Ai-Girl Tan *Editor*

Creativity, Talent and Excellence

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ISBN 978-981-4021-92-0 ISBN 978-981-4021-93-7 (eBook)
DOI 10.1007/978-981-4021-93-7
Springer Singapore Heidelberg Dordrecht London New York

Library of Congress Control Number: 2012954623

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Printed on acid-free paper

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This book "Creativity, Talent, and Excellence" is dedicated to Professor Emeritus Kurt A. Heller (1931–) on his 81st birthday celebration for his lifelong engagement in creating spaces of interaction and development for international researchers in his home country, Germany.

Foreword

Creativity, Talent, and Excellence: A Window to New Insights

Creativity, Talent, and Excellence. To paraphrase a piece of sage advice attributed to an anonymous writer in the 1950s, "never judge a book by its title." If readers were to assess the present volume in this way, they would likely assume that the editor had assembled the writings of some of the foremost Western (most likely US) experts in their field. After all, the research and theorizing on creativity, innovation, and giftedness has long been dominated by American concepts, measurement techniques, and models. Yet an examination of this book's table of contents reveals that not a single contributor hails from the US. Instead, the chapters have been authored by Australian, British, Chinese, German, Italian, Japanese, and Singaporean investigators and theorists, attendees, or collaborators at conferences, symposia, and meetings that took place in Asia and Europe. Is this, then, a volume focused on cross-cultural studies of creativity? Might not a title incorporating this cross-cultural aspect have been more appropriate? Not exactly. Whether deliberate or unconscious, Editor Ai-Girl Tan's decision to leave culture out of the title (and American scholars out of the list of contributors) signals a new, exciting, and long overdue turning point in the study of creativity. An examination of the titles of a few other influential volumes tells the story best.

In 2001, Aik Kwang Ng published an extremely well-researched and comprehensive book bearing the provocative title *Why Asians Are Less Creative than Westerners* (Ng, 2001). The primary goal of this project, as described by Ng, was to explain why the demonstration of creativity is much harder for Asians than it is for their counterparts in the West. Toward this end, Ng emphasized the impact of cultural and societal influences and their role in shaping personality, behavior, and most especially creative performance. Many researchers and theorists working during this time period had become fascinated by collectivistic/individualistic distinctions like those offered by Ng. His book fueled the fire and helped set the stage for years of cross-cultural comparisons and empirical investigations dominated by Western values, concepts, and theories.

Research asking whether empirical findings reported in the US and other so-called individualistic nations could be replicated in Asia, was inevitable and instructive. Studies of this type have taught us a great deal about the influence of culture on the development of self-concept, thinking processes, and creative behavior. But in many important respects, such investigations were by their very nature one-sided and biased. More often than not, the diverse cultural traditions of nations like Hong Kong, Japan, Mainland China, Singapore, and Taiwan were equated, and even many Asian researchers appeared comfortable adopting Western viewpoints and assessment tools.

Driven by deeply felt concerns about the direction the research in their field was taking, Hong Kong investigators and theorists Sing Lau, Anna Hui, and Grace Ng published in 2004 *Creativity: When East Meets West* (Lau, Hui, & Ng, 2004). In their introduction to this edited volume, Lau and his coeditors called for a reexamination of commonly held conceptions of the nature of creativity, most especially within the context of culture. And contained within the many thought-provoking and carefully crafted chapters in this volume were important questions as to the conception of culture as well as questions as to whether creativity can and should be operationalized in the same way across nations.

My path first crossed with Ai-Girl Tan's when each of us was asked to serve as a contributor to *Creativity: When East Meets West.* Researchers and scholars were beginning to move beyond the quest for universals in the creative process or the simplistic description of differences between so-called individualistic and collectivistic groups, and chapters in that volume reflected an increasingly nuanced approach to the study of creativity and culture. As a field, we had progressed from the question of why Asians can't be more like Westerners to a consideration of what labels like "East" and "West" really mean and how culture might influence the perceived value of creativity or the development of assessment tools used to measure it.

The evolution of research on the interface between creativity and culture now continues with the 2012 publication of *Creativity, Talent, and Excellence.* In recent years, the study of personality, educational, cultural, and social psychology in Asia and around the world has begun to come into its own. No longer are American theories and measures held as the gold standard against which all investigations and models are judged. Questions of cross-cultural differences are gradually being replaced by efforts to tie research findings to the solution of local and real-world problems. As evidenced by the chapters in the present volume, whether their focus is on the classroom or the workplace, scholars from around the globe are showing an exciting and newfound commitment to the construction of models that best capture the development and cultivation of creativity in their own nations. Yet, at the same time, the important work reported here is in no way insular or culturally bounded. In our comprehensive review of the creativity literature published in the *Annual Review of Psychology* (Hennessey & Amabile, 2010), my coauthor Teresa Amabile and I observed that while research into the psychology of creativity has grown theoretically and methodologically sophisticated, investigators in one subfield often seem unaware of advances in another. What are needed are systems views of creativity that recognize a variety of interrelated forces operating at multiple levels. The chapters presented here make important contributions toward reaching this goal.

We have come a long way. From questions of why Asians are less creative than Westerners, to attempts to find meeting points between East and West, to worldwide investigations of creativity, talent, and excellence that incorporate a consideration of culture without allowing simplistic dichotomies to dominate the discussion. Where will we go from here? What will be the title of the next important collection of papers exploring creativity across cultures? Only time will tell. But a careful reading of the chapters in the present volume offers a valuable window into some of the exciting new insights and questions driving researchers and theorists around the world today.

Wellesley College, USA Beth A. Hennessey

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Foreword

Broadening Creativity: From Testing to Systemic Understanding

In a book dedicated to Professor emeritus Kurt A. Heller in conjunction to his 81st birthday, I would like to make a brief overview of research on creativity between China and Germany (see Shi & Zha, 2000). Especially, I focus on a move to broaden the boundaries of creativity, from testing to systemic understanding, a dedication to Professor Kurt A. Heller for providing us creative space of communication among international colleagues for academic exchanges (see the lineup of authors and contributors of this volume).

The studies on creativity started in 1978, by Professor Zixiu Zha, a developmental psychologist from Institute of Psychology at Chinese Academy of Science, and other four educational psychologists from Shanghai, Wuhan, and Sichuan. They initiated a research group called National Cooperative Research Group of Study on Supernormal (Gifted and Talented) Children in China (CRGSCC). Zha led the CRGSCC for two decades. The main purpose of the CRGSCC group is to study on giftedness or supernormal children (a term created by some Chinese psychologists which means gifted and talented children). Psychologists of CRGSCC group looked creative thinking as an aspect of giftedness (Shi & Xu, 1998; Zha, 1983, 1993a, 1993b) as some western psychologists thought (Guilford, 1986; Renzulli, 1978; Torrance, 1984). Zha and her colleagues developed a psychological test named Cognitive Ability Test for Identifying Supernormal Children (CATISC) (Zha, 1983). There were several subtests in this CATISC test. One of these subtests is creative thinking test including typical match stick tasks (moving one or two match sticks to make an equation mathematically true), divergent thinking skills, problem-solving skills, and open-ended storytelling (Li, 1984; Zha, 1983, 1993a, 1993b). A series of studies was conducted with this creative subtest in 1980s and early 1990s. Unfortunately, there were no clear definitions of creativity.

Cross-Cultural Studies

In 1987, an international collaboration took place, with a funding from Volkswagen Foundation in Germany. Psychologists from University of Munich of Germany and Institute of Psychology of Chinese Academy of Sciences of China started a cross-cultural follow-up study on intellectually gifted and average children in China and Western Germany at that time (Heller, 1995; Heller & Hany, 1997). A total of 244 children from China and 196 children from Western Germany participated in this study. This was the first cross-cultural study on creativity in Mainland China after the Cultural Revolution. Participants from both countries were selected with same test instruments. Children were from grade 5 and 7; half of them were intellectually gifted. They were equal numbers of boys and girls. The studies were conducted for 3 years (Hany, 1994; Heller, 1995). Both samples from Germany and China were tested with technical creativity test (TCT) with five subtests and two questionnaires. The five subtests were technical problem comprehension, unusual usage, mental folding, geometrical analogies, and numerical equation. The two questionnaires were interests in sciences and technology and learning motivation. The TCT test had three parallel versions to make it possible to test the participants every year during three academic years.

Main findings of the project were summarized in the following three aspects. (1) Generally, the performances on TCT of both intellectually gifted and average students either from China or from Germany, no matter what gender and age they are, gradually increased with their grade increased. (2) The performances of gifted groups from both countries are significantly better than the average groups with the same age from same country. (3) Cultural effects were found on different subtests. Specifically, German students performed better than their Chinese counterparts in aspects of producing unusual usage ideas and attending technical activities, while Chinese students performed better than their German counterparts in aspects of finding geometric analogies, learning motivation, technical problem-solving, and mental folding. For the better performance of Chinese students on mental folding and geometrical analogy, researchers assumed that Chinese students might be benefited from the Chinese language as figural language (more about this project see Hany, 1994; Heller, 1995; Heller & Hany, 1997; Shi, Zha, & Zhou 1995, Zha, 1998; Zhou, Zha, & Shi, 1995).

A Systematic Model of Creativity

"A Systematic Model of Creativity" was published in a Chinese journal of *Developments in Psychology* in 1995 (Shi, 1995). The model defined a human individual's creativity as a manifestation of one's intellectual activities that are influenced by the environment and culture in which one grows up. Creativity that is influenced by one's personality is composed of creative attitude, creative behavior, and creative products. The core of creativity is one's creative behavior, including creative thinking,

creative habits, and creative activity. According to this model, one's creativity can mathematically be treated as a function of one's active intelligence, personality, tasks, factors from social environment, and the time one is engaged in creative activity (Shi, 1995; Shi, & Xu, 1997). The active intelligence refers to that part of one's intelligence that is involved in or directed to the creative activities. Shi and his colleagues called this active intelligence as Intelligence Current (IC) (Shi & Xu, 1997). And the IC can be looked upon as a function of one's intelligence level (or intellectual potential), personality, social factors, and the time one spends on a specific task. And one's creativity is a function of one's IC and the task on which one is working. So, the functions can be expressed mathematically as $f(Ic) = f(I, P, S, Tm)$, and $f(C) = f(Ic, Ts)$. Here C stands for one's creative performance, Ic for one's intelligence current in a specific creative task, P for one's personality traits, S for the factors from the society or environment one lives in, Tm for the time one is absorbed in a specific creative task, I for one's actual intelligence level or intellectual potential, and Ts for the specific creative task. It was the first time that creativity and intelligence were clearly united into the same category.

Studies on Relations Between Creativity, Intelligence, and Motivation

According to a systematic model of creativity, the relations between intelligence and creativity cannot be well predicted with the correlation coefficient of scores on creativity test and intelligence test. In other words, the correlation coefficient of scores on creativity test and intelligence test cannot tell the real relationship between creativity and intelligence. A very important variable called "attitude" (Shi, 1995) plays a key role in the relations between one's intellectual potential and creativity performance. And the "attitude" is influenced by one's motivation either intrinsically or extrinsically. In this sense, the authors assumed that there should be some relations between motivation and creativity. In order to test this assumption, 244 students (half of them are intellectually gifted and the rest are average) aged between 10 and 12 years old were investigated with creative thinking test revised by Zhou and Shi (1996) and learning motivation questionnaire. The correlation coefficients between creativity and intelligence and between creativity and motivation and interests were calculated. As a result, significant correlation coefficients between creative thinking and interest and motivation were found in both intellectually gifted children and normal children, while a moderate correlation between creative thinking and intelligence were found too. It was also found that the correlation between creative thinking and intelligence in average children was higher than that of in intellectually gifted children. The authors explained that it indicated the lower the individual's intelligence, the more possible for people to predict his/her creativity through intelligence (Shi & Xu, 1998).

Instructional Studies

From a holistic view of creativity, Shi and his research team spent several years on developing systematic model of creativity (Shi, 1995; Shi & Xu, 1999) and "iceberg model" of creativity cultivation (Shi, 2000; Qu & Shi, 2003). The systematic model of creativity is mentioned previously. The iceberg model comes from an illustration figure of the notion of programs for cultivating creativity. Creativity is placed at the top of illustration figure, and two most important features, originality and usefulness (see Mayer, 1999), are beneath and then followed by cognitive, noncognitive, and social activities as three main aspects for designing training activities. Under these three aspects a larger base with two categories, physical situation and psychological mode, is considered in creativity cultivation. But physical situation and psychological mode do not directly connect to creativity but play very important roles in constructing a background for the creativity. Their function is like the large base of an iceberg under water. According to this iceberg model, Qu and Shi (2003) designed a program with many activities categorized in three aspects, say cognitive, noncognitive, and social aspects. In cognitive aspect, divergent thinking and critical thinking skills were emphasized; in noncognitive aspect, self-challenge, task commitment, openness to experience, and so on were concentrated; and in social aspect, team building, collaboration, and communication were essentially emphasized. A kind of activity in the training courses was unique to many training programs. According to the authors, it is helpful to be creative if the information is processed across different information processing channels. Cross-channel processing means that one kind of information, for example, acoustical information, is processed in another kind of information, for example, visual information.

The program was applied in both highly gifted and normal students in a high school. It lasted four months and 76 students aged between 14 and 16 participated. Conventional creativity test, as well as students' products, was employed to evaluate the effect of instructional experiment. After the experiment researchers concluded that creativity could be enhanced through sophisticatedly designed programs mainly related to cognitive, noncognitive, and interpersonal variables. But the conventional creativity test hardly can evaluate students' creativity in a holistic way.

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Remarks

Preparation of this article is supported by NSFC Grant (No. 30670716), key project of Knowledge Innovation Engineering of Chinese Academy of Sciences (No. KFSHZ-2007-10). For requests or discussion pertaining to this paper, please contact Jiannong Shi (shijn@psych.ac.cn) Institute of Psychology, Chinese Academy of Sciences, Beijing 100101.

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Preface: Reflections on Creativity, Talent, and Excellence

Introduction

Reflections

The authors of this volume participated in a series of conferences, symposiums, and academic meetings that collectively addressed the importance of nurturing creativity, developing talent, and attaining excellence. These meetings coincidently took place in Asia and Europe. In 2009, European Union and Indonesian government declared the year of creativity and innovation. Activities, seminars, meetings, and discussions on creativity and innovation have since received renewed attention and participation. The same year in November, an international conference on creativity and innovation was organized in Xian, a Chinese ancient city (Vialle, 2009). Prior to and after the year of creativity and innovation, two conferences were organized at the University of Munich, Germany (Tan, 2011; Tan & Urhahne, 2008). The design creativity interest group of the Design Society organized its first conference in Japan (2010) and will hold its second conference in Europe (2012). Other conferences in Asia and Europe included the International Conference on Creativity and Innovation for Sustainable Development (2011) in Kuala Lumpur, Malaysia, the 12th European Conference on Creativity and Innovation in Portugal, and the 15th UNESCO-APEID International Conference focusing on inspiring education, creativity, and entrepreneurship in Jakarta, Indonesia.

In the United States of America, the Annual Review of Psychology released two chapters of creativity in 6 years. The first chapter on creativity organizes the contents with reference to the person, process, product, and press or environment (Runco, 2004) and highlights the interdisciplinary approaches to the study of creativity. The second chapter of creativity allocated sufficient coverage to international studies. The authors use a systems model to guide their review (Hennessey & Amabile, 2010). Some converging effort in making meanings of research was observed at the 2011 annual conference of American Educational Research Association (AERA). The meeting highlights included interdisciplinary understanding of inquiry

(Artiles, 2011), cultural education science research (Luke, 2011), and resilience in ecologies as a new science of learning (Gutierrez, 2011). The 2012 AERA conference theme is about "the use of research to improve education and serve the public good." The increasing enthusiasm and engagement in creativity and related studies suggests timely reflections on alternative theorizing, programming, and services for inclusive learning, education, and life.

Incomplete Representation

The first reflection is related to the multifactorial models of creativity (e.g., Amabile, 1983), talent (Heller, 2004; Heller, Moenks, Sternberg, & Subotnik, 2000; Renzulli, 1978) and excellence (Heller, 2008; Ziegler & Perleth, 2011). The models conceptualize creativity as components of creative processes, domain-relevant processes, and task commitment (Amabile, 1983). Talent is an overlap of three components: Creative thinking, intelligence, and task commitment (Renzulli, 1978). Excellence is a construct comprising innovation, leadership, and motivation. Often creativity, talent, and excellence are measured from the observable behavior, self-reported scales, and correlational research designs. The multifactorial models of creativity, talent, and excellence represent part of our epistemological presentation of the phenomena. Systems views of creativity deserve a revival interest. Arieti (1976) suggests a two-system model of creativity, highlighting the interactive effect of the person and his/her culture. Csikszentmihalyi (1996), Ponomarev (2008a, 2008b), Hennessey and Amabile (2010), and Ziegler and Phillipson (2012) adopt three or more systems views of creativity and talent that highlight multilayer-systemic interactions (with significant others, resources, etc.). Creativity, talent, and excellence development are contextual. Development of creativity and talent is based on actions and interactions between the person and his/her social institution and culture of organization and society (Ponomarev, 2008a, 2008b).

Unconscious Processes

The second reflection is related to the use of psychometric measures of creativity which have informed us about conscious processes of creative thinking. Emergence of creativity, talent, and excellence goes beyond conscious thought and cognitive processes. There are some essential processes that are more important than cognitive and conscious processes. Human beings sense, perceive, and feel the existence of the objects and worlds around us. Creativity includes conscious processes such as will power (May, 1975), nonvoluntary processes such as intuition (Ponomarev, 2008a, 2008b), and feeling (see Vygotsky, 2004). Creativity involves processes of being with oneself and the world, doing something meaningful, and interrelating the person with his/her world, nature, and cosmo (May, 1975; Mu, 1989). In action,

interaction, play, and activity we associate images we perceive, relate to the objects and people around us, and connect to the nature, cosmo, and life.

Connection and Integration

The third reflection is related to how far can our understanding and knowledge of our existence and representation of our worldviews lead to enhancing of our quality of life and development of life identities (Marsella, 2012). Shall we explore ways to understand our being in interconnected worlds and ways to create knowledge and to enhance excellence in life (Hwang, Creativity and knowledge creation, personal communication, December 27, 2011)? There have been conscious calls to creativity and talent/gifted researchers and educators to be mindful of dark sides (Cropley, Cropley, Kaufman, & Runco, 2010) and possible dogmatic orientations in their discourses and practice (Ambrose & Sternberg, 2012; Ambrose, Sternberg, Sriraman, 2012). Cross-disciplinary and intercultural studies are relevant methodological orientations (Hennessey, Creativity and collective identities, personal communication, January 27, 2012). Interdisciplinarity allows "any form of dialogue or interaction between two or more disciplines: the level, type, purpose, and effect of this interaction remain to be examined" (Moran, 2002, p. 16). Cross-disciplinarity is a gradual process in which the research group moves in the direction of integration (Aagaard-Hansen, 2007). Marsella (2012) advocates development of life identities fits wells to being aware of dark sides (Cropley, Cropley, Kaufman, & Runco, 2010) and dogmatism (Ambrose & Sternberg, 2012; Ambrose, Sternberg, & Sriraman, 2012) in studying creativity and talent.

