedback to urban educational resources. This requires rural education to fully integrate modern urban

educational culture and adhere to the main position of rural culture, strengthen the exploration of traditional culture, transform the curriculum and educational content with localism, and thus establish the cultural characteristics and cultural confidence of the rural educational system.

4.2   Change in the Development Content of Urban and Rural Educational Resources: From Traditional Resources to the Excavation of Pluralistic Educational Resources

In the sharing of urban and rural educational resources, educational funds, teacher resources and teaching resources are the main content of "sharing", and they become the main energy source of symbiotic unit transmission in the construction of the symbiotic system of urban and rural educational resources. Energy transmission is essential for the maintenance of symbiotic system. In the process of symbiosis between urban and rural educational resources, apart from the material type of educational resources, educational resources should also be explored in terms of culture and ecology, which is an important opportunity for rural education to improve their own educational level and ability.

First, we should create advanced teaching methods together. Both urban education and rural education have their own unique teaching methods. The development and innovation of teaching methods are conducive to improving the quality of teaching and the level of education.

Second, we should explore regional cultural and educational resources. The urban and rural areas in each region have their own traditional and modern cultures. In the symbiosis of urban and rural educational resources, emphasis should be placed on the mutual transmission of traditional culture and modern culture. We should change the form of teaching classroom and form the cooperation and interaction, which can make the urban and rural students really "go out": the rural students go to the cities and feel modern culture and urban culture; the urban students go to the rural areas and feel traditional culture and farming culture.

Third, we should excavate rural ecological educational resources. Ecological educational resources are an important source of energy that rural areas provide for the symbiotic system of urban and rural educational resources. Urban education is detached from ecology and nature to a certain extent, and many students "know what it is but do not know why" in the face of ecological knowledge. This requires the establishment of urban and rural teaching practice bases by means of ways such as study tourism and extracurricular practice, which will ensure comprehensive and qualitative education, as well as further explore more rural educational resources and integrate them into the urban and rural symbiotic system.

4.3 Change in the Development Pattern of Urban and Rural Educational Resources: From One-Way Resource Supply to Mutually Beneficial Symbiosis

From the perspective of sharing educational resources between urban and rural areas, China's educational resources have long been in a one-way flow from urban to rural areas, resulting in the problem of "passive acceptance" of rural education. From the aspect of symbiosis theory, the symbiotic relationship between urban and rural educational resources has gone through the stages of separate symbiosis and one-way biased symbiosis. At present, rural education depends on the supply of urban educational resources, but a large amount of new energy, such as human resources, flows to the city. The investment in rural education is large, but rural education is difficult to develop. Therefore, it is necessary to explore the establishment of a mutually beneficial symbiosis model of urban and rural educational resources to promote the comprehensive revitalization of rural education.

First, we should achieve the cooperative development of urban and rural educational resources. The essence of symbiosis is cooperation, and the formation of a cooperative relationship between urban and rural education requires a multifaceted linkage of educational resources. Urban schools, with convenient conditions, can raise funds for rural education through extensive social publicity. Through forming cooperation in teacher training, it is necessary to connect the urban with rural teacher training, improve the overall quality of urban and rural teachers, and encourage them to cooperate in teaching and research activities. Through cooperation in teaching resources, it is important to carry out the exchange of high-quality courses by the Internet platform, increase the function of opinions and suggestions, and achieve two-way and all-around interaction.

Second, we should improve the consultation mechanism and broaden the communication channels between urban and rural education. Regular joint meetings should be held between urban and rural educational systems to explore the problems existing in the flow of educational resources between the two sides, express their own needs for educational resources, and realize the complementary advantages of educational resources between them.

Finally, we should realize the supply of new energy to both sides of urban and rural educational systems. Regardless of how educational resources are transferred and supplied in the symbiotic system of urban and rural educational resources, new energy from human resources will eventually be generated. As mentioned before, most of the new energy output will flow to cities. Among the new human resources, some will enter the cities' higher educational system to pursue further study, and the other will seek employment opportunities in the cities. Therefore, the return of new energy (especially the talent produced by rural educational resources) should be actively promoted. This requires promoting the rural culture, awakening the fighting spirit and sentiment of the talents who have left the countryside to return to the rural areas and build their hometown. At the same time, the policy for the introduction of rural talent should be introduced to retain returning talent through a series of incentives. In

addition, the authorized strength and treatment of rural teachers should be improved to attract excellent teachers to return home and participate in the development of rural education to make the new energy return to the flow of rural educational resources.

5 Conclusion

The study of symbiosis theory shows that it is applicable to embed symbiosis theory into the relationship between urban and rural educational resources. The symbiotic units formed by the urban and rural educational system have gone through the stages of non-symbiosis, separate symbiosis and one-way biased symbiosis in the change of political, economic, cultural and other symbiotic environments. The "symbiosis" of urban and rural educational resources has achieved the inheritance and development of "sharing" and has paid more attention to the equal allocation of educational resources, the enrichment of supply content and the innovation of supply methods, which is helpful to solve the problems faced by rural education in the stage of urban–rural sharing, such as the involution of rural education, the lack of interaction between urban and rural education, and the unstable flow of resources.

In the path exploration of revitalization of rural education in the new era, we should follow the idea of changing urban and rural educational resources from "sharing" to "symbiosis" and realize the breakthrough of concepts, the deepening of content and the innovation of ways. The important logical way for the revitalization of rural education in the new era is that the urban and rural educational resources form a reciprocal symbiotic relationship, and the new energy generated by their "symbiosis" flows not only to the city but also to the countryside; the urban and rural areas will develop together and make the common progress in the state of "symbiosis" of educational resources.

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Report 2020 on Frontier and Hot Issues of *Educational Research of China*

Editorial Department of Educational Research

The year 2020 was a year of great significance, as many endeavors were in a final push and new plans kicked off. It was a year where established projects were to be followed and new developments to be handled. Educational reform and development and building on the completion of phased tasks, started a new journey to a high-quality educational system. Research on educational theories, based on economic and social transformation, explored the major issues and frontline projects in education in-depth and contributed to the accumulation of educational knowledge.

1 From Online Education to Mixed Education

With the first online course emerging in 1981, online education is not something new. However, at the beginning of 2020, online education was again applied and inspected at a large-scale in human society. Thus, online education embraced the perfect opportunity to prove itself. The educational mode quietly changed; mixed education, combining online and offline education became an important change in education.

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1.1 Online Education Ensured That Courses Are Continued While Schools Were Closed

The sudden outbreak of the COVID-19 pandemic has impacted all aspects of human life and profoundly changed the world and life. Faced with the sudden disaster, "educational experts have been predicting the future of learning, and it comes all of a sudden (Wang and Minjuan 2020)." At the urgency of moment when the educational system was at the risk of being suspended, online education rose to the challenge and helped continue courses, despite schools closing. The National Online Platform of Primary and Secondary Schools Network was launched as an emergency response and played a strategic role (Yang & Zhuzhu, 2020). The super-large-scale online teaching implemented by higher education institutions stood the test of the pandemic and became a solid measure in providing quality teaching, as effective as offline courses (Han, 2020a). Amid this major public health contingency, online education has achieved many firsts in China's education and teaching practices, for example, the first online teaching program covering all the students of all educational stages and in all types of schools, the first online second-round postgraduate entrance examination, the first online oral defense of graduation dissertation, the first large-scale online examinations, etc. (Hu, 2020a). It is fair to say that a large-scale experiment in online education has opened a new page of history for human education (Guo, 2020). It has provided unprecedented experimental opportunities for schools to carry out intelligent education and accumulate the valuable experience of organizing large-scale online education activities in all aspects, including integrating educational resources, live streaming and recording of courses, internet and information technology support, organizing and managing students, and psychological education (Fan, 2020a). The underpinning role of online education during the pandemic cannot be overemphasized.

1.2 Calm Thinking Behind Practice in Full Swing

At the same time, researchers also calmly reviewed the practice in full swings in two aspects. One is to confront practice issues, and the other is to inspect the theoretical foundation. Regarding the first aspect, despite its enormous potential, online education is faced with huge challenges from students, teachers and its content (Yang & Lei, 2020). For instance, surveys show that online teaching gained less satisfaction than offline teaching, and teachers and students had little interest in continuously using online teaching (Qin et al., 2020). Furthermore, many issues have to be addressed. For example, an effective management system has to be established; teachers and students have insufficient understanding of online education and teaching; the design and implementation of online courses have to be improved; there are not enough resources; teachers do not know the features of online teaching well; the teaching

method does not match the students' information literacy; the development of information infrastructure and facility is imbalanced in general; the overall quality of online education has to be improved (Hu, 2020a). Based on the review of theory, connectivism has become a new theoretical foundation for online education. With an exception for traditional learning theories and collaborative learning theory, it has been one of the teaching theories widely applied to online education (Yang & Lei, 2020).

Some studies responded to major doubts over online education in a relatively systematic way, such as how to view shortcomings of online education, how to evaluate the quality of online education, and whether adaptive learning, a supposition of online education, is valid. They believe we should admit the shortcomings of online education, but we also should avoid falling into the Socratic Trap when we reflect on them. The quasi-experimental research paradigm has limitations when evaluating the quality and effect of online education. Online education is designed based on the reconstruction of the "teaching unit" instead of learning style preference. The future of online education development lies in big data. Such methodology, with both realistic observations and theoretical support, deserves approval.

1.3 Moving Toward the New form of Mixed Education

The opposite of online education is offline education. The discussion on online education is naturally linked with offline education and the relationship between them. Some studies show that it is necessary to correctly identify the dialectical relationship between online teaching and offline teaching and to fully recognize that there is no essential difference between them. Online education does not change the essence of online teaching, and pure online learning does not exist. Online education cannot handle all the issues. Therefore, a great number of learning activities still need to be carried out offline (Li & Huayang, 2020). This is a knowledge supposition that a mixed mode is possible. In fact, online education and offline education were adopted from time to time during the pandemic. This is objectively a normality. The notion of mixed education was created to balance online and offline education and leverage their strengths. This notion involves two ways of thinking. The first starts from the problems of online education, maintaining that the difficulty of applying online education will promote the shift of educational technology from a communication based paradigm on tool-thinking to a social-cultural paradigm based on relation-thinking. It promotes the physical and mental development of learners by building open learning space with mixed learning (Wu, 2020). The second is to address the shortcomings of offline education. With the notion of mixed education, it aims to achieve effective teaching and learning by combining the strengths of the traditional teaching approach and online learning, thus fully mixing learning environments, learning resources and learning methods (Han, 2020a). Or, alternatively, offline teaching should keep up with online teaching, and "two-line teaching mode" and "alternative teaching mode between online and offline" should be adopted to

create a new normality of mixed teaching. Mixed education as a mode of teaching requires in-depth research on issues such as form, modality, distribution, integration, connection between courses, faculty allocation, and a methodology of mixing education for different students and schools.

2   The Singularity Is Near, and the Origin Is Back: Education Reform in the Age of Intelligence

The above discussion on online education leads to a detailed inquiry into the basic question: the relationship between technology and educational reform. A review of the history of educational reform reveals that it is usually driven by thought or technology; often times thought plays a larger role, and other times technology.

Currently, the fourth industrial revolution, Industry 4.0 represented by artificial intelligence (AI), is leading human beings into a new era of intelligent machines. Technology enables educational reform to embrace more possibilities. Whilst driving in-depth and systematic educational reform, it also brings unprecedented complicated situations and potential risks to education.

2.1   The Age of Intelligence Is Sure to Promote Education Reform

Artificial intelligence, the fourth industrial revolution, Industry 4.0, the age of intelligence, and the age of smart machines, though different in expression, refer to similar concepts and have become hot topics of educational academia. Undoubtedly, the age of intelligence will influence education and promote educational reform. The first path of reform is putting forward new requirements for education in accordance to a changing social life. As some studies reveal, the age of intelligence will profoundly change human life. The development of intelligent society will put forward new requirements for the content of education and the type of talent and educational patterns, based on the change of knowledge, structural capacity and demand for employment (Lei, 2020). The second path of reform is to influence the linkage between labor skills and education, as the essential characteristics of industry 4.0 technology directly influence the labor market. Industry 4.0 technologies are interoperable, virtualized, service-oriented, decentralizing, and modularized with real-time capability. They influence the labor market at the macro level, the internal labor organization of enterprises at the meso level, and the labors' skills at the micro level (Yang, 2020a). They also impact education by directly redefining talent. The biggest impact intelligent machines have had on education is that they have changed the definition of talent. To foster new-type talent, the existing educational organization mode and process require major changes rather than simply improving or adding one

course or two (Zhao, 2020). The difference between these paths lies in the indirect influence or direct influence. However, they all clearly show that there is a trend: that education reform in the age of intelligence is approaching.