Scope of Our Volume

Between 2008 and 2011, the contributors of the volume reflected upon their understanding and knowledge of creativity. Contributors of the volume were the participants of the second conference of creativity in Munich (June 2010, Tan, 2010), the international symposium in honor of Kurt A. Heller 80th birthday in Erfurt (September, 2011, Ziegler & Perleth, 2011), Taiwan Educational Research Association international symposium on creativity (December, 2011), Munich-Milano international symposium on creativity (November, 2008), and the Japan-Singapore international research study meeting in Miyagi, Sendai, Japan (December 2009). In one way or another, all contributors were graduate students, colleagues, visiting scholars, and scientific collaborators of colleagues of the Psychology of Excellence program at the University of Munich, Germany. Papers submitted to the conference in Munich which were in time for the review and revision process were released in conjunction to the conference in June 2010 (Tan, 2011). Papers read in the second creativity conference (June 2010) and subsequent scientific meetings (September, 2011 and December 2011) were reviewed and revised for this volume.

Adopting "the metaphor of boundaries" (Tronto, 1993), the volume embarks on discourses on creativity that are strategic (noticing the included/excluded and what shall we do if we wish to change what is included) and visionary (alternative forms of what [ethical] life should be). Accordingly, creativity conceptualization and practice shall take into consideration dynamics of the personal and the sociocultural/community, transitions of age groups, and interactions among gender, social class, and cultural groups. Creativity in learning and at work shall focus on establishing continuity in action and interaction.

We advocate that creativity is a factor indispensable in talent development and states of excellence. We conceptualize creativity as a personal human ability and collective engagement to construct, combine, select, integrate, and synthesize past and new worldviews based on our own and other shared experiences. Talent is used interchangeably with high ability, giftedness, and special abilities in attaining optimal and maximal performance. The word "excellence" can carry the meaning of "very great merit or quality" or exceptionally high quality, superiority, greatness, distinction, value, worth, goodness, and so on. Creativity, talent development, and excellence in schools and at work are social-cultural activities and processes.

The volume is organized into five parts:

Part I: Conceptions of Creativity and Cultivating Creativity
Part II: Studies on Creativity and Cultivating Creativity
Part III: Conceptions and Studies on Creativity and Excellence in Organization
Part IV: Studies on Educational Excellence
Part V: Challenges Ahead

The five parts attempt to address the three reflective points mentioned above. Our volume hopes to relate the increasing awareness of multiplicity in perspectives, orientations, diversity, and inclusion of creativity theorizing and practices. Creativity adopts a new paradigm of research and practices that acknowledges collectiveness, integration, collaboration, and synthesis of knowledge and expertise. Studies of creativity have to consider not only the personal but also the sociocultural aspects of life that are real, relevant, ethical, and meaningful for the individual and community. Diversity is part of life. Differences are opportunities for crossing boundaries. "A boundary can be seen as a social cultural difference leading to discontinuity in action or interaction. Boundaries simultaneously suggest a sameness and continuity in the sense that within discontinuity two or more sites are relevant to one another in a particular way" (Akkeman & Bakker, 2011, p. 133).

Part I: Conceptions of Creativity and Cultivating Creativity

Contributions of part I aim to reflect upon knowledge of creativity with respect to multiple paradigms, forms, and spaces/sites. Broadening creativity conceptions and studies highlight continuity and boundary crossing with respect to the subjects of research (from geniuses to all people), forms of creativity (from breakthrough/big-creativity, professional creativity, everyday/little creativity to mini/transformational

creativity), and places where these forms of creativity display (scientific communities, professional bodies, schools and formal settings, as well as home and informal settings, accordingly).

Machado and Silva (2007) highlight the role of conceptual analysis for a richer view of the scientific method. In envisaging a broadening, integrative, inclusive, cooperative, and meaningful paradigm of creativity, we shall examine the grammar, semantic clarity, and purpose and structure of argument with regard to creativity and research on creativity.

Part I comprises five chapters on conceptions or theories of creativity.

In Chap. 1, Heidrun Stoeger presents her view on learning as a creative process. According to her, creativity is often associated with extraordinary accomplishments in science, music, technology, etc. However, recently there is growing awareness that "big C" creativity has to be complemented by "little c" creativity. Indeed, the "big C" creativity accomplishments by eminent persons are preceded by myriads of "little c" creativity accomplishments, particularly in their learning process. Researchers like Anders Ericsson pointed out that even the daily learning processes of later eminent persons are based on many creative learning decisions. For example, learners have to find out how to overcome learning obstacles, have to develop more efficient learning strategies, or have to be creative when setting their learning goals. These skills are addressed by the self-regulatory learning approach.

In Chap. 2, Alessandro Antonietti and Barbara Colombo present a model of creative thinking. According to their model, creative outcomes can result by three main categories of operations: (1) *widening* the current mental framework, (2) *connecting* elements within a mental framework in unusual ways or connecting two different mental frameworks together, and (3) *reversing* the mental framework or the relationships between its elements. The chapter aims at showing that most psychological theories about creativity can be fitted in this model. Some examples of creative artifacts and solutions resulting from the implementation of widening, connecting, and reversing the mental framework are reported.

In Chap. 3, Ai-Girl Tan calls for reflection on contemporary knowledge of creativity and highlights the neglected aspects of understanding of creativity: being, life, ontology, and existence. The chapter reviews the existing theories of creativity which are multiplicity in orientations. It proposes a framework of cultivating creativity which includes the systems view, constructive processes, creativity for the common good, and creativity for life.

Heinz Neber and Birgit J. Neuhaus discuss about the relationship between creativity and problem-based learning or PBL (Chap. 4). According to them PBL is a complex approach to design and conduct instruction. It can be used for different purposes. PBL can contribute to the acquisitions of self-regulatory and reasoning skills of the students. It supports the development of strategies for productive reasoning and creative thinking for generating knowledge by solving instructional problems. The article states components of the instructional environment of PBL that contribute to achieve this goal. It reports on studies which measured the contribution of PBL to the development of creative thinking. It presents recommendations that will be derived for further strengthening the integrative approach to fostering creativity.

Part II: Studies on Creativity and Cultivating Creativity

Learning involves creativity (Guilford, 1950). "All learning involves boundaries." (Akkeman & Bakker, 2011, p. 132) Five chapters are included into this section. All chapters are related to the studies of creativity in the educational contexts. Creativity education explores the possibilities to enhance interests of the learners in the domains in which they are efficacious and creative. Paola Pizzingrilli and Stefania Molteni (Chap. 5) conducted an exploratory study to examine the what and the how of creativity among young children. They analyzed children's naïve conceptions of a creative person and creativity. Results showed that all pupils were able to outline a profile of the creative person and were also able to express their own creativity.

Anna N.N. Hui, Mavis W.J. He, and Elaine S.C. Liu-Au examine creativity and early talent development in the arts in young and schoolchildren (Chap. 6). Their chapter argues and provides research evidence that creativity can be nurtured in young schoolchildren through early arts education in preschools and primary schools. The data presented in this chapter lend supports to the hypotheses that early arts education inside the classrooms and outside the schools are associated with creativity in typical schoolchildren. Implications and limitations for implementation will be discussed.

In Chap. 7, Mayumi Oie, Yasuhiko Fujie, Yu Okugawa, Shinichiro Kakihana, Shoko Itaka, and Hisashi Uebuchi studied self-regulated learning and creativity related to age and gender in the transition from elementary to junior high schools. This chapter attempts to explore the possible links between learning and creativity, as well as between self-regulation and creativity.

Ai-Girl Tan, Tianchang Li, and Heinz Neber report on a study on creativity self-efficacy and its correlates (Chap. 8). Five hundred and forty five Chinese students participated in study aimed to examine multidimensionality of creativity self-efficacy and its personal (e.g., personality) and contextual (e.g., classroom environment) correlates. Nearly all aspects in the Big Five model (openness, extraversion, conscientious, and agreeableness) were found to have significant, positive correlations with creativity self-efficacy. It was inconclusive if mastery approach or performance approach was a good predictor of creativity self-efficacy. Individualistic value was better than collectivistic value as a predictor of various dimensions of creativity self-efficacy. Students high in creativity self-efficacy scored higher in after-school academic group activities and entertainment than their low-creativity self-efficacious counterparts did.

In Chap. 9, Ji Zhou, Jiliang Shen, and Detlef Urhahne examined personal epistemology and its relationship with creativity. A total of 135 undergraduates in China were investigated by questionnaires on their creativity and personal epistemology. Results showed the characteristics of their personal epistemology and its relationship with creativity. Chinese undergraduates considered knowledge uncertain, improvable, and complex and considered learning speed as gradual and learning ability as incremental. They tended to use objective evidence and tend to categorize knowledge. However, they could use limited methods to justify them. Some dimensions of

personal epistemology were correlated with creativity. High-creativity individuals tended to consider knowledge as more uncertain, improvable, complex, and influenced by subjective and situational factors. They tended to use objective evidences and more justification skills. They also categorized knowledge, considered learning speed as gradual, and considered learning ability as incremental, but the degree was less than low-creativity ones. The epistemological characteristics of high-creativity students indicated that they were more on a higher developmental stage of personal epistemology.

Part III: Conceptions and Studies on Creativity and Excellence in Organization

Excellence in education and organization encompasses the will or motivation of the learners/workers and the teachers/supervisors to construct environments that support extraordinary experience, relevant expertise, and self-worth. Allport (1962) suggests studies of the person from the general and the unique perspective. He commented on the limitation of the actuarial prediction (prediction based on general or dimensional information) and suggested the morphogenetic prediction (clinical prediction, self-knowledge, personal structure analysis, intensive interview, direct questioning, setting anchoring scale) and the semi-morphogenetic prediction (use of checklist to discard irrelevant dimension, a therapy case over two years of study). Echoing Allport's (1962) views, Mischel (2004) highlights the importance of dynamics and organization in studying human personality. An "integrative science" is suggested in Mischel's (2004) proposition of investigating a person.

To attain organizational excellence, processes of boundary crossing that are creative likely emerge in the course of team interactions at work: Reflection (perspective making, making clear one's understanding and knowledge of a particular issue, and perspective taking, taking of the other into account) (Akkeman & Bakker, 2011, p.145) and transformation (e.g., hybridization – combining ingredients from different contexts into something new and unfamiliar) (Akkeman & Bakker, 2011, p.148). Broadening conceptions and practices of creativity is essential in the contexts of work or organization. We regard creativity as a prerequisite of innovation and an important component of organizational excellence. Factors that influence organizational excellence include innovation in team work and creativity of working partners within an organization (e.g., supervisors, coworkers, and entrepreneurs).

In Chap. 10, Dominika Dej, Meir Shemla, and Juergen Wegge report on a validation study on entrepreneurs' creativity and innovation. They focus on a central agent of creativity and innovation in society – the entrepreneur. They review literature on key entrepreneurial activity and performance success factors. They also present entrepreneurs' subjective views of success, as based on a qualitative study with 243 entrepreneurs. In this chapter, the authors address creativity and innovativeness and their impacts on business creation and business performance.

In Chap. 11, Meir Shemla, Dominika Dej, and Jürgen Wegge explore another theme related to organizational excellence: Creating an innovative team. The authors pose a question: What can ensure that the positive effects of team diversity on innovation outweigh the drawbacks frequently found to be associated with diversity? They define diversity. They consider primary theories underlying organizational diversity: information processing, social categorization, and similarity-attraction. They review the contingency approach to diversity research, which currently guides the majority of work in the field. Finally, they introduce a contingency model of diversity and innovation that comprises three central groups of moderators that determine and shape the impact of diversity in teams on team innovation.

Jürgen Wegge and S. Alexander Haslam examined the impact of failure in group goal setting on task difficulty and supervisor fairness (Chap. 12). Group goal setting is a common leadership strategy that is used to improve work motivation, creativity, and excellent performance in organizations. The author tried to answer two important questions: (1) Why do challenging group goals improve group performance? (2) Are there any important (pre)conditions for group goal-setting techniques to be effective? To learn more about potential mediators of group goal setting, they investigated cognitive process variables (e.g., individual problem-solving) and team motivation variables (e.g., group identification) that could function as a causal mechanism. To learn more about potential moderator variables, they analyzed the impact of task difficulty and the fairness of a supervisor in negotiating performance goals with the team.

Part IV: Studies on Educational Excellence

Part IV comprises chapters that report on ways to create opportunities to attain excellence. States of excellence are likely to be attained when a person is provided with opportunities for learning that nurture his or her strengths and that recognize his or her individual differences. Our minds are experiential, fluid, and dynamic. Excellence is likely to be present when the person receives ample space to grow and when educators and leaders show high commitment in maximizing the growth of every person. Inclusion facilitates self-transformation. In an inclusive learning context, individuals are determined to work through differences among them. They attempt to establish diversity in interest and competency. The development of excellence is supported by well-structured research programs and caring services. The outcomes of excellence include high-quality performance which goes beyond the expected behavior, flow in experience, well-being, good health, contentment, high self-efficacy, passion in learning, sustainable interest, tenure at work, peace in society, and harmony in group. Programs of excellence adopt definitions suitable for the vision, mission, and values associated with as well as the goals and objectives of a learning organization. A program of excellence should be specific enough to allow for the establishment of procedures and criteria for improving even upon the state-of-the-art learning and work practices. The program curricula should be challenging

enough to match the learners' levels of learning, and should generate interest in learning among the learners. The program aims to develop the competencies and abilities of the learners and takes into consideration the learners' motivations, emotions, and styles of thinking and learning.

In Chap. 13, Kurt A. Heller reports on the Hector-Seminar: A new enrichment program for MINT/STEM-talents. The Hector-Seminar, an initiative of the Hans-Werner and Josephine Hector Foundation, the School Authority in the Northern Badenia Regional Administration, and the University of Karlsruhe (TH), was launched first as a pilot project in 2001. The main objective is to encourage highly talented grammar school (German Gymnasium) students in the fields of mathematics, informatics (computer science), natural sciences, and technology (MINT resp. STEM). More than 500 talented students are now participants in the Hector-Seminar. In the pilot phase from 2001 to 2008, a project team of the Ludwig Maximilian University of Munich conducted a scientific evaluation. The findings confirm clear encouragement effects in the MINT-related areas of competency. MINT talents are encouraged sustainably in the Hector-Seminar not only in their main areas of talent but also in their entire personality development.

Yanhua Zhao and Rudolf Tippelt examined joint function of perceived classroom goal orientations and personal achievement goals on student school excellence (Chap. 14). A structural equation model encompassing classroom goal orientations, personal achievement goals, and school success (well-being and achievement) is proposed. The model posits that perceived classroom goal orientations and personal goals play integrative functions in explaining school success, which was examined with a sample of Chinese secondary school students. Results indicated that classroom mastery orientation positively predicted personal mastery goals and school success but negatively predicted performance-approach goals. Classroom performance orientation positively predicted the adoption of both personal goals. Classroom and personal performance-approach goals led to negative affect. Mastery goals partially mediated the effects of classroom mastery orientation on positive affect and achievement and partially mediated the effects of classroom performance orientation on school success indices. The mediation effect of personal performance-approach goals was only observed between classroom performance orientation and negative affect. Findings suggest that the integrated functions of classroom-level goal orientations and personal-level achievement goals are instrumental to understand student motivation, emotions, and school-related outcomes.

Mongsong Goh, Ai-Girl Tan, and William Choy investigated effects of video source presentation and cue retrieval on analogical problem-solving (Chap. 15). A total of 315 students (age 17–19 years old) of a vocational college in Singapore participated in a study to find out the effectiveness of multiple source representations of emotions in analogical problem-solving. Four experiments were designed with multiple source representation: In experiment 1, the participants read a story (source analogue) and solved a social interaction problem; in experiment 2, a video; in experiment 3, a video with scaffold annotations; and in experiment 4, a script and a video. In each experiment, two conditions were used: With cue to the source analogue and without cue to it. In each condition, there were 35 participants. A group

of participants (n = 35) who did not expose to the source analogue served as the control group. The performance of analogical problem-solving of the participants was measured in three ways: Selection of appropriate solutions, identifying reasons for the selected solutions, and articulating surface similar vocabulary. The participants scored significantly higher in the cue condition than in the without cue or control condition. When emotions were represented using video with annotations, there was significant improvement in scores of performance in all aspects. The findings suggest the essentiality to choose and use creative and effective designs of multimodal source analogue presentations in analogical problem-solving.

Part V: Challenges Ahead

Creativity, talent, and excellence are forward looking, constructive, contextual, collective, cooperative, and collaborative. Our proposed volume aims to provide space for new discourses and refreshed understanding of what constitute and how we can foster creativity, talent, and excellence. Nurturing talent and attaining excellence demand community-based engagement, collective motivation, and co-constructive space for inclusive education and collective resilience.

Kurt A. Heller (Chap. 16) reexamines perspectives on gifted education in the third millennium. Different sources of information enrich our knowledge regarding the individual needs and effects of the promotion of giftedness or talent. Relevant sources include the psychometric (status) vs. cognitive (process) paradigms, the descriptive vs. explanatory approaches, and prospective (status diagnostic) vs. retrospective (e.g., expertise) research paradigms. Giftedness or talent research (US-preferred terms) is known as high ability (European preferred term) research. According to Julian Stanley, we know more about the "Whats" than we do about the "Whys." This statement summarizes the status quo of our understanding of giftedness or talent, high ability or expertise, etc. This ascertainment leads to a challenge of gifted education in the 3rd millennium. Gifted education and related concepts shall explain the claim in details.

For the past decades, we have believed that East Asian students including those from China and Japan were less expressive and creative. Recently, creativity education and research has given a priority in East and Southeast Asian societies. The move complements insufficient spaces of learning in these societies for creative imagination and innovation as they have been focusing on academic excellence in the forms of international competitive assessments and national examinations. There are many aspects in learning that affects creativity of students and teachers and that influence school excellence.

Makio Taira (Chap. 17) reviews a study on resilience and school transition gaps in Japan. The author developed an inventory: School Diagnosis Chart. The participants were 119 secondary school freshmen. The author categorized participants into three groups according to their change of metacognitive ability: The uptrend, the same, and the downtrend. The downtrend group was overconfident in their metacognitive judgments as compared to the uptrend group. The former did not judge their weak

points from the start of their school year. The participants who evaluated their metacognitive abilities from the lowest among the three groups improved to a moderate metacognitive ability level. They became efficient students in terms of metacognitive judgments at the end of the school year. The group-oriented factor, metacognitive ability, and higher-order learning strategies contributed positively to the study motivation of math. Good use of higher-order learning strategies contributed to "academic excellence" which could prevent them from losing motivation to study.

Concluding Remarks

A paradigm shift refers to a change in basic assumptions of a theory that a community of scientists shares (Kuhn, 1962). Paradigm shifts advance knowledge of humaneness and knowledge for common good. Human psychological phenomena are systemic (all parts of an organism are connected in complex relationships), dynamic (how things change or maintain themselves as the same), and social (reorganizing all the existing parts by creating a new whole) (Wagoner, 2007, p. 70). Giftedness refers to above average intellectual abilities, intense interests in specific tasks, and creative abilities (Renzulli, 1978). For decades, models of giftedness or gifted education (e.g., Three Rings Model, Renzulli, 1978; and Munich Model of Giftedness, Heller, 2004) have focused on interactive effects between cognitive (e.g., intelligence and creativity) and noncognitive (e.g., motivation and perceived support) factors of giftedness. Recent reviews and reflections on gifted research and gifted education (e.g., Subotnik, Olszewski-Kubilius, & Worrell, 2011) suggest among others "expanding the conception of giftedness to include factors that promote social capital and a greater concern for the well-being of people and the Earth's resources." (Renzulli, 2002, p.73) The above statement is consistent with the review by A. Ziegler and S. Phillipson (2012) on giftedness research and practice. Charles W. Kneupper (1949–1989) advocates that to be a human being is to be rhetorical. According to him, the historical goal of rhetoric in education was the pursuit of excellence in creating order, in symbolizing, in sharing discovery, in forming judgments, and in fashioning persuasive communications (Kneupper, 1980). Kneupper (1980, p. 160) uses the term "excellence *in"* to indicate the possible states of excellence in various activities of life and the inclusive condition "with wisdom or some continuity between tradition and creation." New paradigms of creativity, talent, and excellence shall study social contexts *in* an individual's mind or how society gets "inside" the developing person (Wagoner, 2007). It shall relate to the process of how our perception of humanities changes the world (觀乎人文以化成天下).