2.2 Directions of Educational Reform in the Age of Intelligence

In light of the educational system reform, flexible capability-oriented basic education should be developed in order to lay a solid foundation for the whole career. Industry schools should be implemented to advance reform in vocational education and teaching. Higher education should be restructured to foster innovators and leaders for the age of Industry 4.0. Endeavors should be made to build learning organizations for lifelong learning amongst employees (Yang, 2020a). In light of personnel cultivation standards, the educational strategy addressing the challenge of intelligent machines should pay more attention tino fostering students' morality, ethics, value judgment, creativity, social emotion and instinct judgment (Zhao, 2020). High-end international, innovative and versatile talent with digital and intelligent competence should be fostered (Gu, 2020). From the perspective of educators, compared to human teachers who have educational wisdom and teaching strategies, "the level of intelligence" of the existing AI system is lower. Its ability to solve educational problems is limited. The in-depth application of AI needs to tackle difficulties and barriers in technology, ethics, systems and their effects (Xiao et al., 2020). It should be conceded that educational reform driven by AI does not happen overnight. Rather, it is a gradual process that might experience three realms before shifting from industrialized education to intelligent education. First, empowering education maximizes the efficiency of standardized education. Second, innovating education breaks the standardized educational system to achieve individualized learning. Third, remodeling education promotes education from the stage of "destandardization" to the stage of "deinstitutionalization" (Cao, 2020a).

2.3 Unavoidable Potential Ethic and Value Risks

As always in interpersonal relations, education is a cause full of value. Any educational reform should be focused back to the origin, face ethical and value issues squarely and handle them properly. In the age of intelligence, the exploration into educational ethics and value lies fundamentally in answering the question of whether future education is to make people more like machines or humans. Based on this, people express some concerns. Knowledge updates rapidly in the age of information, plunging individuals into situations with too much to receive and adapt within a short period. As the boundary between truth and false disappears against virtual

reality, will it push people away or bring them closer to real life? Will the wisdom and competence example set up by AI lead people to homogenize or to individualise? Will fragmented, ubiquitous, instant and casual fast-food-styled learning strengthen or weaken the real effect of learning? Does the technology age emphasizing ability cultivation and fast learning intensify or ease social competition? Will the enterprise-leading and market-dominant intelligent education pattern make future education fairer or unfairer (Wang & Zixiao, 2020)? Because of these concerns, AI cannot replace the value of human beings and deprive them of subjectivity. AI will not take over all the rights and responsibilities of education, and education should not lose its own right of saying in this progressive campaign of applying AI, which will result in lost meaning and value of education (Li & Huangyang, 2020). Preventing and avoiding potential ethical risks requires education to revert back to the origin, which means refocusing on the locality and ontology of education. Locality stresses that education should take China's traditional cultural, social system, and realistic people's lives as its foundation, while ontology emphasizes that education should be people-centered and uphold the principle of cultivating virtues. The fine traditional Chinese culture highlights the study of life in terms of ontology, virtues and ethics in terms of value theory as well as the role of mentality on consciousness and under-standing in terms of methodology, which underpins the construction of educational ethics in the age of intelligence. The fine traditional culture advocates the technolog-ical ethics of being kind and plays a valuable role in preventing humans from being alienated by technology, avoiding vicious competition and ensuring equity. It is the origin of the reflection on education development in the age of intelligence and the spiritual treasure house for pursuing a better life and will contribute to the Chinese wisdom of avoiding ethical risks of technological application in future education around the world (Wang & Zixiao, 2020).

3   Education Becomes an Important Mechanism for Poverty Reduction

Poverty reduction and alleviation are a shared dream by human beings. The first goal of the UN Millennium Development Goals (MDGs) is "Eradicate extreme poverty and hunger". What tops the 17 sustainable development goals in *Transforming our World: The 2030 Sustainable Agenda for Sustainable Development* remains "End poverty in all its forms everywhere". In 2020, China completely won the battle against poverty. Education, as one of the five major mechanisms against poverty, assumed its mission and fulfilled its responsibility. The guarantee for compulsory education has been achieved across the board, to which educators working on theories contributed knowledge and thought.

3.1 Clarifying the Internal Mechanism of Poverty Alleviation Through Education

Poverty alleviation through education is a way of poverty alleviation that enhances the poor's endogenous motivation and capacity offor development. It can effectively prevent the population lifted out of poverty from falling back into poverty because of the interruption of assistance from others.

Stopping poverty culture being passed down from generation to generation is key to eliminating poverty from the root (Yuan & Yashi, 2020). Empirical research also shows that education has been a stable and positive variable for poverty alleviation regardless of the degree of poverty, overall difference, difference between urban and rural areas and between cities (Liu, 2020a). To reduce poverty, it is essential to clarify the internal mechanism. The root cause of poverty is the lack of human capital; education is an important aspect of human capital. To fight against poverty, input in education should be increased, and priority should be given to educational development. Moreover, parents in poor families have lower expectations of their child's educational attainment, living ability and career prospects, which to some degree affects their attitude towards child's learning, learning incentives, learning motivation, and educational investment, leading to the passing down of poverty from generation to generation (Yu & Xiaorong, 2020). Based on this understanding, the mechanism to increase human capital should come into effect. First, the average years of schooling per capita should be increased, especially that of the new population, by raising the penetration rate of education at all levels and of all types. Increasing the years of schooling not only helps this generation eliminate poverty, but also improves the education level of the parents of the next generation, thus stopping the passage of poverty from generation to generation. Ability is the core of human capital. The key to poverty alleviation through education is empowering cognitive and non-cognitive abilities to help the poor receive education and build aspirations. In terms of empowering cognitive abilities, efforts should be made to help improve the poor's cultural literacy and job skills, stimulate, develop and cultivate potential in different areas during the process, and form a long-term-effect mechanism in which human capital, material capital and social capital cooperate with each other to help poverty reduction (Wang, 2020b). In terms of empowering non-cognitive abilities, poverty elimination through education takes on the mission of enlightenment. Helping the disadvantaged build aspirations is key to poverty elimination through education, whose special status and role is highlighted in the entirety of the poverty-reduction system (Mo, 2020). Having access to education, education lasting longer periods of time, and acquiring more cognitive and non-cognitive abilities is not enough to be recognized as being completely lifted out of poverty. Rather, it depends on using the leverage of education to make "those being educated" distinguished in the labor market and have greater core value and added value, thus realizing intergenerational flow.

3.2   China's Theory of Poverty Alleviation Through Education Has Taken Shape

The year 2020 was the final year of the fight against poverty, during which poverty alleviation through education contributed to plenty of practices. Based on these practices, China's theory of poverty alleviation through education has taken shape. The underlying logic of the theory is giving priority to educational development, which has been an education philosophy held by the Party and government since China's reform and opening-up. Especially since 1992, giving priority to the development of education has been part of China's national education strategy. It has been a strong supporter for poverty alleviation through education. The empirical analysis of panel data of educational investment and rural residents' income in the five provinces in Northwest China finds that every 1% increase in education funding will bring about a 0.56% increase in rural residents' income; the increase in education investment contributes over 65% to the increase in the per capita net income of rural residents in the five provinces in recent years, and the contribution can be up to 87%, representing remarkable achievement of poverty alleviation through education (Peng, 2020). The core of the theory is to ensure that the poor have fair access to education and to promote access to quality education. Regarding fair access to education, the key is promoting compulsory education by controlling the drop-out rate and maintaining school attendance. The essence of controlling the drop-out rate and maintaining school attendance is extending schooling years. In 2020, China's consolidation rate of nine-year compulsory education reached 95.2%. The schooling years of the labour-aged population averaged 10.7 years, equivalent to the second year of senior high school. The average schooling years of the newly increased labor force hit 13.7 years, equivalent to the level of sophomore year of university. Regarding access to quality education, the key is to ensure balanced development of compulsory education. In China, 96.8% of counties have passed the national supervision and evaluation of the basic balanced development of compulsory education. Emphasizing access to education and access to quality education simultaneously means that poverty alleviation through education has shifted its focus from part to entirety. The thinking method of this theory is systemic thought. With guaranteeing compulsory education as the core, endeavors should be made to advance the categorization reform of vocational education, leverage the distinct role of vocational education in helping the poor's building capacities, advocate key universities to allocate more enrollment for poverty-stricken regions and poor households in order to directly cut off the intergenerational transmission of poverty and provide more targeted assistance and grants. With multi pronged approaches, a policy system and working system of poverty alleviation through education has been established.

3.3 Turning to Help Alleviate Relative Poverty Through Rural Educational Revitalization

At the new development stage, the poverty reduction effort shifted to rural revitalization. After eradicating extreme poverty, relative poverty becomes the main symptom of China's poverty issue. Therefore, poverty alienation through education shifts its focus to revitalizing rural education and to helping those in relative poverty through rural revitalization. The premise is to continue to increase investment in educational development and to stop the intergenerational transmission of poverty with dual paths of supply-side and demand-side effects of education (Hou, 2020). The key is building an inclusive public service system for education that covers all urban and rural residents and integrates urban and rural areas, promotes equalization of basic public education services to enable the poor to have the capability of resisting risks and achieving sustainable development; thus achieving endogenous development in poverty-stricken areas (Wang, 2020b). Efforts to control dropout rates and maintain attendance should shift from external control-based logic to endogenous logic by improving schooling and winning support from parents and society (Zhao & Chunping, 2020). The focus is that it is crucial to establish a national mechanism to monitor and prevent falling back into poverty due education and to keep helping the poor by building and improving relevant systems to evaluate and track education in registered state-level poor households (Li et al., 2020c).

4 Education Equity Moving Toward the Pursuit of Substantive Fairness

Education equity is an essential attribute of socialist education. Promoting education equity is a basic national education policy. In the twenty-first century, especially since the 18th National Congress of the Communist Party of China, China has made great strides in educational fairness. With the issue of fair access to education resolved, China's education has advanced into a new stage of pursuing substantive fairness. How to look at the new content and new challenges of education equity after entering the stage of substantive fairness has become a great concern for academia.

4.1 The Standard and Evaluation of Education Equity Is Changing

The measure for analyzing education equity mainly comes from the concepts of equity and justice in political philosophy, based on which education equity is classified into distribution equity, ownership equity, recognition equity, etc. Alternatively, from the perspective of the justice process, education equity is classified

into starting point equity, process equity, result equity and other basic types. Based on whichever type, China has undoubtedly made great achievements in education equity, as people's right to education has been guaranteed with access to education, and compulsory education at the county scale has been basically distributed in a balanced way. However, people also note that in some provinces and cities, the development level of compulsory education demonstrates a dilemma of imbalance between form rationality and substance (Si & Lianhua, 2020). It reflects the fact that people's expectations of education is not only about the right of education, access to education and the basic balance of compulsory education, but also about rule-based equity, access to quality education and balance of quality education resources. The standard and measure of educational fairness is changing, and the judgment and evaluation of education fairness is changing correspondingly. It is time to elevate the connotation of educational fairness from fairness of form to that of substance.

4.2 Substantive Fairness Points to Fair and Quality Education

The focus of research on education equity begins to shift to educational process equity that pays more attention to details and has more humanistic care (Huang et al., 2020). Process equity is not only about equity itself but also about quality. In process equity, the focus of the issue shifts from unbalanced equity or insufficiency of quality to the relationship between equity and quality (Li, 2020g). Process equity points to fair and quality education, which helps students receive education that is suitable for them. Suitable education refers to higher-level education with better quality, which is closer to the essence of education. The fundamental purpose of education is to enpower people who are receiving education to have the ability to create a better life (He, 2020). Against the backdrop of building a high-quality education system, fair and quality education means the pursuit of education with greater fairness and quality. One example is the enrollment exam. Since the founding of the People's Republic of China, the value orientation of its enrollment exam policy has essentially shifted from equal rights and equal opportunities to equal development. The essence is the shift from form equity to substantive equity. After ensuring that everyone can have equal access to enrollment and opportunity to pursue higher-level education, China should advance the reform in its enrollment exam policy by adopting the new logic of equal development equality. In recent years, China has built a fair policy system that make key universities admit more students from rural and poverty-stricken areas, which marks the greater efforts by the Party and the country to develop more equitable and quality education in the new era (Li & Qiuxiang, 2020).

4.3 The Policy Implication of Substantive Equity

After entering the substantive equity stage, the policy implication changes. First, it pays more attention to meritocracy or the cultivation of top-notch innovative personnel. In the context of building a great modern country, especially a country of innovation, meritocracy and the cultivation of top-notch innovative personnel have great strategic significance in the sense that building a strong country requires developing its education. Additionally, it is of humane meaning and intrinsic value to develop meritocracy to meet the developmental needs of children with outstanding abilities (Chu, 2020). Higher education institutions should follow the international trend, alter the philosophy of producing top-notch personnel, and provide diversified programs suitable for students' personality and their individualized needs (Yan & Han, 2020). Second, it enhances public educational service ability at the local county level. China's urbanization strategies are changing, and counties will see new-type urbanization. Thus, strengthening the public service ability of counties will be an essential task. Currently, the gradual decline of county-level senior high schools has attracted much attention. Studies find that lowering the difficulty level of college entrance exams will increase the opportunities of students from county-level senior high schools to be admitted into elite universities. Meanwhile, this will lower the degree of monopoly a few high schools have on access to elite universities and make the enrollment more balanced (Guo et al., 2020). Therefore, we should design the difficulty level of the college entrance exam in a reasonable manner. While ensuring its basic function of selecting talent, we should fully consider the important role of county-level senior high schools in promoting the intergenerational mobility of disadvantaged people in China and further maintain the realization of social justice. Third, it emphasizes the normal flow of teachers between urban and rural areas. At the stage where compulsory education advances from basic balance to quality balance, the key to achieving quality balance for compulsory education at the county level lies in the balanced exchange of high-quality teachers among counties. The optional improvement strategies for building a normal exchange mechanism of teachers between urban and rural areas include scientifically allocating educational space and resources, establishing a public governance mechanism of equal obligation, building an enclosed grid space faculty allocation system and promoting the flow of "virtual teachers" (Yin, 2020).