Creativity is recognized as an indispensable human ability to work with changeable, unpredictable, futuristic, and novel situations, relationships, and experiences. There have been calls of policymakers for years of creativity and innovation and growing numbers of scientific and academic meetings on creativity. Activities related to creativity have been broadened to include conceptualization of creativity within mainstream theories or concepts, conducting creativity and related research

across age, professional, sociocultural groups, to developing talent programs and psychometric and other measures for assessing excellence. Increasing awareness has been seen in identifying gaps of learning, expanding boundaries of research, as well as reexamining theories of creativity and practices in facilitating meaningful teaching and learning. In line with contemporary researchers to reexamine current knowledge of giftedness, creativity, talent, and excellence (Renzulli, 2002; Subotnik, Olszewski-Kubilius, & Worrell, 2011; Ziegler & Phillipson, 2012), our volume focuses on redefining and reconstructing creativity, talent, and excellence as processes and priorities in everyday life. Creativity has to be a component of talent development and excellence programs. Toward excellence shall be a value of learning and working. Our conceptions and studies of creativity, talent, and excellence have to be inclusive and open to new realization of our existence and capacity to create new perception of our changing worlds.

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Acknowledgements

I have been thankful to Professor Emeritus Kurt A. Heller (1931–) who was my Ph.D. supervisor, senior colleague, and mentor for the past decades. When I first met up with Professor Heller, he was a chair professor of the Department of Educational Psychology at the Ludwig-Maximilians-Universität of Munich, Germany. In the 1980s, Professor Heller and team has engaged in international academic exchanges with international scholars through activities such as cross-cultural research projects (see Foreword, Shi, this volume), editing an international handbook, organizing an international conference, and graduates' and visiting scholars' supervision. A volume on excellence was released in conjunction of Professor Heller's 80th birthday (Ziegler & Perleth, 2011). Contributors included scholars in the field of talent and gifted education. "Creativity, talent, and excellence" is a volume specially dedicated to Professor Heller in conjunction to his 81st birthday. This volume collected contributions mainly from scholars who have been affiliated with an international program founded by Professor Heller: the Psychology of Excellence international program (1998–2011; renamed the Learning Sciences program, from 2012 onward). The following lines described dedication of Professor Heller to the Psychology of Excellence program and its creativity conferences.

Psychology of Excellence

Professor Kurt A. Heller is a leader, scientist, and mentor in the field of gifted and talented education in Germany and the world (see Heller, Moenks, Sternberg, & Subotnik, 2000). He is an emeritus professor and the director of the Center for the Study of Giftedness at the Ludwig-Maximilians-Universität (LMU), Germany. Ziegler and Perleth (2012) compile Heller's scientific contributions to the field of gifted and talented education. Their volume of essays in honor of Heller's scientific contributions was released shortly after an international scientific meeting in Germany. Contributions of Heller to talent development of international students are compiled in this volume. The volume is titled "Creativity, Talent, Excellence"

intending to highlight the unrecorded creative influence of Heller in developing talents and encouraging excellence through the first international psychology program he founded. The "Psychology of Excellence" was established at the LMU. It attracted hundreds of applicants each year (1998–2011) from the world including Arabian-speaking countries, Africa, Asia, Europe, America, and Russian-speaking countries.

In its early stages the Psychology of Excellence study program (hereafter, Excellence Program) received financial support from the German Academic Exchange Service (DAAD). The study program enjoyed a supportive lineup of faculty from the Department of Psychology of the university. It attracted visiting professors from various countries: Professors Drs. Heinz Neber (University of Essen, Germany), Neville J. Schofield (University of Newcastle, Australia, 1998–1999), Leticia Hernandez de Hahn (National University in San Diego, California, USA), Tock-Keng Lim (PsychoMetrics International Singapore, October 2003–March 2004), Wilhelmus A. M. Peters (KUN in Nijmegen, Holland, April 2004–September 2004), and Ai-Girl Tan (Nanyang Technological University Singapore, April 2008–March 2009).

The Excellence Program was the first English language program in psychology succeeded in the selection from over 100 applications received by the German Academic Exchange Service (DAAD) (Heller, 2008). The study program of Psychology of Excellence has experienced two phases of development. Under the leadership of Kurt A. Heller (1998–2001) and the appointed director Heinz Neber (2002–2004), the program focus was on high ability or gifted education. The subsequent director, Juergen Wegge (2005–2007), enriched the contents of excellence with an additional area, that is, excellence in organization. The study program aspires to prepare the students for excellence in learning, science, research, and profession. Since October 2007, the study program has received advice from Frank Fischer (2007–) and overseen by his appointed director Detlef Urhahne (2008–2010). In 2012, Psychology of Excellence international study program was integrated into a new international study program on learning sciences. Frank Fischer is the chair professor who oversees the new program.

Creativity Conferences

The creativity conference series aims to discuss the state of art of creativity in education and organization, two core disciplines of the international master study program "Psychology of Excellence in Business and Education," and the possible themes for international collaboration on creativity research in Europe, Asia, and other parts of the world.

The aims of the conference series are:

- Broadening the repertoire of competencies of the course participants of the international program for Master in Psychology of Excellence in Business and Education

- Providing a platform for graduates and colleagues of other disciplines, faculties, universities, and industries to explore and share diversified views of creativity and talent development in business and education

The nature of the conferences is evidence based and practice oriented. The focus of the conferences is on sharing experiences in the field at work and in schools. Graduate researchers (doing dissertations), professionals, and faculties are welcome to present their findings and studies related to the themes listed below:

- Frameworks of creativity and talent development
- Identification of the talented and leaders
- Discovery, innovation, and invention
- Culture and excellence
- Personal and organizational excellence

First Conference: Creativity and Talent Development

The inaugural conference cum workshop on Creativity and Talent Development took place on 3–4 September 2008 in Munich. This special event was sponsored by the German Academic Exchange Service (Deutscher Akademischer Austauschdienst) as part of Ai-Girl Tan's visiting professor program. Creativity is the theme of the excellence program. In conjunction with the European Year of Creativity and Innovation (in 2009), the German Academic Exchange Service (DAAD, 2008) sponsored a 2-day conference cum workshop event focusing on the theme "Creativity and Talent Development" (September 3 and 4, 2008). The conference was organized by the Psychology of Excellence Program Office, University of Munich, Germany. The chairpersons of the conference were Ai-Girl Tan and Detlef Urhahne. The program included two keynotes and five lectures from international scholars (Germany, Italy, Singapore, and Sweden) and six paper presentations from our graduates and colleagues of other organizations (see Tan & Urhahne, 2008). The event stimulated an international seminar entitled "Toward the European Year of Creativity and Innovation" between my research group and our counterpart in Italy (November 14). Eight presentations were scheduled including my keynote address, two short research finding sharing sessions from Germany, and four from Italy.

Second Conference: Creativity in Business and Education

Recognizing the significance of creativity research and creative activities in schools and at work, Professor Ai-Girl Tan initiated the second conference entitled "Creativity in Business and Education: Interdisciplinary and Intercultural Aspects." The Creativity in Business and Education Conference was cochaired with Detlef Urhahne and Ai-Girl Tan and sponsored by the Münchner Universitätsgesellschaft.

It took place on 24th and 25th of June 2010 in Munich. This special event was a follow-up effort of the inaugural conference aiming to promote creativity research among colleagues from various disciplines and across different cultures (see Tan, 2010; Tan 2011 for details of papers presented in the conference).

International Symposium in Germany (September 2011)

On September 30, 2011, an international symposium entitled *From High Ability to Creativity in Talent Development and Excellence* was organized in honor of Kurt A. Heller's 80th birthday and contributions to the fields of high ability, creativity, and excellence. Three former graduate students of Professor Heller who are professors in Asia and Germany worked together to ensure the success of the event: Ernst Hany (University of Erfurt, Germany), Christoph Perleth (University of Rostock, Germany), and Ai-Girl Tan (Nanyang Technological University, Singapore). The symposium and conference were held at the University of Erfurt. Ernst Hany provided the administrative and technical support. The international symposium was chaired by Ai-Girl Tan and was part of the program of an annual conference of Arbeitskreises Begabungs Forschung und Begabtenforderung e.V (ABB) organized by Christoph Perleth. The publicity of the international symposium was released through the websites of the ABB and University of Erfurt. As a tradition, the ABB worked closely with an organization that promotes the study of excellence in mathematics and science (Verein Mathematisch-Naturwissenschaftlicher Excellence-Center an Schulen e.V. or MINT-EC). The audience of the symposium included members of these two organizations. Professor Heller has mentored eminent scholars of high ability in both China and Germany. Three of them who were founder and executive members of the International Research Association of Talent Development and Excellence (IRATDE) were in audience: Heidrun Stoeger (vice president), Albert Ziegler (secretary), and Jiannong Shi (treasurer). The international program was divided into four parts, with alternate German and international presentations. The first part of the international symposium was led by the German team with an introduction of Kurt A. Heller by Ernst Hany, followed by a brief presentation of the outline of a book entitled "Excellence" edited by Albert Ziegler and Christoph Perleth, and a short message from Kurt A. Heller. The edited book "Excellence" comprises 17 chapters (at the stage of writing) contributed by scholars who have worked with, supervised by, and known Kurt A. Heller. It was edited in honor of Kurt A. Heller's contributions to the fields of high ability, creativity, and excellence. The second part of the international symposium was led by the Asian team with two presentations: Creativity in excellence by Ai-Girl Tan (Singapore) and Self-regulation by Mayumi Oie (Japan). The third part was led by Heiner Rindermann (Chemnitz, Germany) on "Ergebnisse der Internationalen Mathematik-Olympiaden" and by Albert Ziegler (Erlangen-Nürnberg) on "Erziehung Hochbegabter." The fourth part was led by Jiannong Shi on "Gifted Studies and Education in China" and Langfeld (Äthiopien) on "Aktivierung von Bildungsreserven – Back to the Grass Roots."

Appreciation

We are thankful to Professor Kurt A. Heller for constructing space of learning for talented students around the world. The program allowed many to grow and to experience excellence in learning. My deep appreciation goes to contributors of this volume who were directors of the Psychology of Excellence program (Kurt A. Heller, Heinz Neber, Juergen Wegge, and Detlef Urhahne) and presenters of the creativity conferences (Munich, 2008 and 2010; Alessandro Antonietti, Paola Pizzingrilli, Jiannong Shi, Heidrun Stoeger, Ai-Girl Tan, Albert Ziegler, Ji Zhou, and Yanhua Zhoa). I am indebted to authors who were presenters of international (creativity) symposiums (Sendai, 2009; Taipei, 2011; Tokyo, 2011; and Xian China, 2011; chaired/participated by the editors Anna Hui, Mongsong Goh, Mayumi Oei, Makio Taira) for their timely submission to this volume. Juergen Wegge initiated three chapters on themes important in organizational excellence. His team's (Dominika Dej, S. Alexander Haslem, and Meir Shemla) contributions enhance the quality of this volume. Beth Hennessey's foreword is encouraging and reflective. It is in line with the practice of creating spaces for intercultural and international exchanges that Professor Heller has been dedicated in his lifelong, professional career. Her voice channels the importance of creative engagement in nurturing talents and promoting excellent scholarship beyond cultural boundaries.

Ai-Girl Tan

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Part I
Conceptions of Creativity and Cultivating Creativity

Chapter 1
Learning as a Creative Process

Heidrun Stoeger

Creativity is often associated with extraordinary accomplishments in areas such as science, music, and technology. There is, however, a growing awareness that "big C" creativity has to be complemented by "little c" creativity. Indeed the "big C" creativity accomplishments of eminent persons are preceded by myriad "little c" creativity accomplishments, particularly in their learning process.

Researchers like Anders Ericsson (Ericsson, Charness, Feltovich, & Hoffmann, 2006) have pointed out that even the daily learning processes of future eminent persons are based on numerous creative learning decisions. For example, learners have to find out how to overcome learning obstacles; they have to develop more efficient learning strategies or have to be creative when setting their learning goals. These skills are addressed by the self-regulatory learning approach. In this chapter, I will first give an overview of the points in the learning process at which "little c" creativity comes into play. I then will discuss a training program designed to promote creative decisions in daily learning.

The New Role of Creativity in Learning: Self-Regulatory Learning

The first models of leaning were externally oriented (Edelmann, 2000) and thus predicated upon the assumption that learners are exposed to various stimuli. Changes in behavior were viewed as direct results of such stimuli. Learning modeled in this way only consisted of stimulus-response sequences. Creativity simply did not factor into this idea of learning.

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_1,

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This mechanical view of learning has been rejected by work of the last few decades and supplanted by models of learning in which the learner has a more active role. One now even speaks of self-regulated learning. This concept is understood as "[…] an active, constructive process whereby learners set goals for their learning and then do monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and contextual features in the environment" (Pintrich, 2000, p. 453). Similar definitions have been offered by scholars such as Butler and Winne (1995) or Zimmerman (2000).

Scientists subscribing to the theory of self-regulated learning believe that an improvement in this central ability also induces a series of other positive effects such as an improvement in learning strategies and control convictions, since the results of learning are made more feasible through one's own efforts. Thus, the learner herself plays a crucial role in the leaning process. The learning outcome is a function of the quality of her judgments and decisions concerning her own learning.

There are no simple recipes for achieving perfect self-regulated learning. Factors such as an individual's knowledge level, the exigencies of particular learning activities, the situation in which learning occurs, and goals for learning are never identical. Thus, every individual learning process is *unique*. Even when a learner attempts to memorize poem a new which she had learned long ago and since thoroughly forgotten, the initial encounter with the poem nevertheless constitutes a crucial factor in differentiating (and ameliorating) the second memorization attempt over against the first.

Creativity is an essential prerequisite of successful learning. Decisions made in the course of a learning process always represent the relation between an individual's skills and learning goals, on the one hand, and the specific requirements of the task at hand, on the other. Learning thus relies upon an ongoing process of problem solving oriented toward finding the path to the most effective sort of learning. In this sense, achievement excellence can be conceptualized as a long series of creative learning decisions.

The Seven Tasks Comprising "Little c" Creativity in the Learning Process

Researchers are investing extensive effort in exploring the question of whether the learning process can be divided into meaningful components (Bandura, 1977, 1986; Stöger & Ziegler, 2009; Zimmerman, 1989, 2000). A consensus has been reached that learning can indeed be understood as a cyclical process comprised of a series of steps. In each of these steps (Fig. 1.1), "little c" plays an important part as it will be illustrated on selected examples in the following passage.

The first step entails a self-evaluation by the learner of her own knowledge level and skills. This phase is best understood *not* as an act of direct observation of oneself but rather as one of self-*construction*. The learner compares her image of her current self to the image she holds of the would-be self suggested by the learning task.

Fig. 1.1 The seven tasks comprising "little c" creativity in the learning process

Successful learning offers the key to overcoming the discrepancy between the current self and the possible self, and such learning requires goal-oriented behavior. As research on problem solving has shown, *the setting of goals is a creative process.* It is of great importance in surmounting learning obstacles, to give just one example, that earlier learning goals be set aside or modified in favor of new orientations in learning. Thus, the second step within the learning process is not only the strict adherence to externally set learning objectives (e.g., studying for a graded in-class writing exercise) but also the transformation of learning demands into optimized learning goals – a process which demands a great deal of creativity from the learner.

In the third step of this learning cycle, the learner develops her *own individual learning process*. In the case of complex goals aimed at extending one's action repertoire, this development has more in common with invention than it does with the adherence to strict regiments of learning and studying. Various tasks and perspectives need to be contemplated and harmonized; learning strategies, for instance, need to be appropriately selected and employed in a manner commensurate with one's own knowledge level.

The fourth step envisions the implementation of the learning plan or strategy. Learning actions are now executed. Yet it would be a mistake to view this step along the lines of running an algorithm. The process of carrying out learning strategies actually extends action repertoires; in other words, such behavior *creates* new action repertoires.

The fifth step is one in which the learner observers herself and assesses her own learning. As with the self-evaluation in the first step, this is not to be understood as a sort of passive or casual introspection but rather again as a dynamic process of self-*construction*. Such a constructive examination of one's learning behavior and progress looks at issues such as studying time, invested effort, the

nature and frequency of mistakes, and the quality and amount of learning progress. But this monitoring is not just about examining what one has learned and how this was accomplished, it is also forward looking in that it seeks to dynamically project the path of future learning.

Should this dynamic projection of the learning path lead to unsatisfactory results, then the learning strategies need to be modified accordingly during the sixth step to ensure progress toward the overall goal of the larger learning process. This requires a modification of the strategy implemented thus far. This dynamic improvement also resembles the *creative act of invention* in that it cannot be understood as simply pulling another tool out of a toolbox of established learning methods but, rather, as the development of an improved strategy.

In the seventh and final step, the learner evaluates the results of her learning process and learning efforts. This offers her the chance to *construct a new image of herself and her capabilities* in light of her learning experiences. She considers the ways in which her action repertoire has been expanded and the implications this has for new learning processes. This thought process naturally leads to contemplating new goals and obliges the learner to reconsider her relationship to her social environment, because the increase in behavioral capabilities and new goals open up new possibilities for an individual's interactions with her social environment.

These seven steps comprising "little c" creativity within the learning process can also be observed in self-regulated learning. The same steps are taught in training programs focusing on self-regulated learning. We will now turn our attention to an instructional unit developed by Zimmerman, Bonner, and Kovach (1996) for improving self-regulated learning which aim at optimizing "little c" creativity in the learning process. This will be followed up by a description of how one of these instructional units is actually implemented. I will describe a unit in which homework and time-management strategies in the subject of mathematics are used as a means of improving self-regulated learning skills.

Theoretical Background of an Instructional Unit Aimed at Increasing the Effectiveness of Self-Regulated Learning

At the core of the instructional units developed by Zimmerman et al. (1996) are daily achievement measurements and systematic feedback, as well as measures which contribute to increasing self-regulatory skills. In the following section, the general conception of the instructional units will be examined, and particular consideration will be given to activities which aim at increasing self-regulatory skills.

Each of the five instructional units lasts 5 weeks. During each week, the students work through four steps of a self-regulated learning cycle that more or less represents the seven tasks comprising "little c" creativity in the learning process (see Fig. 1.2). The students' *self-evaluation and monitoring* of their own learning (see task 1 above) conducted at the beginning of the instructional unit as well as the ensuing systematic observation of their learning and performance behavior with

Fig. 1.2 Cycle of self-regulated learning (Zimmerman et al., 1996)

the assistance of standardized forms helps them to become actively aware of their strengths and weaknesses. This provides them with information for appropriate *goal setting and strategic planning* aimed at improving their learning and performance behavior. Teachers help pupils set intermediate goals (cf. task 2 above) by considering with each student the specification and difficulty level of each goal and its proximity in time (Bandura & Schunk, 1981; Locke, Shaw, Saari, & Latham, 1981). Goals for the following week, developed jointly by teachers and pupils, are also documented on a standardized handout for the second week of the instructional unit.

To find the best method of attaining their goals, the students are instructed on how to use strategic planning (see task 3 above). This means pupils execute decisional processes leading to the selection or alteration of self-regulatory strategies (Bandura, 1982; Mischel, 1968; Zimmerman, 1983, 1989). The chosen methods should be appropriate for the task and setting. Teachers encourage this process by presenting the students with appropriate strategies for each new task, or by consulting with them on whether the strategies the children have thus far chosen also appear suitable for the tasks at hand. Since each strategy is not equally appropriate for each pupil and since the personal, behavioral, and environmental components are constantly changing, cyclical adjustments are necessary over the course of the instructional unit.