5 Integration and Curricularization: New Coordinates of Political and Ideological Theory Courses

Political and ideological theory courses are a component of education of socialism with Chinese characteristics, as well as the fundamental guarantee for students to achieve all-round development. Attaching great importance to its development, the CPC Central Committee and President Xi Jinping have made major decisions that

have achieved significant results. The new vertical and horizontal coordinates of political and ideological theory courses were initially established.

5.1 Political and Ideological Theory Courses Are Key Courses for Cultivating Young People in the New Era

Political and ideological theory courses are of great significance. The courses should be built according to high standards. (Shen, 2020). On the one hand, only by building courses according to high standards can we highlight the important status of ideological and political courses in the new era as well as emphasize their function as a main channel and as a way to cultivate young people for the new era, thus leveraging their role in thought-leading value orientation in a better way. On the other hand, only by making greater efforts to build political and ideological theory courses in coordination can we keep improving their function and effect of cultivating young people (Gao, 2020b). Courses of high standards and built with great effort are determined by their functions and roles. The construction of political and ideological theory courses is related to not only the implementation of the Party's education policies and realization of educational goals but also the direction of socialist school running in the entire education system and the cultivation of young people in the new era who assume the mission of national rejuvenation (Han, 2020b). The construction of political and ideological theory courses can help foster students' ideological and political literacy and morality, and it plays an irreplaceable role in improving students' ideological and political understanding (Yang, 2020c). High-standard construction of political and ideological theory courses with great efforts is also determined by the current situation of the courses, as they face new problems and challenges. For example, people are not well aware of their important status; the content of courses is not interesting enough; the evaluation and supporting system of the courses is to be improved; and the courses face unit division, disconnection between educational levels and poor cohesion (Ye, 2020). All these require serious consideration.

5.2 Improving Integration Is the Horizontal Coordinate of Political and Ideological Theory Courses

Integration refers to building a system of political and ideological theory courses that runs through all educational stages ranging from preschool to primary school, middle school to college. First, we should build an integrated, systematic and cohesive system (Chen, 2020). We should take into consideration the varying features of preschool, primary school, middle school and college; understand the characteristics of students' mental development and personality development in preschool, primary school, middle school and college; implement an overall goal of fostering

virtue through education at different educational stages and in all types of schools; and develop a system of political and ideological theory courses with integration and diversification (Yang & Yanping, 2020). Second, we should consciously strengthen the construction of the weak links. We should strive to reverse the upside-down phenomenon of political and ideological theory courses, promote activities related to political and ideological education in primary and middle schools, bring relevant activities into courses, and ensure the political and ideological theory courses are included in the curriculum. We should strengthen the specialization of political and ideological theory courses at higher education stages and improve the professional level and teaching quality (Liu, 2020c). Third, we should pay attention to the development of educational spaces outside of schools and develop a school-family cooperating mechanism.

5.3 Making the Curriculum the Horizontal Coordinate of Political and Ideological Theory Courses

In the past, moral education was implemented in all subjects in primary and secondary schools. At present, some higher education institutions, based on their long-term ideological and political work, have developed political and ideological theories taught in all courses, which stresses that all kinds of courses should shoulder the responsibility of educating people and educating all students throughout the schooling years and in all aspects. This is an important innovation in educational theory. The ideas of moral education implemented in all subjects, or political and ideological theories taught in all courses, reflect the curriculum-oriented thought of political and ideological theory courses. Curriculum-oriented thought means that political and ideological education is not only the mission of political and ideological courses. Rather, all the subjects and courses shall include the content of political and ideological education. There will be major changes brought by political and ideological theories taught in all courses in higher education institutions. First, the change of school curriculum management. Some studies believe that curriculum planning should highlight the centrality of educating people, create the teaching system of all subjects educating people in curriculum implementation, and take fostering virtues and educating people as the fundamental standard for curriculum evaluation (Yang, 2020c). Second, the school's ideological and political working system has changed. Studies point out that the curriculum should be a part that can fully bring forth the responsibility of ideological and political work, widely apply the concept of educating people in all subjects in the work and make political and ideological theories taught in all courses contribute to the ideological and political work system. Thus, we can build a system which guarantees teaching political and ideological theories in all courses (Shen, 2020). The third is the change of teachers' work of educating people. Some studies emphasize that we should enhance teachers' awareness of teaching political and

ideological theories in all courses and improve their ability to practice that (Gao, 2020b).

6   Reflection and Progress of Moral Education Under Public Crisis

Moral issues are complicated, and moral education continues to improve. The outbreak of the COVID-19 pandemic drew humanity into a public health crisis. As crises contain opportunities, educational academia carries out discussions on the topic "public", promoting the update of moral education knowledge.

6.1   Public Crisis Triggers Discussion on Moral Education

In the face of adversity, people tend to show their true colors, which easily leads to discussions regarding morality and moral education. This is because, in light of the relationship with oneself within the context of the social environment, personal experience and direction of public opinion, the moral ideas people gain might be moral prejudice (Gao, 2020a). In light of the relationship with others, the lack of boundary consciousness and rational spirit leads to blame in the name of morality and immoral results. In light of the relationship with society, the pursuit of exquisite self-interest alienates people's relationship with society, leading to an insufficient sense of social responsibilities. In fact, the three situations seem to have something with the awareness of public regulation and spirit of contract, which has been a weakness of our social construct. Against the backdrop of a public health crisis, the weakness is exposed more acutely. Research points out that with the inadequacy of the tradition of the public person, the accelerating expansion of "individual person" under market economy is showing and revealing the declining trend of the public person (Feng, 2020a). This result contrasts with the priority of public interest and collective consciousness emphasized by our country. Therefore, it is an important proposition to implement education of public characters based on public spirit, public participation and cooperation (Zhu and Wang), foster a public person who stands by public position, participate in public life, carry out public communication and have public characters (Feng, 2020a), and develop right public values by building boundary consciousness and rational spirit of subjectivity.