The next step in the cycle of self-regulated learning is that of *strategy implementation and monitoring* (see task 4 and task 5 above). Performance or volitional control, which is primarily ensured through self-control processes (e.g., self-instruction, imagery, attention focusing) and self-observation processes (e.g., self-recording, self-experimentation), plays an important role here (for details see Zimmerman, 2000). In the units developed by Zimmerman et al. (1996, see Fig. 1.2), self-control is primarily assured through attention focusing. This increases concentration among the pupils and eliminates potential disruptions, and improvements in both areas should favorably

influence strategy application and learning behavior (Corno, 1993; Weinstein, Schulte, & Palmer, 1987). Since the application of strategies occurs primarily while a student completes homework assignments, topics such as proper workplace organization and avoidance of distraction by television are addressed. If, in the monitoring phase, students realize that they are not effectively applying their strategies, they have the chance to adapt their strategies (see task 6 above).

At the end of the week, time is taken for self-reflection or *strategic outcome monitoring* (see task 7 above). The students thus have the chance to establish a link between their learning outcome and the strategic processes they will have used. This allows them to discern the effectiveness of the strategic processes they chose and continuously adapted over the course of the previous week. Then, with the help of their teachers, a systematic comparison is made, using the self-compiled records of learning behavior and performance results produced each day.

In the units developed by Zimmerman et al. (1996), mastery and previous performance (Bandura, 1991) are used primarily as evaluation criteria. These have been assessed by Covington and Roberts (1994) as being particularly advantageous because they allow individuals to observe their personal learning progress. This enables students to make *adaptive or defensive inferences*, that is, to come to conclusions as to how they need to alter their self-regulatory approaches. Adaptive inferences guide learners to new and potentially better forms of self-regulation, such as shifting the goals hierarchically and adapting or choosing a more effective strategy (Zimmerman & Martinez-Pons, 1992). Defensive inferences, in contrast, merely safeguard individuals from future dissatisfaction and aversive affects and undermine appropriate adaptations. For this reason, feedback and support in self-evaluation over the course of the instructional unit are designed to inspire primarily adaptive inferences which, thereby, encourage the more advantageous types of possible self-reactions.

These self-reactions lead to adaptations in learning behavior and thus affect learning in the following week in that the pupils are now able to use their self-reflections to adapt their goals and strategies. A major advantage of the training modules developed by Zimmerman et al. (1996) is that the cycle of self-regulated learning will be repeated several times over the course of the 5-week training period, and the pupils, thereby, subject their self-regulation processes to constant monitoring, improvement, and intense practice. In summary, then, emphasis should be placed on the fact that the units developed by Zimmerman et al. (1996) are based on a cyclic model of self-regulation which incorporates the most important components of self-regulation (self-evaluation, goal setting, strategic planning, monitoring, etc.) and therewith the seven steps comprising “little c” creativity in learning.

Practical Execution

We have developed several instructional units in accordance with this theoretical model. These not only aim at improving self-regulated learning but also at enabling realistic appraisals of one’s own strengths and weaknesses and at fostering improvements

in self-concept as well as in motivation and control. I will now describe a unit in which homework and time-management strategies in the subject of mathematics are used as a means of improving self-regulated learning skills.

The participating teachers attended a 3-day seminar. On the first day, the theoretical groundwork of self-regulated learning was presented. The second day was dedicated to the topics of time management and behavior patterns relevant to home study, and exercises related to self-regulated learning were also conducted. In addition, all instructional materials relating to the instructional unit were distributed and discussed. On the third day, the teachers worked together to conceptualize 30 sets of exercises, six mathematics quizzes, and a comprehensive final exam which was to be completed by all students in all classes. The exam was intended to function as an indicator of the success of the instructional unit.

The content of the unit addressed the abilities associated with time management and the preparation of classroom materials at home (for more details and the materials, see Stoeger & Ziegler, 2008). The instructional unit itself was conducted over a 6-week period. In the first week, the students were to recount their own learning behaviors on standardized forms. Entries were made, for example, as to when and for how long a student studies, what kinds of breaks he or she takes, what types of distractions are present, whether the student studies alone or with others, and where the studying takes place. Additionally, these forms had room for the students to both predict how well they expected to do on the homework exercises and on the "math quiz" and then to later record the actual results.

From the first day of the instructional unit, the students received exercises. These were to be completed at home and were based on the topics currently being covered in the classroom. Students could score up to ten points on the exercises. A grade in the traditional sense was not given. These daily homework exercises were formulated by the teachers taking part in the study, and consideration was taken to insure that the exercises were standardized to the same level of difficulty in order to ensure that effective or less effective learning could be directly inferred on the basis of each student's performance on the exercises. The students were able to inspect the exercises at the end of the periods in which the material was covered and were asked to estimate how many points they thought they would be able to attain. Additionally, at the end of each week, a math quiz was given during the classroom period which covered the subject matter discussed that week. Once again the students had the opportunity to attain a maximum of ten points per quiz, and the difficulty level remained appropriate for the achievement one would expect of a student who had not participated in this instructional unit.

After the first week of the unit, the students were in possession of an outline of their homework behavior skills for the prior week, their daily achievement levels on the exercise sets, and their score on the weekly math quiz. At the start of the second training week, the teachers addressed the entries made in the first week during the class period. They established a relationship between the quality of the homework behavior skills and the performances on the exercise sets and quizzes and gave hints on how the homework skills could be improved. The students were then to set achievement goals (e.g., six out of ten points on the next exercise sets or five out of ten points on the next math quiz), which were then recorded in the materials

prepared for them. They were also to record which strategic methods they intended to employ in order to attain these achievement goals. In addition to the clues given by the teachers, leaflets on effective homework skills which had been distributed among the students contained tips on how to organize a workplace, regulate study time and breaks, deal with distractions, etc.

In the records for the second week, for which the students once again received standardized forms, the students were to list, among other things, (1) the goals they had set for themselves and (2) the strategies they chose to engage in order to attain these goals. As they had already done in the first week, the students were to continue recording (3) their daily scores on the exercise sets (both the predictions they made in school after viewing the exercise sets for the first time and the actual scores attained after working through the exercises at home) as well as those for the (4) math quiz. Since, (5) analog to the documentation made for the first week, the learning behaviors with respect to home study were also recorded, (6) notice was also taken as to how well the implementation of the chosen learning strategy supported the attainment of the goals set. The students were thereby able to establish a relationship between the effectiveness of their strategies and their learning performances.

At the start of every subsequent training week, discussions were held with the students on examples of effective as well as ineffective learning strategies. Each student continued setting specific goals for the coming week and making concrete decisions for, in his or her opinion, suitable learning strategies needed to meet these goals. The completion of the homework exercises, the math quiz, the filling out of the materials, etc. was formulated analog to the procedure followed for the second week of the instructional unit.

Outlook

We have applied this unit of instruction on self-regulated learning in various ways within our research on gifted students (e.g., Stoeger & Ziegler, 2005a, 2005b, 2006, 2008). Results show that students as of the age of nine are capable of substantially improving their self-regulated learning. They stop carrying out learning processes planed and dictated by their teachers or their parents and start creating individually tailored learning strategies. Thus, they empower themselves with the capability of making their own decisions regarding learning and studying and develop their “little c” creativity in the process.

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Chapter 2
Three Creative Mental Operations

Alessandro Antonietti and Barbara Colombo

If we would like to describe what a guitar is, we could focus our attention on the physical features of such an object and/or on its functional properties, as well as on familiar notions associated to it. The definition which we can find in a dictionary may be a relevant example of such a way of describing a guitar: "Popular musical instrument, widespread in Latin countries, especially in Spain. It has a flat back and a long neck with a fretted fingerboard. The wooden case has a round hole in the center. It usually has six strings, played with a pick or with the fingers" (Wikipedia). Presumably, nobody would label this description as creative. A creative description of a guitar might be provided by a poem, such *The six strings*, written by Federico Garcia Lorca:

> The guitar makes dreams cry.
> The sob of the lost souls
> escapes from its round mouth.
> And, like the tarantula,
> weaves a big star
> to catch the whispers which shiver
> in its black wooden cistern.

Why is this way of describing a guitar so different from the previous one exemplified by the dictionary definition? Firstly, the creative approach involves *widening* the mental framework in which the entity to be described is included. In the above reported poem, such a framework does not concern the more blatant aspects of the guitar but further, nontrivial aspects (such as the psychophysiological reactions – such as dreaming, crying, and sobbing). Secondly, the creative approach involves

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_2,

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connecting different frameworks: For instance, in the case of *The six strings*, the framework of the human body (the round mouth), as well as the framework of the spider (and its activity, such as weaving), is superimposed to the physical shape of the musical instrument so to lead one to map meanings, originally associated to the former, to the latter one. Thirdly, creativity involves *reversing* the usual framework: according to the common view, a person employs a musical instrument to express his/her feelings; emotions rely inside the person, and an instrument such as a guitar is meant as a tool to externalize and communicate them. According to Garcia Lorca, instead, feelings are inside the guitar. Thus, in the poems, the traditional framework is reversed: the source of feeling is the guitar but not the person.

By starting from the suggestions provided by Garcia Lorca's poem, we can wonder if the three mental operations mentioned above – widening, connecting, and reversing – can be conceived as the three basic processes underlying creative thinking. *Widening* concerns the tendency to keep an open mind; to be aware of the great number of elements that can be identified in a given situation; to recognize possible, not obvious, meanings; to discover hidden aspects; and to overcome apparent constraints. *Connecting* refers to the capacity to establish reciprocal relationships among different elements, to draw analogies between remote things, to combine ideas in odd ways, and to synthesize the multiplicity of disparate elements into an overall structure. *Reversing* consists in changing the perspective, assuming a different point of view, seeing things by inverting relationships between their elements, asking original questions, and imagining what should happen if unusual conditions occurred. Due to the need to have adequate general theories of creativity (Sternberg, 2001), this chapter will try to show that most psychological theories about creativity can be fitted into a model which assumes that widening, connecting, and reversing are the core operations involved in creativity (Fig. 2.1) (see Antonietti, Colombo, & Pizzingrilli (2011) for the application of the WCR – widening, connecting, reversing – model to creativity testing and training).

Widening

The idea that creativity involves widening the mental framework is shared by many theoretical perspectives. Starting from Guilford (1950) and according to the factorialistic perspective, creativity is linked to the ability to produce many ideas, so leading individuals to assume a broader mental perspective. This ability is characterized by the richness of the thinking flow (fluidity) and the ability to follow new directions (flexibility) in order to achieve uncommon and original outcomes. How can such a goal be achieved?

According to Weisberg (1993), a mental framework can be widened by search processes which increase the variety of the ideas to be considered. This author, by analyzing cases of scientific discoveries and technological innovations and production of artistic works, highlighted that creativity always started from existing ideas that have been modified to fit the specific problem or goal in question. The existing

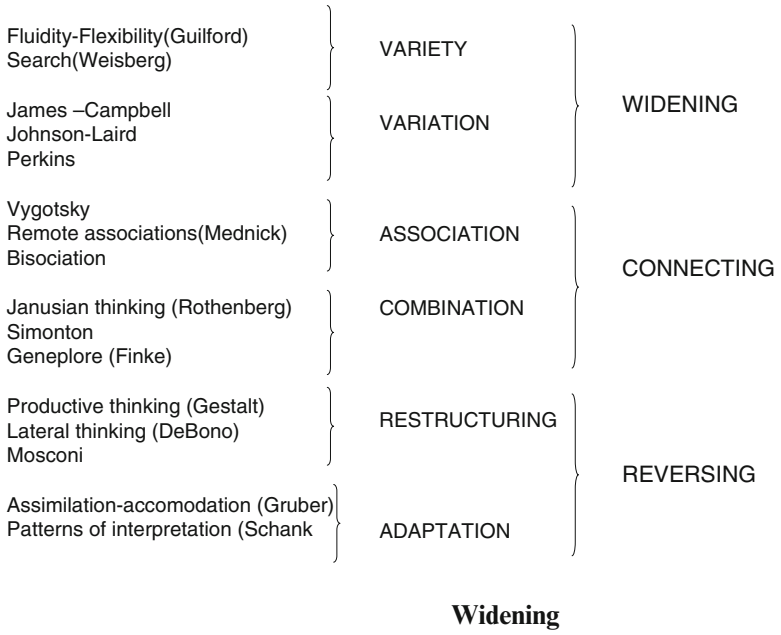

Fig. 2.1 Prospectus of some main theories of creativity

knowledge provides the basic elements with which we construct new ideas. However, so that such a construction can take place, the old ideas should be changed in order to allow persons to have a highest number of ideas, hopefully different one from the other. According to Weisberg, this kind of changes, aimed at introducing variety in the current mental framework, goes beyond the simple repetition of past responses in the past since it is prompted by the failure of previous attempts and from information so acquired. In fact, information that the person gradually gets while trying solutions that come to mind leads him/her to change the direction of reasoning. Creative thinking is based on a search process which moves from the continuity with the past: we face new situations based on what we have done previously in similar or identical situations, and novelty arises in the form of variations of old themes.

Variation

Variation is thus a strategy to make changes in existing ideas. In fact, by varying the existing idea, I can create new ones, so widening the range of opportunities at my disposal. Already in 1880, William James wrote that new concepts arise from accidental variations of mental activity, which can be either accepted or rejected. This view was taken by Campbell (1960), who claimed that creativity involves variation,

selection, and retention. According to Campbell, in fact, the basis of creative thought is a process similar to that underlying evolution. The production of an innovative idea follows the previous generation of many inadequate ideas. As a consequence, the greater is the number of ideas found – most of which later prove to be unsuitable to the solution of the problem at hand – the greater is the probability that an interesting idea emerges.

Such an "evolutionary" view of creativity, which leads to understanding it as a process of change and selection, has been recently revived by Johnson-Laird (1998). According to this author, creative products result from preexisting elements which are varied in order to create something new. The changes that are produced are subject to three types of selection: neo-Darwinian, neo-Lamarckian, and multistage. The first type of procedure that governs creativity is defined as *neo-Darwinian* since in a first stage ideas are generated randomly and in a second stage they are evaluated according to certain criteria. Only the ideas that pass this evaluation, namely, that meet the restrictions placed on this second phase, "survive." According to the *neo-Lamarckian* procedure, instead, the production of ideas is guided by a criterion: in this case, ideas are generated only within a predetermined area. There is also the possibility of a *multistage* procedure when certain criteria are used to generate ideas and others to select them. More precisely, the ideas are produced early in the light of a criterion, but, because they are inadequate, it is necessary to apply additional selection criteria.

Even for Perkins (1988), innovation is a process of variation. For this author, however, changes cannot be accidental. Although the basic mechanism is Darwinian – involving the generation of alternatives, selection of the most effective ones, and their preservation – there is an important difference with respect to natural selection: the creative process is not "blind." In fact, if you were blind to the alternatives, an excessive number of them should be generated to find an interesting one. Another aspect that differentiates the creative process with respect to biological selection is, according to Perkins, that in the former the choice of alternatives takes place not only according to survival criteria but on criteria such as elegance, parsimony, originality, power, truth, and interest. Moreover, in the case of creativity, conservation implies not merely a passive retention of ideas but also the reflection and the construction of further progress.

Connecting

The second operation suggests that creative ideas can emerge from unusual combinations of known ideas. We have to keep in mind that many mythological creations have an underlying associative mechanism of the kind described. For instance, the siren resulted by the association between woman and fish as well as the hippogriff from a bird associated with the horse: in both cases, beings which fail to share common characteristics and live in very different environments were put in reciprocal relationship. The association between different elements, which naturally would not

be linked to each other, does not happen only in cases of eminent creativity but also in everyday life. In the absence of suitable instruments (e.g., color papers and wires), the student of the first case linked the problem of making a lantern with an object – an empty coca cola tin can – that is routinely used for containing drink. The student associated the empty coca cola tin to the celebration.

Association

Already in 1932, Vygotsky had formulated a view of creativity based on the concept of "association." Creative activity was meant as resulting from associations among elements already known or previously acquired, which leads to the production of new realities. The creative process, according to Vygotsky, would develop in the following phases:

- Firstly there is the moment when people receives, stores, and accumulates, through experience, data, and information from the environment.
- Once acquired the materials, a process of dissociation occurs: the existing object or concept is broken into parts; some are placed in relief, and others are relegated to a secondary plan.
- A process of internal revision – in which the broken parts of the original material undergo deformation, amplifications, and reductions – follows.
- Then an associative phase, in which the parts of the original material are re-elaborated so that other elements are connected in the mind of the person, takes place.
- The result is "translated" into workable products or communicated to others.

Through this process, elements drawn from previous experience are transfigured by the imagination so to give rise to ideas or objects before unknown which can, in turn, transform reality.

This perspective was resumed by Mednick (1962) who claimed that creativity results by the so-called *remote associations*, which allow individuals to connect ideas which are distant from each other. According to him, creativity is the ability to combine, in a new and unusual way, disparate elements that apparently have little in common. Other authors have recognized association as the fundamental process of creativity. For example, Koestler (1964) called *bisociation* the operation consisting in bringing together two creative reasoning structures commonly regarded as incompatible, or to find similarities between different fields of knowledge. Innovation emerges as soon as two different levels of reasoning overlap, so producing something that did not exist. In support of his view, Koestler mentions the well-known anecdote according to which Newton would have discovered the law of universal gravitation after watching the fall of an apple from a tree and trying to imagine the behavior of the apple if it was dropped from increasing heights from the ground up to reach a height equal to the distance of the moon from our planet. The intuition of Newton consisted in having thus put a relationship between

two planes of reality seemingly unrelated: the apple and the moon. Another example coming from bisociation is the invention of the system of movable type printing: Gutenberg would have seen how, during the harvest, the action of the press is exercised over all the grapes packed in it; this suggested the use of a similar mechanism to make sure that the characters leave a trace of the letters printed on the page.

Combination

Another form of connection involved in creative thinking is described by Rothenberg (1979). He proposed the existence of a form of thought – called *Janusian* (from Janus, the Roman god of the two faces looking in opposite directions) – which marks the genesis of artistic and scientific creative products. It consists in composing the terms of an antithesis, namely, in being able to hold simultaneously two opposite elements and attempting, against the initial inconsistency or paradox, to integrate them. The reconciliation of opposites would not be a result of unconscious processes, but of conscious and deliberate strategies: the individual chooses a particular pair of opposites and try to integrate them. Rothenberg cites, as evidence of his theory, autobiographical accounts of scientists and artists, the analysis of the preparatory notes or prerelease versions of literary works and paintings, and a long series of interviews with artists and scientists relating to the mental processes activated during their work.

In recent times, Simonton (1999), in order to give an account of the creative process, postulated the existence of *mental elements*, that is, the fundamental psychic units, such as feelings, emotions, concepts, and ideas. Combinations of well-organized and stable mental elements give rise to *configurations*. Following a process of "consolidation," configurations can become so cohesive that they can be treated as a unit. The more configurations are integrated, the more psychic functions are consistent and organized. Units are usually combined together permutations. In these permutations, what is relevant is not so much the elements which are combined but the way in which they are combined. The permutations are then selected according to some criteria. First of all, permutations vary according to the degrees of stability: at one extreme, we have the most unstable configurations, called *aggregates*; at the other extreme, the configurations are highly stable. Another selection criterion is the communicability: because the configurations must be expressed in symbols (verbal, visual, etc.) in order to be shared by others, permutations that offer such opportunities are preferred. A third criterion is social acceptance: a permutation, to be preserved, must be able to influence others or to exercise a kind of leadership in an area. On the basis of this conception of the creative process, Simonton argued that creative people have first of all many mental elements available: the greater is the number of these elements, the greater is the number of possible permutations. In other words, creative people are those who have a greater chance of producing new combinations of mental elements. Secondly, creative people have a particular skill in performing random permutations. This should help them to create a rich mental structure of interconnected elements. Consistent with what has been exposed,

Fig. 2.2 An ostrich created by reassembling the pieces of a motorcycle creatively

Simonton proposed to differentiate individuals along two axes: the number of unit owned and the strength of the connections among them. The higher the number of units, more – as mentioned – is the possibility to do permutations; the lower is the strength of the connections that link the units, the greater is the likelihood of establishing new combinations. The creative person hence has a mental structure whose elements are highly connected to each another by nonconsolidated associations. The creative person has a distributed mental network where there are more ways to move from one element to another.

The mechanism of connecting disparate elements can take on a further form. In some cases, we can combine among themselves the available elements in a different way than usual, resulting in something original. For example, consider the way in which the pieces of a motorcycle were linked together to create a kind of ostrich, as done by the students of the University of Amiens, which they explained their creative product in the university atrium (Fig. 2.2).

This aspect of creativity is stressed in the *Geneplore* model (Finke, Ward, & Smith, 1992; Ward, Finke, Ward, & Smith, 1995), according to which original and innovative outcomes can result by a process in two phases: the *generative* phase, in which an individual constructs mental representations, and the *exploration* phase, in which these representations are interpreted in order to lead them to suggest creative discoveries. In the generative phase, the representation results as a consequence of

an associative process through which elements are combined together. In this phase, the emergence of a creative product is facilitated if elements are combined in unusual ways. Finke (1990) devised a procedure to foster such a process: he showed participants some simple geometric shapes and then asked them to mentally combine the shapes with the goal to achieve an overall form with a final meaning or a final object that has some usefulness. He found that the combination of mental images is particularly effective in inspiring original ideas.

Reversing

Reorganizing

Reversing is the third operation which is assumed laying at the basis of creativity. Such an operation can be exemplified as follows. During the second world war, when Nazi occupied Denmark, they wanted to impose the obligation in that country for Jews to wear the armband with the Star of David. The Danish king was totally contrary, but had no power to oppose this law. Forced, he signed the requirement to bring this despicable badge of distinction, but he first began to wear the armband. In this case, it was impossible for him to do what he wanted (not signing the edict); thus, he made the opposite: the king, instead of opposing to what the German occupiers forced him, conformed more than was required. In doing so, he found a decent way out of a situation that looked like a dead end: he expressed his opposition against the measure and its solidarity with the Jewish population and thus emptied of its meaning the symbol of disgrace; if the king was wearing the armband, it was not so humiliating to wear it.

Sometimes creativity emerges from a real physical reversal, as in this case. At the beginning of 1900, the artist Gustave Verbeek wished to offer in the *Sunday New York Herald* eight stories cartoons instead of four since the readers of the newspaper asked so. However, the publisher did not want to increase the space devoted to cartoons for financial reasons. Hence, Verbeek invented stories with cartoons to be seen on the one hand and other stories cartoons for the same views on the opposite side. In this way, by reversing the newspaper you can read a new story based on the same pictures (Fig. 2.3).

Reversal may be conceptual, rather than physical. For instance, Magritte in his painting, *The collective invention* (Fig. 2.4), draw a siren by reversing the nature of the two halves it is composed by the following: the upper part of the siren is a fish instead of a woman and the lower part is a woman instead of a fish. An artistic surprise is generated in *The collective invention*, suggesting possible insightful thoughts about the relationships between the human and the natural worlds.

The idea that a reversal in the mental framework is a psychological mechanism which lies under creativity can be identified early. Some suggestions coming from the Gestalt psychology tradition can be interpreted in this perspective. Gestalt psychologists did not use the word “creativity,” even if they dealt with thinking processes implied in discoveries and inventions. What is commonly conceived as

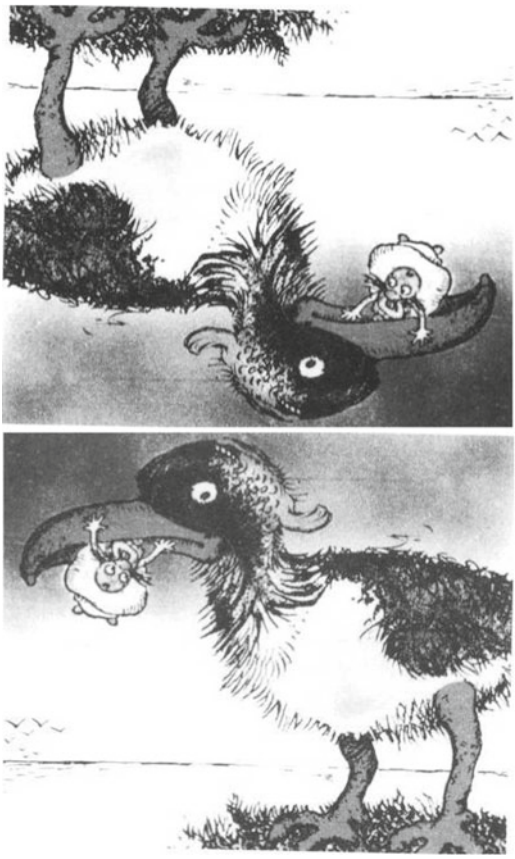

Fig. 2.3 A cartoon designed by Gustave Verbeek, which changes its meaning by reverting it

Fig. 2.4 Renè Magritte, *The collective invention*

"creativity" refers to what Gestalt psychologists called *productive thinking*. Productive thinking involves a restructuring act, which consists in the transformation of the point of view from which the current situation is analyzed, so leading people to identify new properties of the given elements and/or new relationships among them or new functions of the available materials. Consider this case reported by Wertheimer (1959). Two children are engaged in a match of badminton. One of the players is much more skilled than the other one, so that the latter, finding himself constantly defeated, decides to stop playing. The first child wants to continue the game, but he does not succeed in convincing the partner to continue the match. Suddenly he finds a way to achieve his goal by restructuring the situation. Indeed, he proposes again to his companion to play badminton, but with a different challenge: no more one against the other, but in the attempt to make together the largest number of hits without dropping the ball. In this way, his partner is led to perceive himself as an ally but not as an opponent. The first child gets what he wanted, namely, to continue the game, by changing the structure, that is, the purpose of the game.

The restructuring act appears to be the core of what De Bono (1967) calls *lateral thinking*, a kind of cognitive process which moves from one pattern of reasoning to another one, so inducing people to look at problems in new ways.

In some cases, restructuring involves linguistic factors. In fact, certain verbal expressions can be interpreted in two (or more) ways. We usually tend to decode them in one sense, apparently the most natural, but in fact as to conceal the alternatives. Neglecting the alternative meaning hinders creativity since it prevents people to consider other possible ways to conceive the situation or to solve the problem in question. For example, consider the following riddle: "A surgeon is called to the hospital to operate a guy who had a motorcycle accident. The surgeon prepares for the operation but when entering the operating room, by looking at the patient, says: 'I can not operate him; he is my son'. The surgeon is not the boy's father. How is that possible?" The difficulties encountered in making sense of this apparent contradiction are due to the fact that the noun "surgeon," which may designate both a male or a female, tends to be decoded only in the first sense, so that it is not taken into consideration the possibility that the surgeon is the boy's mother. This kind of phenomena was the subject of attention and original theorization, within the context of Italian perspectives on creativity (Antonietti & Cornoldi, 2006), by (Mosconi, 1990; Mosconi & D'Urso, 1974). According to this author, when the subject is placed in front of a problem or request, information is provided: the subject receives a message. In this regard, Mosconi distinguished between the *given message* (consisting in what is explicitly told to the subject) and the *actual message* (which includes information not given explicitly but implicitly contained in the message). The actual message is, therefore, always broader than the given message. In some situations, individuals are limited in their mental framework because of an error generated by the difference between the actual and the given message. The person is sent a message (the given message: for instance, a surgeon has to operate a boy), but he/she decodes it, through what is called *primary decoding*, by adding other elements, so producing the actual message (a male surgeon has to operate a boy). In ordinary

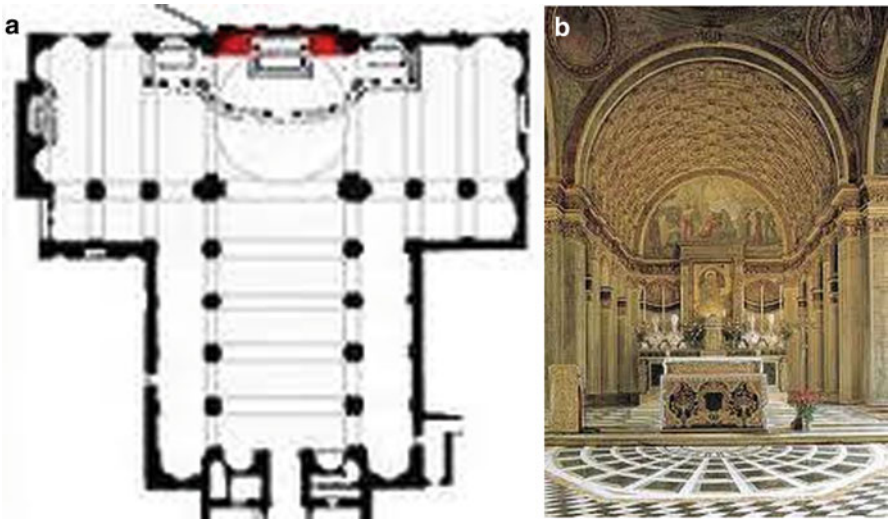

Fig. 2.5 (**a**) The plan of the church of St. Satiro in Milan. (**b**) The back wall of the church of St. Satiro in Milan

communication, the actual message is, in general, substantially identical to the given message, because the speaker wants to make him/herself understood by the listener and then he/she tries to express him/herself in a natural way. In certain situations, however, things are different, since the given message is decoded differently. A rule of communication is that, when a question is asked, it is plausible that the statements contained in the message are informative and relevant. Problems arise – such as the aforementioned case of surgeon – because the actual message contains elements which are incompatible with the solution. Sometimes creativity is impeded by a series of constraints and boundaries, not actually required by the original description of the situation, that the subject constructs in his/her mind. Eliminating the gap will eliminate such constraints and boundaries. In fact, this removal opens a new interpretation and thus makes it possible to reorganize the mental field, even in a creative way. Thus, in certain cases, creativity may consist in switching from a meaning of the message to another one, so reversing the representation of the situation.

Consider the order received by Bramante in Milan when he was asked to "give greater depth" to the choir of the church of St. Satiro. Apparently he could not increase the depth of the chorus since there was (and there is also nowadays) a street after the back wall of the church (Fig. 2.5a). Bramante then gave the expression "to give greater depth" a different meaning, which is also implied in the expression, even if it is not clear in its primary decoding. The greatest depth of the choir was not obtained by moving back the back wall (which was not possible for the reason mentioned above) but creating a perspective effect produced by fake pillars aligned in different planes that actually required a few centimeters of depth

(Fig. 2.5b). The message "to give greater depth" included several possible meanings. One of its readings is limited to the possibility of stretching the physical length of the building. Another one is not bound by linguistic mechanisms but includes other options, such as the effect of perspective illusion.

Reconstruction

Some authors have shown that mental reversing may involve a long and gradual process. For example, Gruber (1974) pointed out that not all innovations and discoveries must necessarily come by sudden reorganizations of the conceptual field in question. The reconstruction performed by Gruber of the elaboration of Darwin's theory of evolution shows the presence of progressive and slow changes in the theoretical system that the British naturalist was gradually formulating. These changes are interpreted by Gruber as a result of adaptation processes consisting of both assimilation of new data to previous patterns of thought and accommodation of prior mental structures to new empirical data. According to Gruber, in fact, the creative process takes place in a complex system that evolves under the direct control of individuals. Gruber highlighted how the so-called microgenesis of insight has its own structure: starting from the initial sketches, the subgoals are set, and these subgoals must be organized in a hierarchical order. The creative mind allows one to recognize, store, and process innovations which occur since it is operating on the basis of a sort of device that amplifies the slight deviations that a person progressively makes in his/her ideas.

The reversing of a mental framework can also follow another path, that is, trying to apply a mental framework outside its normal scope. This is what Schank suggests (1988). According to this author, to understand reality, we must have *knowledge structures*, which are generally derived from repeated experiences. A knowledge structure which was used several times to give an account of events constitutes a *pattern of explanation*. A parsimonious strategy is to treat a new situation as not so different from the previous ones, that is, to apply a pattern of explanation that we applied to other known situations. This prevents us to perform all the processing that would be necessary if we treated the situation as if for the first time we encounter it. Creativity emerges when, in order to face the new situation, we adapt a pattern of explanation, originally set for another situation, to the current situation. Creativity consists in applying a pattern of explanation which is not expected to be applied to that situation. In other words, creativity comes from the misapplication of a pattern of explanation: in front of an unusual event, we fail to apply the typical pattern of explanation for that situation, but we apply another pattern of explanation. The patterns of explanation, when applied out of their familiar context, may produce creative results. The creative attitude is what allows the individual to leave the patterns of explanation to be applied to apparently not relevant situations so that they can lead to discover useful properties.

Conclusions

In this chapter, we proposed a model aimed at synthesizing different theories in order to define an exhaustive and organic view to conceptualize creativity. By omitting the specific aspects that characterize each position, we identified three major mental operations which are at the basis of creativity.

A first group of authors fundamentally believes that creativity comes from the *widening* of the mental framework. If the individual is capable to generate many different ideas (Guilford, Weisberg) or tries to vary existing ideas and select the most promising ones (Campbell, Johnson-Laird, Perkins), he/she may reach interesting findings or may produce something new and valuable. Hence, expanding the mental horizon through variety and variations of ideas may contribute to creativity.

A second group of authors think that creativity emerges when people establish relations between realities which are commonly unrelated (Vygotsky, Mednick, Koestler) or even antithetical (Rothenberg). Original combinations may also result by assembling elements in unusual ways. According to this perspective, *connecting* mental frameworks is the basic process of creativity.

Finally, a third group of authors claims that a creative act occurs when a reversal of the mental framework occurs. This can happen through restructuring (Wertheimer, De Bono, Mosconi) or through the adaptation of an interpretive scheme to novel data so to produce a different vision in which it is possible to grasp not obvious and interesting meanings (Gruber, Schank).

The model we outlined here may be the starting point for devising procedures and materials to assess the creative potential of individuals and to design training programs aimed at enhancing creative skills. To these purposes, a coherent general view is needed, and we hope that our model can provide both researchers and practitioners with such a view. In this attempt, we tried to preserve the valid insights included in each existing theory, to identify the overlapping claims and the shared issues and to integrate, but not only juxtaposing, them in an overall scheme. In fact, the analysis we carried out of the main authors who contributed to highlight the psychological mechanisms underlying creativity led us to recognize that the various theories are not mutually exclusive, but each stresses an aspect of a complex kaleidoscope. If creativity is a multifaceted dimension, mono-perspective approaches seem to be inadequate. Rather, a comprehensive approach can take into account the reasons of each point of view and make them understandable within a general overview, thus providing a solid ground for applicative projects and interventions.

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Chapter 3
Psychology of Cultivating Creativity in Teaching and Learning

Ai-Girl Tan

Introduction

A Timely Reflection

Recent development in creativity research and practice shows promising trends (e.g., declaration of years of creativity and innovation; an increasing number of publications). Within the policymakers, there are policies to promote and nurture creativity nationwide (Hui & Lau, 2010). Among the researchers, there have been continuous attempts to synthesize knowledge of creativity (e.g., Hennessey & Amabile, 2010; Kaufman & Beghetto, 2009; Runco, 2004). The increasing interest in nurturing creativity around the world calls for a timely reflective analysis on knowledge of creativity and cultivating creativity. Evidently, confluence theories of creativity recognize the *interactive* effect of the individual persons and environments. Every person possesses the potential to be creative in one or more domains (Gardner, 1983). There have been efforts to explore new paradigms of creativity (Glaveanu, 2010; Tan, 2011, 2012). For decades, we have acknowledged the presence of creativity but seldom examine the existence of creativity. It is timely to reflect upon our knowledge of creativity (*epistemology*) including our understanding (*ontology*) and meanings of creativity *for* and *in* life.

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_3,

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Creativity and Its Importance

Human beings possess the abilities to react, reflect, and create (Bandura, 2001). Memorization allows us to reproduce workable experiences of the past for the current use. It enables us to pass experiences from one generation to the next generations. Creativity enables us to rework on our experiences and construct realities. As a productive activity (imagination), creativity complements the reproductive activity (memorization) (see Vygotsky, 2004). How is creativity important in life? Creativity includes actions and interactions that lead to human development, innovations, civilizations, inventions, breakthroughs, discoveries, revolutions, and evolutions. *Breakthrough* creativity is related to search for new ideas that have not been thought by other people. *Adaptive* creativity is the result of responding creatively to breakthroughs (Tatsuno, 1990, p.17), for example, to transform them for applications in everyday life. Creativity is a source of development. Interaction mediates and leads development (Ponomarev, 2008a). Discovery, invention, and innovation in varying degrees are related to creativity (Draeger, 1991). Innovation is a sociological concept because it gives structural modification to many things that are not totally new. Invention is a new application of knowledge, whereas discovery is the new knowledge itself (Duric, 1972).

Knowledge of Creativity

According to Glaveanu (2010), there has been four phases of development in creativity research in psychology from prior to the 1950s to the present. The pre-psychological phase focused on the studies of geniuses (or *the he paradigm*). The psychological phase of creativity presented the creative person's perspectives (or the *I* paradigm). The social psychological phase of creativity highlighted creativity within the person and his/her contexts (or the *we* paradigm). The revival of the person and culture phase emphasized creativity within the intersubjective space (or the *cultural* paradigm). In connection with *multiple* paradigms of creativity, psychologists acknowledge *multiple* forms of creativity. Kaufman and Beghetto (2009) outline a framework of the four forms of creativity. Every person is able to engage in creativity that leads to self-transformation (mini c) and in everyday creativity (little c). Professionals with specialized expertise are able to engage in domain-relevant creativity (professional c). Eminent scientists are those who experience breakthrough creativity (big C).

Creative potential is present in every person. We form images with reference to experiences. Characteristics of the creative person (e.g., making independent judgment, maintaining deep motivation, having strong desires to live on, being patient, and being able to tolerate for ambiguity) (e.g., Gardner, 1983; Guilford, 1950). Person-context interactive relationships facilitate or hinder creative behavior or performance (see Amabile, 1983a; Csikszentmihalyi, 1996). Culture is part of transactions and as resources and mediators of problem solving and creativity. Culture preserves variations that are sustainable over generations. Variations were transmitted in the

forms of shared values, skills, and expertise to the new generations in the course of human civilization, development, and societal advancement (Simonton, 1999).

Our engagement in creative activities varies according to our needs and phases of development. We perceive, accumulate, store, retrieve, rework, combine, and embody emotional, socio-cultural, and historical experiences. In creating, we dissociate, distort, change, exaggerate (or minimize), associate, and combine (or unify) elements of experiences (or images) into a system (e.g., a complex picture). Young children engage in play and enjoy drawing. Gradually, adolescents engage in literacy creativity, verbal creativity, or written creativity (Vygotsky, 2004). Creativity and culture have reciprocal, dynamic, iterative, cyclic, and interactive relationships. Creativity is a basis for all aspects of cultural life (Vygotsky, 2004). Culture serves as a resource (e.g., an interworked system of construable signs, Geertz, 1973) and is a product (e.g., a system of artifacts, Cole 1996) of human creativity. In dialogues (Gruber, 1998), we conceive, create, and communicate social realities (Markova, 2003). Creating happens in the relational space between the creator (the *inner* self) and environment (the *external* life) (Winnicott, 1971). In the intersubjective space, we creatively use symbolic resources or cultural elements to do something that is reflective, to resolve "ruptures" (Zittoun, 2007), to elaborate meaning, and to externalize the outcome (Zittoun, et al. 2003).