6.2 Attaching Greater Importance to Fostering Sound Personality and Public Character

Personality matters more than grades, and education, especially moral education, should attach greater importance to the cultivation of students' sound personality. Following excellent examples is an important way to foster personality. With compassion as the original motivation, "same thinking and same structure" as the true state, "personality generation" as a fundamental direction, such education, can be regarded as a path of model education (Sun, 2020). Instead of producing moral sages, exemplar education establishes basic moral qualities through example, from which it fosters a sound personality (Dong, 2020). It is also an important path of public values education to cultivate learners' basic affective quality, help them build ethical awareness and moral spirit, and foster a moral foundation to educate people through values (Wang, 2020d). On the basis of building a sound personality, we should foster people's public character through public value education. Public values refer to value consensus and public code of conduct gradually established when members of society participate in public life. China's socialist core values are widely recognized public values. However, in practice, values education has the problem of "knowing but not believing, knowing but not practicing". The root cause is that we ignore and forget the "genetic phenomenology" of values (Hu, 2020b). To awake and activate a deep understanding of the genetic phenomenology of public values, we should give way to the subjective initiative of moral education's subject.

6.3 Promoting Moral Education While Improving Social Civilization Standards

The Recommendations for the 14th Five-Year Plan for National Economic and Social Development and *The Long-Range Objectives Through 2035* indicate that China should improve social civility standards. A society is composed of people of generations, and social civility depends on the quality of people of generations. The basis of social civility is the awareness of social responsibility in each member of society. This puts forward higher requirements for and brings new opportunities to moral education. To promote moral education while improving the level of social civility, we should further review some prerequisites of moral education. For example, in moral education, we often advocate that children model adults. This is reasonable but not enough. We cannot put all the weight of moral education on children, nor the adults' sense of social responsibility and awareness of public regulations. In fact, all the adults were once children. In moral education for children of this generation, we should break the individualized, competitive and isolated approach of existence and education and foster younger generations with a sense of social responsibility, public participation spirit and civic duty to achieve the national, social and individual mission of moral education (Ye, 2020). Based on the core socialist values, we should

guide children to understand and think about the positive value association between themselves and the country, build deep emotional and cultural bonds between themselves and the Chinese nation, and learn to correctly judge and evaluate the value links between themselves and the environment, humanity and the world as a whole (Sun, 2020). Moreover, by virtue of the community of moral education, we should foster public character with community spirit as core and make people consciously participate in community life and care about others as well as society and the country (Zhang & Fengqin, 2020).

7 Curriculum and Teaching Reform from the Perspective of the "Big Idea"

The curriculum and teaching reform is shifting to competence-oriented, which means the transformation from introducing experts' findings to cultivating deep contemplation. Thinking like an expert is transferable and conducive to helping students solve realistic issues. However, the method of applying this goal to the curriculum and teaching transformation remains a hurdle. Currently, both theoretical circles and practical circles focus their attention on the "big idea", which has gradually become the pillar for implementing curriculum and teaching reform.

7.1 Curriculum and Teaching Are Experiencing Value Transformation with Competence at the Core

The introduction of core competence and key capability has enormous influence on the field of curriculum and teaching. This influence is not limited to being included in relevant text; rather, it also lies in the value-orientated transformation of the curriculum and teaching practices. Knowledge and real world ability can be the goal and value of curriculum and teaching methodology. To impart knowledge and to foster skills was a Rashōmon in history. For a long period, China's curriculum and teaching have attached great importance to imparting knowledge, and it is fair to say that the knowledge orientated approach is deep-seated. Nonetheless, whether from the perspective of future goals or from that of realistic issues, it is time to shift the country's curriculum and teaching practices to be oriented around competence and focus on cultivating students' cognition, innovation, cooperation and professional ability. Today's education should focus on real world issues that students have to face in the future. From the perspective of migration, if students attain knowledge from books via systematic methods, they will "forget it systematically" after they graduate (Liu, 2020b).

7.2 "Big Idea" Can Make Competence Goals Concrete

In curriculum and teaching, the core idea and key idea of the subject are what are often featured. What is the difference between "big idea" and the two? The core idea and key idea usually care about the integration of knowledge within the subject, while the "big idea" gets through not only learning within subjects and between subjects but also the relationship between school education and the real world. "Big idea" reflects the idea, concept, or topic of professional thinking. Abstract or high-level thought does not come away from concrete situations, rather it comes from nothing. Because professional thinking comes from concrete situations, it can be applied to concrete situations. "Big idea" with professional thinking reflects coordinated thinking between the concrete and the abstract (Liu, 2020b). From an epistemological point of view, "big idea" is summarized based on facts, experience and concepts; thus, it usually refers to upending ideas at a higher level, placing core ideas at the center and having essential ideas hidden within deeper contemplation. Methodologically, "big idea" provides people with a cognitive framework to understand things and gain knowledge. With this cognitive framework, people can clarify the connection of facts, experiences, things and concepts. They can also understand the meaning of facts, experiences, things and concepts as a whole. From the perspective of axiology, "big idea" is valuable to the understanding of things and the construction and transfer of knowledge, and it takes into account human factors, human nature and human society (Li, 2020e). With the help of a "big idea", we can turn competence into concrete goals, push student-oriented teaching reform to develop students' core competence as well as a lever to prmote teaching reform in deep water zones (Li, 2020f).

7.3 The Implementation of "Big Idea" with Unit as Carrier

"Big idea" is hierarchical. It includes the big idea of the subject and of the big idea of having multiple subjects. At present, it has attracted the attention of teaching various subjects, specifically related to Chinese (Xu, 2020), Math (Li & Xindong, 2020), English (Wang et al., 2020), Science (Li et al., 2020a), Politics (Zhang, 2020a), History (Li, 2020b), Geography (Zhang, 2020b), Chemistry (Wu & Zihua, 2020), Biology (Su and Zhao), Physics (Cao, 2019), and Art (Shen, 2019), and is applied to interdisciplinary learning, such as labor education (Li & Lijie, 2020) and learning of science-technology-engineering-mathematics (STEM) (Liu et al., 2020a). Whether it is a single subject or multiple subjects, the specific courses and teaching practice are based on the unit because a single lesson is not enough to support the establishment of a highly abstract "big idea", while the unit as a set can provide a variety of specific cases. In that case, the unit is the best vessel, which responds to the structured idea of curriculum design. A unit carrying a "big idea" has three forms of expression: dominance, semi recessiveness and recessiveness. Dominance refers to clearly extracting the core idea of the subject from the curriculum and placing it on

the structural fulcrum of the curriculum system. Teaching material is complied based on this and clarifies the design unit. Semi Recessiveness means there is no unit for designing content based on certain core ideas in curriculum standards or textbooks, and teachers need to adjust part of the content in the textbook for subsequent course development. Some "big ideas" emerge in different grades, educational stages and even subjects. They are either spiraling or joining together other across subjects. Such units also need to be developed by teachers to form virtual units and to guide students with certain purposes in different time periods or courses so that they can gradually understand the "big idea", which is the recessiveness of the "big idea" (Lv, 2020).