Creativity for Life

How does creativity relate to life? Creativity is a process of bringing something into being (May, 1975). As a force of movement, creativity leads development (Ponomarev, 2008a, pp. 18–19) and life. Life is when we assume being (Mu, 1989). Being, perceiving, and becoming are processes of existence. Marsella (2012) advocates the development of life identity or lifeism. *Lifeism* is an identification with life. We are part of life. We value peace, service, cooperation, education and learning, courage, justice, and cosmic unity. We embrace life with compassion and respect, connect life with the cosmo, and understand that we make part of life in the cosmo. According to Mu (1989), we concern about our own life from praxis. In reflection, we realize/generate ideas/concepts and build principles. Reflection is a prerequisite of concept realization and principle formation. In sum, in reflection we generate ideas, concepts, and principles.

A Framework for Cultivating Creativity

Cultivating Creativity

To cultivate means "to prepare and use land for growing crops and plants; to develop a particular skill or quality in yourself; and to make an effort to develop a friendly relationship with someone because you want something from them" (Longman,

1995). Cultivating creativity refers to the effort made by the educators (teachers, teacher educators) to move beyond the conventional educational objectives that end at acquiring knowledge and skills (see Takahashi, 1993, p. 192).

Recognizing the Individual and Sociocultural Interplay

Creative performances of an individual do not happen in a vacuum. Vygotsky (2004) highlights dynamic interactions between creativity and experiences or imagination and realities. Creative performances are products of an individual's interactive efforts, commitment, and perseverance in her/his area of specialization supported by resources and people around her/him. Cultivating creativity takes its shape within the humanistic and life contexts. The effort to cultivate creativity is in line with the contemporary life and educational aspirations. It goes beyond structural changes in the curriculum, assessment, and pedagogical infrastructures. Cultivating creativity involves a series of cultural and psychological transformations in conceptualization and in practical implementation. The transformations challenge a fundamental issue, that is, how the efforts of cultivating creativity can assimilate strengths of life systems (beyond person, sociocultural, ecological systems). They also challenge the readiness of the system to accommodate and assimilate unconventional behaviors and cognition.

As a developmental and lifelong process, cultivating creativity shall begin at home and continue in schools, in industries, or at work. Innovative and creative ideas are likely to furnish if they receive social support and recognition. It is indispensable for social institutions (e.g., family, schools, universities, industries) to prepare environments (e.g., psychological, sociocultural, and life) that can stimulate the spark of original, new, productive, and useful ideas. The ultimate aim of cultivating creativity is to uncover an individual's potential abilities and to develop them effectively. In brief, the researchers and educators are challenged to generate ways and conditions that can uncover creative potentials, that can foster creative performances, and that can facilitate the process of constructing a culture of cultivating creativity.

Observing the Principle of the Common Good

Cultivating creativity should be "safeguarded" by encouraging the individual to employ creative work for the well-being of all living beings. Creativity in sciences and technologies shall adopt selfless, non-dogmatic spirit of discovery (Popper, 1959).

Understanding the Intention of Creation

We have to understand the *intention*, *purposes*, *aims*, *and philosophies of the creation* beyond the creativity (Kitaro Nishida; Nishitari, 1991). The purposes of creativity behavior shall be understood. What makes a person engage in a creativity act,

performance, cognition, and so on? What can the creator and his/her communities benefit from his/her creative thoughts and behavior? Under what circumstances are creative solutions, ideas, and products essential? Do creative inventions, innovations, and discoveries serve only needs to obtain recognition from others? Do inventors, innovators, and creators place saving resources, care for life, and instill meanings and positivity in everyday experiences into their list of creation's priority? Are creativities guided by the common good?

Making Holistic Inquiries

Inquiries must be holistic, *taking life as the main course of concern* (Dewey, 1938). Comprehensiveness and interconnectedness are core values of inquiries. Inquiries must revolve around the common good, involving biological, cultural, social, ecological, and psychology processes, as well as ensuring the outcomes of inquiry are beneficial to all parties. The principles of continuity and interaction in dialogical spaces are present (e.g., success in business and in maintaining a congenial climate, clean oceans, and safe transportation routes, Velasquez, 2010).

Constructing Knowledge in Action and Interaction

In the process of searching for and attaining new meanings in life, we rework, combine, abundant, and restructure existing and past knowledge with reference to our experiences. Knowledge is constructed with reference to our experience in *action* and *interaction* (von Glasersfeld, 1995). We create new spaces for dialogues and reset priorities in life. Our emotional, cognitive, and experiential realities alter by the events and change accordingly in the *intersubjective* spaces. Tools and signs emerge and alter the existing cultural artifacts. Collective efficacies (Bandura, 1986) are enhanced through dialogues, interventions, and reflections.

Constructive Creativity

A framework of psychology of cultivating constructive creativity is proposed (see Table 3.1. for the main points of psychology of cultivating constructive creativity). Our framework considers psychic reflection as ontological which involves interaction of the subject-object and epistemological, which is about the relationship between knowledge of existence and existence (Ponomarev, 2008a, pp. 19–20). The adjective constructive entails connotations such as being open to all experiences (Rogers, 1961), being ethical, being humanistic, and being able to care for oneself and others. Constructive creativity is built upon a general framework of fostering creativity.

Table 3.1 Main points of psychology of cultivating creativity

Multiplicity in creativity	Cultivating creativity for the common good	Constructive creativity for full personhood	Creative teaching	Creative learning
Acknowledging knowledge in various paradigms: i, we, and culture	Recognizing the individual and sociocultural interplay	Creativity for full personhood	Component 1: basic pedagogical skills	Interaction for development
Considering multiple forms of creativity: big-professional-little-mini cs	Observing the principle of the common good	Creativity for self-care and care for others	Component 2: the content knowledge, creative techniques, and knowledge of developmental processes	Play for imagination
Broadening creativity in multiple disciplines/domains: innovation, invention, discovery, etc.	Understanding the intention of creation	Creativity for growth (positivity)	Component 3: assessment modes	Interplay between imagination and experience/realities
Reflecting upon gaps in ontological and epistemological understanding of creativity	Making holistic inquiries	Creativity for self-transformation	Component 4: intrinsic motivation	Creative activities for healthy minds (relaxation, puzzles, games, etc.)
Synthesizing views of creativity in diversity for the common good, developing personhood in teaching and learning	Constructing knowledge in action and interaction	Creativity in systems (regulation, collaboration)	Component 5: educational policies Component 6: school culture	Reflecting upon creativity for life

Note: The points are listed in arbitrary sequence

Ponomarev (2008a) claims that "the unperceived part of the result of a person's *actio*n that does not depend directly on the consciously set goal and sometimes plays the decisive role in a creative act" (pp. 18–19). In a collateral product of action, interaction between the subject and the object happens without any consciously set goal but depends on the transfer of primacy in interaction from the subject to the object (Ushakov, 2007). The object starts to transmit information for the construction of our models of the world apart from or bypassing our conscious orientations and goals. Intuition is important as it has yet organized into a coherent form of the system of conscious activity, and hence it is local and is ready to form any association. The dynamics of interaction includes the activeness of the subject and the reverse influence of the object (Ushakov, 2007, p. 39).

Creative processes involve representation of realities (perception and imagination), dissociation of images, association of experiences, idea generation, and exploration. *Time* to engage is a prerequisite of creativity. We rework the images that come to us and refine them according to constraints. *Space* is another prerequisite of creativity according to which we broaden our thought-action repertoires and build resources which can support and realize our creativeness. During the idea generation phase, numerous pre-inventive structures emerge from intuition or experiences, which can be ambiguous and novel. These structures can be refined with references to disciplinary and sociocultural constraints during the exploration phase (Finke, Ward, & Smith, 1992). The person and his/her communities of interest and practice set the values of social acceptance of our inventive structures (Amabile, 1983a, 1983b; Finke, 1990). Creative imagination works with what is given in the present and projects the future (Vygotsky, 2004). Our motivation (Amabile, 1983a, 1983b), positive emotions (Fredrickson, 1998), and humor (Frankl, 1984) regulate creative learning, engagement, and performance. We learn informally from significant others (parents, close kinship, caregivers, etc.) and formally in schools and other social institutions ways to socialize, solve problems, and behave appropriately (Bronfenbrenner, 1979).

Constructive Processes

A framework of constructive creativity comprises the following main processes:

Constructive creativity is a process of *becoming* a person who cares for oneself and others. Care emerges as a response to a need, explicitly acknowledges, and equally respects all the aspects of a particular need. "Care implies responding to another out of something more than pure interest. Care also implies that this response will lead to an action." (Pantazidou & Nair, 1999, p. 207) There are five phases of care (Tronto, 1993):

- Care about: the phase of recognizing the correct need and realizing that care is necessary
- Taking care: the phase that involves assuming some responsibility for the identified need and determining how to respond to it.

- Care giving: the phase where the need is met.
- Care receiving: the phase where the object of care will respond to the care it receives.
- The ethic of care or integrity of care: the four moral elements of care are integrated into an appropriate whole.

An ethic of care is best expressed as an activity; it is about respecting a person's wishes, desires, and needs and wants as well as restoring dignity and ensuring a person's quality of life. Care is in a relation. The unit of care is the person and his or her loved ones (Saunders, 1990). Care for a person includes paying attention to the needs of the unit of care, taking responsibility for these necessary actions, developing the competencies and the adequate means to achieve that, and active listening to and evaluating such caring actions (Smeyers, 1999). Care involves feelings of acceptance, acts of giving and sharing, and the joys of seeing others grow. Qualities that support the growth of caring dispositions and competence include motivation to self-care, patience, friendliness, trust, forgiveness, respect, love, and happiness. The care of the self requires a life of receptivity (*Gelassenheit*), or "letting things be" (Edwards, 2000).

Constructive creativity is *experiential*. Continuity in growth is dependent on present experiences that live fruitfully and creatively in subsequent experiences, as creativeness in present experience can become a moving force for growth (Dewey, 1938/1997). A person who is open to all experiences is creative and his/her creativity is constructive. Rogers (1961) delineated the importance of unconditional positive regards in supporting the unfolding and experiencing of all the positive, negative, and neutral experiences one has. To embark on the journey of openness, a person must feel accepted and supported and be capable of seeing the constructive or positive relevance of his/her present experiences with his/her previous and future experiences.

Constructive creativity is about *self-transformation*. In the framework of constructive creativity, we propose employing the learning and reflective cycle as a means to facilitate humanist, problem-posing education based on authentic reflection and action upon reality, inquiry, and creative transformation (Freire, 2002). Within the learning and reflective cycle of problem-posing education, cognitive actors cooperate in perceiving the same cognitive objects (e.g., creativity or helping the twice-exceptional students to attain states of excellence). It is essential to recognize the synthesizing reflection in which the self uncovers its connections to the world and its rootedness in it. At this level of reflection, we undergo genuine personality development, the ability to feel, to encounter reality, and to live in contact with it (Fakhrutdinova, 2010, p. 38).

Constructive creativity is for *full* life. Full life is attained when we possess positive emotions and lead *an engaged* and a *meaningfu*l life. The *engaged* life pursues involvement and absorption in work, intimate relations, and leisure (Csikszentmihalyi, 1990). We can enhance engagement and flow (the state or moments when we are highly engaged in challenging activities) by identifying people's signature strengths (highest strengths) and talents and enlist them, as much as possible, each day as we work, play, and relate to others (Seligman, 2002). The *meaningful* life involves

using our signature strengths and talents in the service of something larger than we are, to find meaning and purpose in living (Seligman, 2002). "Positive institutions" such as religion, politics, family, community, and nation provide us with opportunities for establishing a meaningful life and, in so doing, achieving a sense of satisfaction and the belief that one has lived fruitfully (Myers, 1992; Nakamura & Csikszentmihalyi, 2002). Performing or carrying out such activities produces a sense of meaning and is strongly correlated with happiness (Lyubomirsky, King, & Diener, 2005).

Creative Teaching

Cultivating creativity, in brief, refers to how the teachers help the students to become creative. Practically, it involves multiple ways the teachers use to uncover an individual's innate potentials and nurture them. The teachers have to acquire various pedagogical competencies such as *content knowledge*, *assessment modes*, *and ways to identify the individuals' needs*. Their understanding of the subject-related concepts should be enriched with knowledge of child and adolescence psychology. The teachers should be aware of *developmental processes* of various age groups. They should investigate how the learners understand new contents. If the teachers understand the learners' cognition and behaviors, they are likely to select appropriate teaching materials and design suitable teaching aids to prompt intuitive and creative experiences. The teachers should design various techniques for cultivating creativity. They should know the conditions that can stimulate creativity (e.g., the use of prompt to activate intuition, non-goal-directed psychological experiences, Ponomarev, 2008a). Techniques are modified according to the learners' needs and psychological development (e.g., according to stages of developing the internal plan of action – a situation object-related transformation, Ponomarev, 2008a). Moreover, the teachers should be aware of types of knowledge in psychology of creativity (e.g., descriptive knowledge and empirical knowledge, Ponomarev, 2008b). Teachers shall know the strengths and limitations of using a certain type of assessment. They should employ various forms of assessment (see Campbell, 1997) that accredit independent and interdependent learning. *Intrinsic motivation* is one of the prerequisite conditions for continuous learning and self-education (see Amabile, 1996). Thus, the teachers should know how to arouse the learners' interests in learning a subject at their young age (Smith, 1996) and associate content knowledge learning with the learners' real life experiences.

Creativity in Systems

An individual is regarded as a system. She/he interacts with other individuals who are collectively termed contact persons. Within an individual, there are various subsystems: biological, psychological, sociocultural, etc. For an individual to function

well, the subsystems have to regulate efficiently. The systems' view suggests that "no act or product with claims to creativity can exist without an input from each of the subsystems" (Csikszentmihalyi, 1990, p. 200). "Any reality presents a system only in relation to its components. At the same time, any reality, regarded as a system, always forms part of another more complexly organized system, in relation to which it itself plays the role of a component" (Ponomarev, 2008a, p. 22). "A higher level system incorporates lower-level systems as components. In interactions between objects the entire system of levels is brought into play" (Ushakov, 2007, p. 69). We acknowledge the importance of information flow between two or more systems. The within system regulation (among the subsystems) is as equally important as the across system regulation or collaboration (among the systems). These two types of regulation are mutually dependent. In the classroom, a lesson is conducted in a classroom that consists of a teacher and 25–40 learners. We regard the teacher, an individual learner, and other learners as three systems in a classroom. The teacher and the classmates are the individual learner's contact persons. The immediate social system is the school, whereas examples of distant social systems are tuition centers, community centers, self-interest clubs, and ministries. Social interactions with various objects and people enrich an individual's life experience. The development of an individual's set of repertoire of skills and knowledge depends on the quality of her/his interaction or experience with the objects and peoples in her/his sociocultural settings.

Components

Creative teaching is conceptualized within the interactive systems of the teacher and the learners and across the interactive systems in schools and social institutions. Systems are always interactive among components that constitute them. A system is always a part of another more complexly organized system, in relation to which it itself plays the role of a component (Ponomarev, 2008a, p.22). Features of creative teaching include active interactions and information flow across systems and within systems. External (relative to the given components) process of interaction is mediated by internal process of interaction. Components of creative teaching are suggested to help facilitate active interpersonal and intersystemic interactions and efficient information flow within and across systems. The first component is related to basic pedagogical skills such as lesson planning, classroom management, communication, and evaluation. The second component refers to the content knowledge, creative techniques, and knowledge of developmental processes. The third component is related to the competence in selecting appropriate assessment modes. The fourth component includes supportive factors such as the teachers' and the learners' motivation. Intrinsic motivation is an indispensable component (Amabile, 1983a, 1983b) as it generates ongoing task commitment. The fifth and the sixth components are related to the learning climate and environment: educational policies and the school culture. Educational policies influence school learning climates.

If creative and critical thinking is one of the educational concerns, teachers and principals may pay special attention to the development of the learners' problem-solving skills and creative competence. They are likely to adopt an unconventional approach to teaching. In contrast, if examination results constitute the core of education, schools are likely to adopt an academic achievement-oriented learning culture.

Creative Learning

Interaction

A condition of any process of interaction is disequilibrium in the system of components. Any change in the internal state of one component inevitably leads to change in the relations among the components, thereby causing their interaction (Ponomarev, 2008a, p. 22). The teacher and the learners are interdependent systems. They interact by participating in various types of classroom activities (academic, sociocultural). How do the teachers interact effectively with the learners? Tools to do this include dialogue, problem-posing education, and appropriate intervention. *Dialogue* engages in critical thinking and is carried out by the learner and the teacher mediated by the contexts of specific themes (e.g., creative writing). Each dialogue has two dimensions: action and reflection. The contradiction (e.g., equality in education, pull out or inclusive programs for children with special needs) is to be resolved through dialogical relations. *Intervention* is a process, an intrusion into value systems, and based on a relationship of trust and expectations (Bruhn, 2000). The elements that must be specified in an intervention are the agent (who should intervene), the target (whose actions are to be changed in some way), the mechanism (how to intervene), and the time and space (when and where a concrete social intervention takes place).

Activities

Learning does not confine to drill and practice. Various types of learning activities such as games and quizzes (see Baer, 1998) that invite the learners' active participation should be introduced. Learning activities in a classroom shape the types of learning environment (psychological, sociocultural). Individual writing, for instance, demands a learner's competence to express her/his thoughts in words, phrases, and sentences. Role-play, for instance, challenges a learner's competence to translate her/his understanding and feelings into actions. The sociocultural environment of learning depends not only on the nature of the activities (e.g., individual writing, role-play) but also on how these activities are organized. If a project has to be completed within a given time frame (e.g., 20 min) and within structured instructions

(e.g., individual work without consulting books or peer), the activity challenges limited competence of an individual, and hence, it is likely to uncover and develop an individual's limited skills. Should the same activity be organized with challenging instructions (e.g., possibility to consult books, talk to the peer, ask the teacher) and within a realistic time frame, the learners who aspire to improve on the given task would have the opportunities to do so. A pedagogy of play can enrich children's experience in life (Lindqvist, 2001).

"(I)magination, the basis of all creative activity, is an important component of absolutely all aspects of cultural life, enabling artistic, scientific, and technical creation alike" (Vygotsky, 2004, p. 9). Our previous experiences provide materials from which our imagination, fantasy, and creative thoughts are constructed. The richer experience we have, the richer materials to which our imagination has access. Broadening the experiences with which we provide children is beneficial as this helps build a relatively strong foundation for children's creativity. Excursions and short trips shall be organized for children to gain a variety of experiences by paying visits to science museum, zoo, bird park, zoo, recreation gardens, and the like. Children are exposed to musical concerts and take part in school concerts and cultural festivals. These experiences are materials from which children's creative imagination can emerge. The functioning of imagination and reality is an emotional one (Vygotsky, 2004). "Emotion possesses the capacity to select impressions, thoughts, and images that resonate with the mood that possesses us a particular moment in time" (Vygotsky, 2004, pp. 17–18). In the creative minds of the inventor, the elements of imagination undergo complex reworking and transformation into products of imagination (Vygotsky, 2004, p. 21).

Play and flow are creative experiences. To Vygotsky (2004), creativity or imagination is associated with realities, and emotional reality is part of imagination. Play is experiential and it is important for children's development. In play, children take the roles they observe in adults' worlds. They act in various roles and construct the world of experiences that they have yet to fulfill in everyday life. Creativity is thus developmental, transcendental (Frankl, 1984), and transformational (Rogers, 1961). Creative imagination enables children to work and rework on their existing experiences they gather themselves and/or through other people and adults in their communities (Vygotsky, 2004). In play, children learn to represent problems, generate ideas, evaluate options, etc. Children experience emotion which is induced positively. Their cognitive repertoires are broadened. They likely build personal and sociocultural resources be resilient and creative (Fredrickson, 1998). Children then experience flow (Csikszentmihalyi, 1996). Supportive space and sufficient time in play facilitate creative experiences. When we engage in creative tasks, we are likely open to all experiences. When we construct space to accommodate our chosen activities, our behavior is likely constructive and creative (Rogers, 1961). Creative engagement is part of learning (Guilford, 1950). Our creative products include signs, tools, languages, arts, music, dances, sciences, technologies, and cultures. Creative activities of human societies include relaxation exercises (e.g., Yoga, meditation), recreation (e.g., drinking tea, listening to music, watching movies),

performing (e.g., dance, sport), sightseeing, and travel. Meaningful creative activities likely connect us to our minds and hearts, our communities, and our worlds peacefully and in harmony.

Final Remarks

Psychology of cultivating constructive creativity for teaching and learning acknowledges *multiple approaches* to the understanding of the complexity of the construct creativity (Amabile, 1983a, 1983b; Csikszentmihalyi, 1999; Rhodes, 1961; Runco, 2004). Creativity includes multiple forms of creativity (Kaufman & Beghetto, 2009). Our framework of creativity adopts a systemic approach to the study of creativity. A systems model of creativity consolidates psychological and sociological inferences on creative performances. It resolves the debate between the overemphasis on psychological factors (e.g., personality, intelligence, and attitudes) and the mere inference of any sociological data to the influence of environment (e.g., value systems, patterns of cultural growth) (see Stein, 1953, 1966).

A systems approach of cultivating creativity also acknowledges the significance of the presence of *zeitgeist* (favorable period) and *ortgeist* (favorable situation) (Simonton, 1994) for social acceptance of new ideas. Csikszentmihalyi (1988, 1997) suggests creating stimulating conditions for creativity. Hennessey and Amabile (2010) use a systems model to represent *interdisciplinary* creativity studies and multiple levels of analysis of creativity (e.g., person, organization, and culture). They attempt to outline multilayer systems (represented by layers of circle) to represent knowledge of creativity we discovered so far. A systems model of creativity recognizes the importance of systemic interrelations for facilitating creative activity (Simonton, 1996).

To perform beyond limited academic achievement, the teachers need to examine the nature of creativity (Ponomarev, 2008a, 2008b) and recognize the role of non-goal-directed behavior, intuition, discursive thinking (unity of the intuitive and the logical thinking), and internal plan of action in development and learning. Teachers shall be alert of social and environmental conditions that exert positive or negative impacts on the efforts of cultivating creativity of all individuals (Hennessey, 1995a). An open environment is likely to increase the interaction of the learners in classroom activities and their development of intrinsic motivation to explore new activities and to solve unfamiliar problems (Cornelius & Casler, 1991; Hennessey, 1995b).

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Chapter 4
Creativity and Problem-Based Learning (PBL): A Neglected Relation

Heinz Neber and Birgit J. Neuhaus

Introduction

Since more than 50 years, educators have called for more creative learning and teaching in classrooms than ever. Creativity in classrooms still remains as a neglected aspect. One of the reasons is likely related to conditions for school-based teaching and learning. Barriers for involving and expressing creativity exist in terms of a dense and prescribed curriculum, in having limited time and material resources, or in learning under strongly competitive and assessment-oriented conditions. Another reason for the low level of creativity in classrooms is likely related to the unclear concept of creativity. Even after decades of investigations and development, a generally acknowledged conception of what is creativity is missing (Runco, 2004; Tan, 2010). As a consequence, misconceptions about creativity exist even within teachers as those who provide instruction in classrooms. Beghetto (2009) found out that creativity will be neglected in classrooms if teachers restrict its meaning exclusively to producing only completely novel and original ideas that do not correspond to the curricular knowledge, if they only consider major discoveries as creative achievements, if teachers consider only few students as being able to be creative at all, or if teachers assume that the promotion of creativity always requires special extracurricular programs. Teachers should replace these narrow conceptions of

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_4,

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creativity. Adequate specification of the concept of creativity is required that focuses on its role in classroom-based learning. This will allow convincing answers to the general question: Could the quality of learning and knowledge acquisition by the students be improved in considering creativity?

"Self-System" and Environments as Social-Cognitive Determinants of Creative "Products"

Creativity can be conceived in terms of products generated by individuals or groups. Such products or achievements have certain defining characteristics. In reviewing various definitions, case studies, and research findings, Lubart (1994) distinguished novelty and appropriateness as the two central features of creative products. Both features are acknowledged characteristics for defining and evaluating the creativity level of achievements in a broad diversity of cultural contexts (Werner et al., 2010). What are the causes or determinants for generating creative products with these characteristics? This is an important question for designing learning environments that capitalizes on and utilizes creativity for learning purposes. A variety of determinants has been considered in models, investigations, and in interventions, a variety of determinants. Social-cognitive models categorize the spectrum of possible determinants of creative products. In such models, the "self-system" and the environment are distinguished as causes for creative achievements (Neber & Heller, 2002).

The self-system includes general constructs and specific process variables as determinants of creative products. Intellectual abilities, expert knowledge, motivational, and belief variables represent constructs that correlate with or determine creative achievements and products. "Process" variables of the self-system include productive reasoning, divergent thinking, critical thinking, and self-regulatory strategies. Such process variables can further be decomposed into microlevel processes like problem finding, hypothesizing, estimating, or analogical reasoning.

Environmental determinants of such processes and of resulting creative achievements have been investigated in educational and in work organizations. As with self-system variables, the diversity of environmental conditions for creative achievements may be located on different levels of generality. Broad cultural characteristics like individualism versus collectivism represent examples of general-level environmental conditions for elaborating creative products by individuals and groups (Ghassib, 2010). However, and as with macro-variables of the self-system, discrepant results have been found. It remains unclear how such broad variables determine creative processes and achievements. Specific conditions in learning and work environments seem to influence creativity processes and products more directly. This applies to environmental variables such as the social-emotional climate, openness for information and contributions, or autonomy of the participants (e.g., Cole, Sugioka, & Yamagata-Lynch, 1999). On a lower specification level and in school-based contexts, such environmental characteristics are themselves influenced by instructional methods and their components such as types of learning tasks, prescribed or scripted constraints for communication between teachers and

students, as well as among classroom peers or kinds of getting feedback. Depending on their design, these characteristics and components of instructional environments constitute positive or negative conditions for creative processes like fluency and flexibility in idea production by the students as well as for the overall creativity level of resulting products generated by individual students, groups, or whole classrooms. For deciding on the creativity-promoting status of programs and methods, and to derive arguments why problem-based learning (PBL) enables the expression of creativity by the learners, it has to be specified which of the inflationary spectrum of possible concepts of creativity should and will be used. Which of the possible range of creativity-related self-system components seem to be promising for being modified and improved in integrated or stand-alone interventions?

Creative Processes and Divergent Thinking Interventions

Creative Processes in Instruction

We suggest that in instructional programs, the priority should not be devoted to general self-system constructs (e.g., motivational constructs, or self-concept) but to processes that are immediately involved in contributing to creative effects. Three reasons are given for a preference for creativity-related processes in learning environments: (1) Processes determine the generation of creative achievements or products directly. Self-system-related general constructs represent indirect mediators which are hard to specify and often unclear causal links to processes and to creative achievements. (2) In interventions, processes can immediately be modified. It is not the case with general constructs (e.g., abilities, self-concept, motivational goal orientations, or beliefs). (3) Process variables, in contrast to general constructs, can clearly be related to specific phases and steps of creative work. This allows it to capitalize on process models that have been elaborated in other disciplines of psychological research (e.g., learning and problem solving).

Process conceptions of creativity have been used as a basis for deriving creativity training programs as stand-alone solutions or partially integrated into regular classroom instruction. Training creative processes is the preferred approach in promoting creativity (Scott, Leritz, & Mumford, 2004). Programs, tools, and methods differ in length and content. Irrespective of their diversity, they intervene primarily into processes. All of them involve the production of divergent thinking processes as the capacity to generate multiple alternatives (Ripple, 1999). Longer interventions such as the "Creative Problem Solving Program" (Treffinger, Isaken, & Dorval, 2003) or the Future Problem Solving Program (Torrance, 2011) include convergent processes and other steps and phases of problem defining and problem solving. We do not consider such all including interventions as creativity training programs but as complex problem-solving programs. Our process definition of creativity is strictly restricted to "divergent thinking."

Integrating Divergent Thinking into Instruction

Pyryt (1999) conducted a meta-analysis with 25 studies on training divergent thinking. His analysis confirmed positive effects in solving transfer tasks that required divergent processes. These effects are attained by direct training that was exclusively restricted to divergent thinking. Two limitations of divergent thinking intervention for the purposes of instruction in classrooms should be mentioned: First, the divergent thinking intervention programs have not been developed to contribute to the goal of acquiring knowledge in curricular domains that are taught at schools. The primary goal of these divergent thinking interventions is to optimize general constructs of the self-system. Training objectives are creative cognitive abilities, motivational and other construct variables as mediators for applying the trained creative abilities. The training may help to transform anxious students into risk takers who are intentionally using the trained divergent thinking abilities for elaborating original and innovative products. Flieth, Renzulli, and Westberg (2002) provide an example for a divergent thinking training that aimed at modifying such general constructs of the self-system. This training successfully contributed to acquire divergent thinking as a general ability and at developing positive self-concepts of the trained students.

Second, the divergent thinking training programs are insufficiently related to instructional methods or models of instruction as a framework for their integration into classroom-based teaching. As a consequence, a meaningful location and positioning in instructional processes is difficult to achieve or even not possible, thus limiting their use to nonintegrated add-on interventions.

Recent interventions established a closer causal link between divergent thinking and the acquisition of knowledge in curricular subjects than previous interventions did. In a qualitative case study, Cheng (2010) infused short divergent production activities in middle-grade biology lessons in Hong Kong. His method is similar to the problem-defining and (solution-) idea-finding stages of the creative problem-solving training program. The middle-grade students should brainstorm multiple ideas after they had received open-formulated biology problems (e.g., what happens if all plants disappear?). The training was less effective than expected. Teachers of the study tended only to accept correct ideas. The students hesitated to communicate their ideas.

Some preliminary conclusions may be derived from such results: (1) Promoting creativity as divergent thinking processes should not be designed as an isolated phase in an otherwise unchanged teacher-guided instruction. (2) Divergent thinking processes should be directly and transparently related to the knowledge objectives of instruction. (3) Interventions involving divergent thinking require adequate instructional methods.

Ishii, Suzuki, Fujiyoshi, Fujii, and Kozawa (2007) provide an example from higher education (engineering studies) that remedies some of these deficits. They supported “idea generation” as a divergent thinking activity by web-based tools, in a meaningful and functional context for creative processes. To establish this context, the students received design problems (e.g., create a computer program for a robot to win a speed competition) as open learning tasks that allowed divergent thinking

in the domain of their studies. An adequate instructional approach for such types of tasks and processes was provided by implementing project-based learning as a general instructional model. In this instructional context, positive effects could be measured for enabling divergent (creative) thinking processes. In posttest engineering design tasks, increases in fluency (number of ideas) and in flexibility (scope) of ideas produced by the students were attained in solving such specific tasks. The divergent thinking measures were positively correlated with the complexity of programs written by the students. In this case, complexity of the "product" quality was not only taken as a measure for the creativity of the product but also as an indirect indicator for a higher level of the acquired procedural knowledge in computer programming.

Problem-Based Learning (PBL) as an Instructional Model for Functionalizing Creative Processes for Learning

Creativity researchers have recommended problem-based learning (PBL) as a program for attaining the goal of enhancing creativity as a general, not domain-specific ability (Plucker & Nowak, 2000). The National Center on Education and the Economy recommended PBL as a means to develop creative abilities as a basis for innovative achievements (Adams, 2006). At a Malaysian university, Awang and Ramly (2008) used PBL with engineering students. They compared the PBL instructional approach to a structured instructional approach. Effects on creative abilities were measured by the Torrance Test of Creative Thinking (TTCT) as a widely used instrument for diagnosing such abilities. PBL resulted in higher originality and fluency scores idea productions as indicators of general creative abilities. Neither divergent thinking processes in PBL phases nor effects on the acquisition of engineering knowledge were examined by the authors. In Singapore, the Temasek Polytechnic has implemented PBL for developing general creative abilities. For more than a decade, a version of "Problem-Based Creativity Learning" (PBCL) has been applied to strengthen creative abilities among engineering students. Tan (2008) reports positive effects of the instructional model as measured by Thorndike's cognitive abilities test.

The use of PBL as a general creativity as ability training is different from the intentions of original versions of PBL in instruction. PBL as an instructional approach should prevent deficits of instruction that have been recognized by educators who delivered traditional lectures. The evidence indicated that, as in medical studies, students acquire huge amounts of factual knowledge which remains unused and cannot be transferred to solve domain-specific problems. This "inert" knowledge problem seems to be a general result of traditional lecture and otherwise strongly teacher-directed learning environments. As a consequence, the primary goal of PBL is to contribute to the acquisition of non-inert knowledge for solving domain-specific transfer problems (e.g., diagnostic problems by inferring causes for

symptoms or evidence) (Neber & Neuhaus, 2011; Spangler, Neber, & Neuhaus, 2010). There are arguments for supporting knowledge generation processes in instruction: findings about generation effects in learning in classical studies on memory (Slamecka & Graf, 1978), positive results for transferable knowledge of discovery, and inquiry learning that require to generate abstract knowledge from given lower level information (Neber, 2011) and evaluation studies of PBL itself.

Assessments of PBL resulted in favorable effects on the acquisition of knowledge in different subjects and on all educational levels. Gijbels, Dochy, van den Bossche, and Segers (2005) conducted a meta-analysis with 40 studies. Compared to receptive instructional methods like lecturing, PBL resulted in superior effects for the acquisition of applicable knowledge but not for merely reproducing definitions of concepts (conceptual knowledge). In an experimental study comparing PBL and lecturing in sixth grade social studies (Wirkala & Kuhn, 2011), the intervention extended only over three sessions but showed positive effects of PBL on acquiring conceptual and applicable knowledge. In this and other global comparisons of PBL with teacher-guided versions of instruction, it remains open which instructional processes defining PBL as a procedure and which characteristics and components that define PBL as a concept determine these effects.

PBL as a Procedure

As procedural knowledge, PBL is defined as a sequence of phases or steps. The instructional procedure is used to organize the knowledge-generating problem-solving processes of the students. For decomposing these processes into instructionally manageable steps, the originators of PBL at the McMaster University formulated a sequence of seven steps (Walsh, 2005):

1. Identify the problem
2. Explore preexisting knowledge
3. Generate hypotheses
4. Identify learning issues
5. Self-study
6. Application of the new knowledge to the problem
7. Assessment and reflection on learning

The procedure organizes learning as a cycle of problem-defining and problem-solving processes. The class is divided into groups (4–6 students in K–12 classrooms according to Lambros, 2004). The class is introduced to the ill-defined problem. The seven phases represent a cycle of problem-defining and problem-solving processes of the students. After having identified learning issues (step 4), the learners pose questions and hypotheses for different kinds of missing domain-specific knowledge that is required for solving the problem. These issues are distributed among the group members for individual information searches (step 5). In step 6, the groups meet again to communicate the individually acquired knowledge and to use it in integrated form to solve the problem.

As a procedure, PBL capitalizes on results of problem-solving studies. Ill-defined problems have to be transformed into one or several well-defined problems. Novices and poor problem solvers neglect these pre-solution or front-end activities and immediately begin to solve noncomprehended, poorly defined problems (Larkin, McDermott, Simon, & Simon, 1980). In the regular, non-PBL-oriented instruction problem-definition processes also remain neglected. In contrast, the McMaster PBL procedure emphasizes the importance of problem defining as a procedural component of knowledge generation. The problem-definition process is even further decomposed into several instructional steps (steps 1–4). This approach finds its parallels in creativity training programs like the Osborn-Based Creative Problem Solving (Treffinger et al., 2003). The explicit decomposition of problem definition corresponds to the Geneplore model of creative cognition (Saunders Wickes, & Ward, 2009) which distinguishes an idea-generation phase followed by an exploration phase for evaluating, selecting, and further elaborating the generated ideas. In PBL, creative (divergent) thinking is promoted in the idea-generation phase (step 3) by brainstorming possible (domain-specific) causes and solutions of the problem. In step 4, the generated ideas help to derive learning issues as well-defined problems (e.g., as epistemic questions for missing information). The PBL procedure undoubtedly establishes a link between creativity and learning and stimulates divergent thinking processes explicitly by applying creativity tools in the front-end of the PBL cycle, expected effects of divergent thinking on the acquisition of knowledge. Development of creative abilities has not been measured in PBL studies.

PBL as a Concept with Defining Characteristics

Problem-based learning (PBL) as a concept is defined by several general features and by some indispensable components. Both kinds of characteristics may provide a framework for using divergent thinking processes for learning.

General Features

- PBL represents a “problem-first” approach to instruction. Students get a problem to solve before having available the required curricular knowledge. PBL reverses the common instructional sequence of first providing knowledge, then applying it afterward to solve exercise problems.
- For this reason, PBL functionalizes problem-solving processes (divergent thinking included) for generating the missing and required knowledge by the students. PBL is a constructive approach to instruction.
- PBL therefore realizes a more complete spectrum of learning processes. In particular, students themselves have to find out their knowledge gaps and, dependent on that, have to define their own learning or knowledge-acquisition objectives in terms of more specified problems or questions for the missing knowledge that is

not completely provided by the teacher. With such questions, students establish epistemic goals for intentional information searches. In this way, PBL transfers the regulation of learning that is usually performed by the teacher to the learners.

- PBL is organized as collaborative learning, preferably in groups that may be heterogeneously composed. Given individual differences could be considered (e.g., in knowledge, grades, abilities). In addition, PBL develops heterogeneity by specializing group members in different subjects. The resulting distributed knowledge sources establish the need to collaborate and to synthesize different perspectives for solving the problem. In PBL, communication is used to distribute knowledge generation processes among students.
- PBL can be adaptively used and represents a flexible approach to instruction. As a consequence, PBL is implemented on all levels of education, in a broad range of school subjects, with average as well as highly gifted students (Gallagher, 2005). What is adaptable to the needs and progress of the students are the level of structure or guidance (by tutors and/or tools) and the level of complexity (of the problem and the intended knowledge). However, PBL learning processes are neither extremely structured and prescribed nor completely open and unguided as in the misconceived description of PBL by Kirschner, Sweller, and Clark (2006). PBL versions vary adaptively between both extremes and enable divergent as well as convergent processes to attain knowledge objectives.

Components

Ill-Defined Problems as Learning Tasks

The problem provided to the students is probably the strongest determinant of their learning processes, including those that are called creative. As learning tasks, problems determine cognitive processes, and knowledge structures as their resulting products (Doyle & Carter, 1984). Each problem given to the students provides information about four components: the initial state (givens), the final state (solution), about methods to transform the initial into the final state (solution method), and about constraints that specify conditions for solving the problem and for deciding on the quality or appropriateness of the solution. In PBL, at least one of these four components has to be open or ill defined. As a consequence, students can transform the ill-defined problem into several alternatives of well-defined problems. Problem definition as a front-end process in generating knowledge is required in all versions of PBL for establishing the epistemic goals ("learning issues") for subsequent information searches. Involving students in problem defining and not only constraining them to only solving already well-defined problems improves the quality of subsequent search processes and the quality of the acquired knowledge (Verkoeijen, Rikers, Te Winkel, & van den Hurk, 2006).