8   Teachers' Professional Development in the Age of Accelerations

Teaching staff underpin the construction of a high-quality education system. The 17 million teachers in China are a large team, and their career development carries too much importance. Every stage of life for different teachers contains its own unique characteristics. In an age where everything happens more quickly, what "teachers of this generation" have encountered, what they have shown and what they have left have triggered people's attention and discussion.

8.1   "Teachers' Career Development" Has Become an Area with New Connotations

Friedman, T., the columnist of *New York Times* once had a vivid description of the feature of the age, saying "The market, Nature, and Moore's Law speed up simultaneously and constitute the 'age of accelerations', and this is where we are (Friedman, 2018)." The root of "accelerations" lies in "Moore's Law", i.e., the information technology revolution (Wang, 2020c). This way, teachers are facing a new situation in their career development. Teachers in the school system have gained a new understanding and experiences of their profession consisting of the age they live in, society and students. The age of accelerations has given birth to teachers of shadow education, online teachers who exist in cyberspace, and even smart robot teachers. All of which are changing the occupation of teachers. The clear definition of the teacher of the past is becoming blurred; thus, a new definition is needed. Some new problems and new topics arise among these changes, such as burnout, which is a kind of psychological and behavioral phenomenon often seen in teachers (Shi, 2020). Identity crisis is also a major new problem. While empowering teachers, technology also brings them new challenges and requires them to change how they see their professional role (Zhang, 2020c). Teachers' identity is an issue that we should profoundly

explore from the perspectives of theory, policy and practice. Another problem is the competency issue. For example, teachers no longer hold a monopoly on knowledge, and their advantage in knowledge and information is not as large as before. The requirement for teachers' information literacy has been raised to an unprecedented level due the emergence of the Internet.

Teachers' competency standards will be redefined, and their career requirements will be fully updated (Lei, 2020). Teachers' professional development in the new era demands "integration of both online and offline teaching competency" (Qiu & Zhengtao, 2020).

8.2 The Age of Accelerations Has a Two-Way Influence on Teachers' Career Development

In the age of accelerations, the rapid development of information technology, changes in the speed and method of spreading and gaining knowledge and the exponential increase in the accumulation of data and information have significantly influenced teachers' career development. On the one hand, the development of information technology enables teachers to have more convenient access to teaching resources. This supports their career growth and development. It also helps meet their needs for professional development, greater autonomy, and a sense of belonging (Liang, 2020). Moreover, the promotion and application of information technology frees teachers from heavy manual labor, so they can spend more time and energy teaching and focusing on the essence of "educating people". At the same time, teachers can analyze and diagnose students with information technology and use that to help students formulate personalized learning plans and strategies (Fan, 2020b). On the other hand, rapid social transformation and a fast-paced work culture make teachers work longer hours. They have to meet higher requirements and work under greater pressure. This will seriously affect teachers' satisfaction with their work (Liang, 2020). Teachers in the career development process might become lost in terms of the institutionalization of academic life, frustrated with conflict between work and family, and struggle to balance academic freedom and institutional regulations. Their physical and mental health might have a causal relationship with burnout (Yan, 2020). Despite a full schedule, the things they do or experience seem to leave no trace in their memory. Teachers' autonomy and flexible pace of life is greatly affected; their emotional anxiety has gradually become a social symptom (Cao, 2020b).

8.3 The Focus of Teachers' Career Development in the Age of Accelerations

Overall things remain the same despite all the changes. Educating people is the eternal duty of teachers. The prerequisite for teachers' career development in the age of accelerations is to have good teachers' ethics, which is the foundation for maintaining the profession of teachers and an integral component of teachers' professional development. Taking teachers' ethics and virtue as the foremost standard and building a professional code of morality for teachers in universities, middle schools and primary schools is urgent (Ren, 2020). Regarding teachers' ethics, the most important thing is to realize that as a responsibility, it varies greatly in content, structure and weight at different academic stages (Tan, 2020a). At the preschool stage, teachers' ethics must start with protecting and promoting the full realization of every child (Feng, 2020b). At this stage of basic education, it is wholesome, demonstrative and developmental (Li, 2020c). At the same time, it is open. That is, teachers embrace different styles, have inclusive attitudes towards students' culture when interacting with them, and enrich cultural characteristics in self-introspection (Yang, 2020b). At the higher education stage, university faculty members have a unique set of ethics with the characteristics of an academic profession based on advanced knowledge, advocating academic freedom, and taking the academic community as an entity consisting of its relationship with its ethics (Li, 2020a). In the age of accelerations, the core of teachers' professional development is to enhance their ability to educate people amid changes and challenges. The value of teachers' ability to educate people is that it leads students to build correct views of the world, life and values, develop a strong sense of justice characters, increase knowledge and wisdom and improve the mastery of skills and methods (Liu et al., 2020b). In the age of accelerations, the key to teachers' professional development is to improve information literacy. In teachers' career development, we should incorporate technology into teachers' lives and enrich teachers' quality of life so that teachers can use technology to interact with students and promote the development of humanity in practice, thus highlighting para-life features (Ye, 2020).

9 Promoting Health Through Health

A great pandemic has pushed the health issue to the forefront. People in all related fields are studying health issues from their own perspectives. Education is an important part in shaping lifestyle and promoting physical and mental health. An in-depth exploration of the relationship between education and health has important policy value and academic significance.

9.1   Education Is an Important Factor Affecting Health

Many social factors play a role in a person's health, including gender, marriage, education, occupation, income and lifestyle, among which education undoubtedly plays a more basic role. Considering the essence of education, if human life contains an ontological meaning to the pursuit of mental health, if health is both personal and public well-being, promoting health is an important task for education, and it must include the improvement of people's mental health. If education has no concern over people's mental health and spiritual health, it will lose its fundamental purpose (Jin, 2020). From the perspective of the fruits of education, education can help one get a better job, make more money, and invest more into nutrients and medical insurance. Meanwhile, education can also change personal thinking, improve personal health awareness and shape relevant healthy behaviour (Li & Jei, 2020). Certainly, due to the difference in social structure and personal experience, education's influence varies by age. In adolescence, one has sound health, and education and other post-endogenous factors play a bigger role. As one ages, a person's physical state will decline rapidly, the influence of physical aging on health will reduce the role of other social factors. This will also cause the effect of education on health to further decline (Li et al., 2020a). Education's influence on health is also cumulative from one generation to the next. On the one hand, parents with a higher level of education are more inclined to increase investment in children's education. Such an educational mechanism helps maintain the educational advantage of children and results in a "cumulative effect" on health (Li, 2020b). On the other hand, parents' behavior will also produce a "socialization effect". Their stronger belief in health being important can reduce children's risky behavior and foster positive behavior that contributes to health rather than being detrimental (Hong & Jie, 2020).

9.2   How Education Promotes Health

How does education promote health? There are the two main sources of influence. First, education can positively influence people's health by increasing their personal income. As an integral part of human capital, individuals can turn skills and knowledge acquired from education into corresponding economic resources in order to provide a material basis for improving health. People with higher educational levels usually have more income, and they are more likely to participate in various medical insurance programs and are able to obtain more medical care when they are sick due to their socio-economic status. Second, education can promote health by shaping a good way of life; that is, education can improve personal healthy awareness and shape a way of life that can achieve long-term health. The higher the level of education one receives, the stronger their ability to control their life, and the greater their willingness will be to choose a healthy lifestyle. They might take more exercise and have a healthier diet, a more consistent schedule, and display less bad behavior such

as smoking, drinking and taking drugs. He is more willing to follow the advice of doctors, undertake physical examinations and take preventive measures to strengthen their health. (Li, 2020d). In youth, education mainly promotes health by promoting lifestyle choices which influences health far greater than income. After that, the impact of education on health is mainly restorative, and the impact which lifestyle has on health will gradually weaken, while economic status will become the main path that affects health (Li et al., 2020a).

9.3 *Improving the Educational Approach to Promote Students' Physical and Mental Health*

In light of education at all levels, the early years as students are an important period to shape lifestyle habits and foster healthy behavior, at the key point of organ and tissue development, when they are sensitive to the external environment and have strong plasticity. During this period, disease prevention and intervention cost less and have greater benefits. A tiny change in risk factors may lead to lifelong health benefits (Gao, 2020c). Early exposure has a lasting influence on future health, and it will not be offset; however, socioeconomic factors will change in the future. Therefore, strengthening health awareness education in the early years is important for promoting the future physical and mental development of individuals. All types of education should enhance education of the "body" by improving physical education, allowing students to develop a passion for both sports and PE courses, and strengthen vocational education. For education on mental health, art education should be strengthened to integrate art and education and deliver benefits to all students. Moreover, we should strengthen mental health education, develop the specific goals and details of each stage as a whole, build a new health integration pattern that is horizontally suitable for age features and vertically suitable for personality development rules, and with all stages well connected (Yu & Yali, 2020). In education management, we should realize that policies regarding class grouping based on ability and fierce competition for high-quality educational resources among households, though helpful for students' academic performance, might take a toll on students' mental health as a price. Weakening the differentiation of educational resources at the stage of primary education, easing fierce competition in education and enhancing the integration of students at school are conducive to students' overall development (Wu & Fan, 2020).

10 Can Computational Social Science Bring Computational Education?

In China, interdisciplinary integration has been a national strategy. Outside of China, computational social science is at the forefront. Technology is changing education

in this domain, and the bigdata research paradigm is gaining momentum. All these factors foretell the emergence of computational education, but things seem to be not that simple.

10.1 New Trends in Knowledge Production That Support Disciplines

Human society, the object of social science research, is a complex adaptive system. The new round of information technology revolution enables social science to embrace a data-intensive era, as access to unprecedentedly vast information resources for research marks a new era for social science research (Luo, 2020). Computational social science emerges along with the trend. Computational social science is not only the introduction and application of pure technology but also the diversified update and transformation of the research paradigm. Its essence is the penetration, integration and innovation of technology h represented by computing science, data science humanities and social sciences (Wang, 2020a). This means that the way to produce knowledge in social science is changing, and it relies more on big data and is evidence-based, which might affect teaching practices. First, the scientific concepts, knowledge and methods used in education sciences come from other branches of sciences. Knowledge derived from education, compared with that of other subjects, is more context-dependent (Zeng et al., 2020). Second, for a long period, philosophical speculation, integration of experience and fragmented empirical analysis have been the main approaches used to produce educational knowledge. Third, in terms of the development trend of the international educational scientific research paradigm, quantitative and qualitative methods and other empirical research methods have been applied the most in the past decade, while the application of philosophical thinking has been on the decline Quantitative research methods have been constantly updated and have become increasingly diversified, refined and scientific (Wang & Minjuan, 2020). The emergence of big data and advancement of more intelligent technology have promoted the development of educational practices and the systematic change in the research paradigm, making the emergence of computational education inevitable and necessary (Zheng et al., 2020).

10.2 What Is the Proposition of Computational Education

Based on the perspective of subject construction, computational education is an emerging discipline with quantitative educational data as the research object and computation as the main research method. The research method is centered on the calculation method. The research paradigm has shifted from quantitative research based on data-based exploration and research on educational laws both from top

to bottom and from bottom to top (Zheng et al., 2020). With producing innovative talents as the main goal, computational education builds on a data-intensive research paradigm regarding education in the information age and takes educational activities and issues in the information era as the main research object. It reveals the internal mechanism of the complex education system by quantifying educational factors and the interactive process of these factors. Computational education builds its theoretical framework on the basic theories, methods and technologies of education, information science, mathematics, psychology, brain science, etc. It focuses on the understanding of educational subjects, perception of educational situations, customization of educational services and other major issues. It tackles core tasks within the process of fostering talent in the new era. For example, tasks such as new computational education ethics, educational environment computing, educational subject computing, and educational service computing (Liu et al., 2020c).

10.3   What Is the Argument About Computational Education?

According to the foundation of generating educational knowledge, educational research paradigms include experience-based, logic-based and experience-based frameworks (Ma & Ailei, 2020). What is the educational science research paradigm of computational education? The particularity of education and uniqueness of educational subjects determine that the research paradigm of computational education is different from that of natural sciences. The ways of using use data and calculations to quantify the subject of education and reveal the laws of education has become the topic of discussion (Tan, 2020b). Some studies have pointed out that the reduction and digitization of big data is not completely compatible with the overall characteristics of education. The mathematical quantification of human behavior is not as effective and feasible as the mathematical quantification of natural science. The search and expression of educational knowledge and laws, in essence, are the research and theoretical explanation of the principle mechanism, not data analysis. Computational education, by subject, should belong to computational science and information science, not education (Tan, 2020b). In addition, risks will arise when phenomena and problems gradually become an algorithm. The human value in education fades; contradiction exists between certainty of "algorithm" and uncertainty of education; smart technology creates new political and ethical issues, and human beings may face the risk of being marginalized (Zhao et al., 2020). According to the existing small number of discussions, one side is in information science, and the opposite is in education. The study of computational education is about the study of knowledge rather than discipline. Only when computational education reveals truly new laws of education in its own logical way will the knowledge move from cognition to identification.

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