The most elementary type of PBL problems has an ill-defined solution state which allows more than one appropriate solution. The other three components

may also be ill defined. Accordingly, several types of problems are distinguished (e.g., diagnostic versus design problems). Different types of ill-defined problems are used in PBL because they determine the acquisition of different kinds of knowledge. As an example, Hmelo-Silver and Pfeffer (2004) have shown that with ill-defined design problems (e.g., design an artificial lung) students generate functional knowledge. They do not only acquire knowledge about parts and the structure of lungs but also about the purposes or functions of these facts. As a consequence, the elaborated and more complete knowledge supports transfer. Like experts, the students are better able to use their knowledge to solve biological problems, and the knowledge acquired in instruction does not remain inert.

What may be the role of creative processes in problem-based knowledge generation? PBL research did not really focus on this question. However, parallels can be found in creativity programs. As in PBL, packaged programs apply ill-defined problems for stimulating divergent thinking processes for promoting creative abilities. Ill-defined design problems have been used to diagnose and to promote such abilities since the early studies by Getzels and Csikszentmihalyi (1976). Maker, Muammar, Serino, Kuang, Mohamed, and Sak (2006) DISCOVER curriculum model applies a whole spectrum of ill-structured problem types. To promote the acquisition of transferable creative abilities, the structure of the problems is gradually reduced by increasing the number of ill-defined components. Creativity training based on such problems establishes a need to employ divergent thinking processes, which determine the acquisition of the intended creative abilities. However, the contribution of these creative processes to the generation of knowledge may interact not only with the problem types but also with their structure. A study by Lee and Cho (2007) has shown that problems should be partially well defined or structured and not completely ill defined if divergent thinking processes should contribute to generate knowledge. More research is required on the "problem" as an important component of PBL. The latest meta-analysis on PBL supports this conclusion (Walker & Leary, 2009).

Groups as Learning Organization

Another component of PBL is acquiring knowledge by solving ill-defined problems in groups of about 3–7 students. This component is based on sociocultural conceptions which consider learning as a participatory process (Cole, 1996). The composition of the groups should be mixed for enabling distributed expertise and conflicting perspectives for intensifying problem-centered verbal interactions (Kapur & Kinzer, 2007). PBL as a procedure supports knowledge-related interactions in such groups by specializing their members on different learning issues. There is a need to exchange information. The members of the groups ask questions and explain to each others. Asking for help, explaining, and arguing are most important for generating knowledge in collaborative environments (Kaartinen & Kumpulainen, 2002). The number and the (epistemic) quality of questions (Chin & Chin, 2004) and the ideas communicated by the students in the collaborating groups determine collaborative knowledge building in PBL

settings (Hmelo-Silver & Barrows, 2008). A recent finding by Pease and Kuhn (2011) indicated that "social collaboration is not essential to PBL" (p. 79). This seems to be misleading because the authors did not consider the quality of the collaboration. More differentiated conclusions can be drawn from a study by Yew and Schmidt (2011). They analyzed verbal interactions in PBL groups (biology students in Singapore). It was found that the acquisition of basic conceptual knowledge in biology strongly correlated with the amount of problem- and knowledge-related verbalizations in the groups. The two most important variables might even be taken as measures of the level of creativity or divergent thinking in the groups. The number of verbalized concepts (as a measure of fluency) and the number of different concepts (as a measure of flexibility) correlated strongly ($r > .80$) with the conceptual knowledge acquired by the students. Altogether, the group organization of PBL represents a defining component of PBL and contributes to stimulate creative processes in knowledge generation.

Facilitation of Processes

Problem-based learning (PBL) transfers the responsibility for generating knowledge to students and even expands the spectrum of the required processes. As a consequence, these processes should be adequately structured and facilitated. In PBL, this is accomplished by different means. Most important is the teacher as a tutor or alternatively trained student tutors. Their task is to observe and promote the problem-based knowledge generation processes and the distribution of these processes among the students and, in more limited ways, to provide required information or content (even by short lectures) but preventing to solve the problems. Paper- and computer-based tools represent other means for facilitation or structuring the processes in the different PBL steps. This includes templates or rubrics (e.g., for generating learning issues), content-free question stems for formulating epistemic questions (Neber, 2008), prompts for specific divergent and convergent operations, scripts for collaboration, as well as tools for scaffolding creative thinking in all phases of problem defining and solving (Yeo, 2008). In particular, technology-based tools (e.g., prompts for generating arguments or other tools for structuring open tasks) may not be provided by a tutor, but could be made available on request by own initiatives of the students (Puntambekar & Hübscher, 2005). Optional tools for structuring knowledge generation processes by solving ill-defined problems seem to have special advantages for the resulting quality of knowledge of high-ability students (7th grade biology) (Belland, Glazewski, & Richardson, 2011).

PBL is generally conceived as a structured approach to instruction (Hmelo-Silver, Duncan, & Chinn, 2007). Many questions are still open: How much and which processes should be structured, guided, and scaffolded? Current evidence indicates that even divergent thinking should be guided if it is not only utilized for developing original products. In PBL divergent thinking is used for generating the curriculum-specific knowledge. It is important that the provided ill-defined problem stimulates problem definitions (learning issues) that correspond to the curricular learning objectives (Sockalingam & Schmidt, 2011). Unguided problem-defining processes

may have negative consequences for generating and solving problems for attaining adequate disciplinary knowledge. In a study, Hmelo-Silver, Holton, and Kolodner (2000) found that the unguided learning with an ill-defined design problem (design an artificial lung) resulted in original solutions (products). However, the unconstrained processes often led to the acquisition of misconceptions that contradicted to the intended biological knowledge. More positive effects on knowledge acquisition were achieved in a study that employed brainstorming as a creative tool for stimulating divergent ideas (hypotheses about causes for debris after flow hazards in Taiwan) (Wang, Rose, & Chang, 2011). Brainstorming was most effective for the acquisition of knowledge in earth science when it was strongly guided. A virtual tutor provided feedback and direction after each generated idea. The authors recommend such forms of guidance and structuring for stimulating creative processes in educational environments that are characterized by curricula with defined knowledge objectives.

Conclusions

The relations between creative processes and PBL have not been systematically investigated and developed. The current analysis encourages the study of this relation. The quality of PBL as an instructional method can further be improved. The following suggests further investigating and intensifying the relation between creativity and PBL as an instructional method:

- Divergent thinking may not only be promoted for generating solution ideas but in all phases of the learning cycle in PBL. Even in phases like "selecting and evaluating ideas" which are considered as requiring only convergent thinking. Constraints and criteria for such decisions could be divergently produced.
- Divergent thinking as all other knowledge-generating processes in PBL requires varying levels of guidance and structure for attaining planned knowledge objectives. Even brainstorming ideas should be adequately constrained and guided to contribute to the attainment of intended knowledge in educational domains.
- More research is required for elaborating a stronger evidence-based link between creativity and PBL. So far, neither creative processes nor creative abilities belong to the spectrum of investigated issues in PBL.
- The analyses reveal that PBL may support productive and even innovative efforts to "infuse creativity elements into regular classrooms" (Cheng, 2010).

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Part II
Studies on Creativity and Cultivating Creativity

Chapter 5
The What and the How of Creativity: An Exploratory Study

Paola Pizzingrilli and Stefania Molteni

Introduction

Researchers have attempted to describe the complexity of creativity with reference to the final *product* of the creative process (Amabile, 1996; Bruner, 1964; Taylor, 1956), the *process* generating creative products (Drevdhal, 1965; Getzels & Jackson, 1962; Mednick, 1962), the *person* responsible for the creative act (Eysenck, 1993; Sternberg & Lubart, 1999), and the environmental *pressure* (Vygotskij, 1930; Winnicott, 2001). Some researchers suggest coexistence of various forms of creativity such as *little-c* (implying basic functionality, Simonton, 1999) and *big-C creativity* (Plucker, Beghetto, & Dow, 2004; Sternberg, Grigorenko, & Singer, 2004; implying the level that is compatible to Noble Prize recipients, Simonton, 1999). Sternberg (1989) tried to place creativity at the intersection of psychological components such as intelligence, cognitive style, and personality, but creativity is not the sum of these three components. This chapter provides an overview on various definitions of creativity. Implicit theories refer to tacit knowledge about creativity manifested in opinions and expectations (Runco, 1999). In contrast, *explicit theories* represent the knowledge of experts supported by research data. The chapter also reports on a study that explored how students conceived creativity (in particular the creative child) and how they responded to a measure of their own creative potential.

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_5,

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The "What" Question of Creativity

The early references to the creative abilities are found in the Genesis passages in which the gorgeous creations of God were emphasized (Cristini, Cesa-Bianchi, Cesa-Bianchi, & Porro, 2011). Such descriptions enforced the belief that creativity belongs to a few and talented people, and this position persisted during the illumination. The focus of interest moved progressively from an individualistic and restricted perspective to a wide conception. Creativity is assigned to a collective value as every individual has talent to be developed by education (Antonietti & Cesa-Bianchi, 2003). This statement points to the importance of studying the development of creativity (rather than what creativity is), the value of cultivating creativity from childhood, and the impact of scholastic environment on children's creativity development.

According to Vygotsky (1930), the creative process was affected by the environment in which individuals live so that experiences and external stimuli can encourage or hamper their own creativity. In particular, at school, children explore themselves and they deal with the first experiences with others. School is a place where children not only acquire concepts and culturally organized information, but they also learn to use imaginative thinking in order to give meaning to objects and events (Moran & Steiner-John, 2003).

Smolucha (1992) summarized Vygotsky's creativity works emphasizing the characteristics of *imagination*, considered by the Russian psychologist, "the basis of all creativity activity" and an "important component of absolutely all aspects of cultural life, enabling artistic, scientific, and technical creation alike" (Vygotskij, 2004, p. 9). The development of imaginative thinking can be resumed as follows: During play, children first learn to create and manipulate symbols and signs. Then, pretend play and object substitution become internalized, thus contributing to form flexible and interactive mental functions. Imagination becomes a consciously directed higher mental function as inner speech develops. During adolescence, when children cease to play, imagination and thinking in concepts are combined so that creative imagination becomes *fantasy*. Finally, in adulthood, such faculty can mature into artistic and scientific creativity. Creative ability as language becomes more conscious. It can be used with increasing goal-oriented awareness and intentional control (Moran & Steiner, 2003).

Development of creativity proceeds along a continuum from the external (social) to internal (individual) level and the acquisition of knowledge and skills through practice. Hatano (Hatano & Inagaki, 1993) introduced the notion of "adaptive expertise" in contrast with "routine expertise." Both adaptive and routine experts share an extensive repertory of knowledge and abilities in a given domain. They use a different approach to solve new problems. Routine experts tend to apply the same procedures already used in familiar tasks. Adaptive experts consider a problem as a challenge, an opportunity to learn, and to extent their own knowledge and capabilities. Hatano's research contributions – together with his personal example of adaptive expert – focused on promoting the "culture" of adaptive expertise in the schools, considering it an important educational goal. Teachers should help students to realize the existence of different levels of variability in everyday life (Lin, Schwartz, & Bransford, 2007): a variability

related to the task environment, a variability related to individual strategies application, and a variability related to the culture. Students have to learn and apply different procedures adaptively in order to manage life variability. According to this perspective, the relationship between creativity and environment does not exhaust in the classical definition of context in which the creative act occurs. Moreover, traditional creativity research tried to define creativity emphasizing a specific aspect related to this construct, thus limiting the extent and the extreme variability of creativity itself (Antonietti & Cesa-Bianchi, 2003). Today creativity is related to school but also to organization. It is synonymous of originality but also of innovation and technology. The focus of creativity studies moves from "what" creativity is to "how" to nurture creativity (European Commission, 2008; Tinagli & Florida, 2005)

The "How" Question of Creativity: The Implicit Theories

Andiliou and Murphy (2010) examined existing literature in order to devise sustained research programs regarding beliefs about creativity and their role in educational practice. The authors raised concern about the relation between social desirability and teachers' conceptions of a creative student. Runco and collaborators (1993, 2002) claimed that teachers described creative children as socially desirable persons. Westby and Dawson (1995) found that teachers' conceptions of creative student and good student tended to overlap. Dow (2004) expressed the similar view after reviewing relevant literature.

Antonietti and Cerioli (in Antonietti & Pizzingrilli, 2009) conducted a series of studies aimed at exploring how teachers conceive creativity. Main findings revealed that most teachers consider creativity as a general ability that can potentially be educated in all students, especially young children. Teachers have a positive imagination of the creative person. A creative person is full of ideas. She/he uses originality to solve problems. She/he is fairly socially integrated. Some stereotypes are still present. Some teachers believe that the development of creativity concerns only certain fields of education (e.g., arts and music). The concept of creativity as innate ability persists in many respondents. Such misconceptions emerged in other studies (Sironi, 2005). The studies reported above analyzed implicit theories by assuming that individuals' beliefs can influence their own and others' creativity. What is children's point of view about creativity? An exploration of this topic is reported in the following paragraphs.

The "What" and "How" of Creativity: An Application

Zachopoulou and collaborators (2009) examined the test-retest reliability of Torrance's Thinking Creatively in Action and Movement test (TCAM). Their results supported the psychometric properties of TCAM. The TCAM test is a valid and reliable instrument to measure creative movement in preschool children. The researchers

posed two relevant concerns: (1) the importance of assessing creativity quantitatively, qualitatively, and in different fields and (2) the promotion of the "culture" of creativity education in the schools.

Hsiao (2010) conducted a research aimed at investigating artistic creativity and expressive drawing in preschool children. Children picture books' appreciation and artwork activities were analyzed. This study indicated that devising specific activities focused on specific analysis levels of picture books, such as aesthetic, content, and meaning and may improve children's art appreciation ability and artistic creativity. Children learned to observe carefully and to describe in detail the illustrations of books. Dialogues analyses showed an improvement of children's art vocabulary. Moreover, children extended their knowledge about artistic materials, tools, and techniques employed to create the illustrations. Finally, analyses on pre- and posttest scores revealed that children who involved in these activities changed their drawing behaviors. They drew more often at home than before.

It is possible to cultivate creative thinking in early childhood by planning adequate training and encouraging children to discuss with teachers and peers. Culture may influence children's narrative and creative styles. Gorman and collaborators (2011) analyzed the effects of culture on children's storybook narrations of different ethnic groups (African American, Latino American, and Caucasian). Findings highlighted the impact of cultural differences on the use of creative and stylistic devices in a narrative production. For example, African American children tended to include fantasy and suspense in their stories to capture the attention of the listener. In studying creativity, the authors recommended us to take an account on the importance of individual differences within cultural groups. Yeh (2008) found that different variables related to the individual (as the temperamental traits, the use of emotion regulation strategies, and the age) and related to the education (as creative drama instruction) may have positive effects on children's creative performance.

The actual tendency of researchers and educators is based on the development and the promotion of creative potential in disparate context and topics. In particular, Mindham (2005) stressed the importance to preserve such exceptional abilities that characterize the young children and that seem to diminish. It is important to deepen what children consider "exceptional abilities" and how they use them, that is, creativity representations. Children's representations of creativity are scarcely explored. Some studies confirmed that young children were able to distinguish creative and noncreative artifacts because they recognized some crucial mechanisms involved in a creative act (Pizzingrilli & Antonietti, 2009, 2010). But is there any relation between representation and expression of creativity?

Aims and Hypotheses

Three aims of the research of this chapter were the following: (1) examining the ability to be aware of the restructuring process in school children of different ages using a brief story, (2) evaluating children's creative abilities using different tests,

and (3) investigating if the creative performance is related to the corresponding metacognitive skills. The study assumed that age influenced the understanding of some important aspects of the creative process but hypothesized that there were no age differences in creative performance.

Method

Participants

Fifty school children (16 males and 34 females) attending primary schools of Lecco and Monza-Brianza were involved in the study. The mean age of children (aged from 6 to 11 years) was 104.28 months (SD = 15.8 months). The participants of the study were grouped according to the age levels: young group (between 73 and 94 months), intermediate group (between 96 and 113 months), and old group (between 114 and 134 months).

Materials

Creative Drawing Story (Antonietti & Pizzingrilli, 2008)

The creative drawing story consisted of a storyboard illustrating the realization of a drawing in three different steps (initial, intermediate, and final phase) from two schoolmates. The instrument was available in two versions (creative and noncreative versions). Some modifications were introduced to the original version of 2008. In the creative story, Marco began to draw a flower (initial phase) and then asked his friend, Luca, to help him. Luca decided to modify the initial drawing so that it came to represent a human character (intermediate phase). Marco decided to complete the drawing according to the changes introduced by his friend, so that he drew a sultan (final phase). In the noncreative version of the story, Luca modified the first drawing by adding elements that were coherent with the initial interpretation. Consequently, Marco completed the drawing depicting two flowers according to his initial intentions. To avoid the influence of characters' gender on performance of children, two versions of the story were designed and administered. The first version was for the male subjects (Marco and Luca). The second one was for the female subjects (Anna and Marta).

For each drawing, children were requested to judge:

- The level of beauty by attributing a score from 1 (*it is very ugly*) to 5 (*it is very beautiful*)
- The level of originality by attributing a score from 1 (*it is not original*) to 3 (*it is very original*)

The participants were asked to evaluate some metacognitive aspects underlying the realization of the drawing. They had to judge the contribution of both children involved in the story motivating their answers.

Picture Completion Subtest (Torrance, 1989)

This subtest was extracted from the figural version of Torrance Test of Creative Thinking (TTCT). It consisted of ten incomplete figures. Children were asked to create by completing incomplete figures and then suggested a title for each figure. Fluency, flexibility, originality, and elaboration scores were computed.

Creative-Noncreative Picture Completion Task

This task consisted of a paper divided in two sections both including a stimulus (a triangle). Children were requested to realize two distinct drawings using the triangle. In the first case, they had to draw as children usually do. In the second case, they had to draw creatively. Children had to add a title to each drawing. Seven scores were obtained. In this chapter, only originality and elaboration scores were evaluated. Scoring procedure was the same as the Picture Completion subtest of TTCT.

Procedure

The administration took place in the schools during lesson time and also after scholastic activities in another building. In both settings, children performed the tests individually in a restful room. Before testing session/administration, each participant was presented two series of pictures in order to provide some examples of creative artifacts. All tests (both creative and noncreative versions of the story, TTCT subtest, and creative-noncreative Picture Completion task) were presented in a counterbalanced order in a single session. No time limits were established. The experimenter told the story using a storyboard that showed the realization of the drawing. The answers were recorded on a separate sheet.

Results

Creative Drawing Story

The trends of beauty and originality judgments expressed by children about the drawings in both conditions (creative vs. noncreative) were examined. In the control version, beauty tended to increase progressively whereas originality decreased. In the creative version, originality increased from initial to intermediate phase.

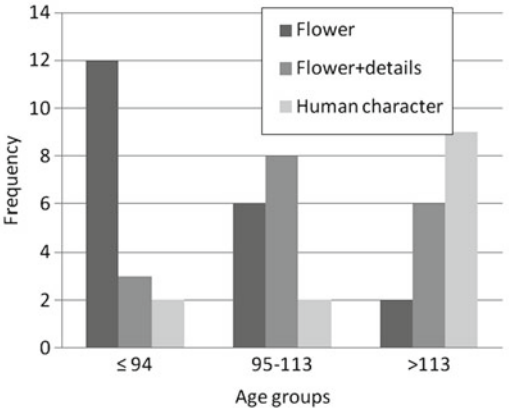

Fig. 5.1 Frequency of definitions by age groups (the intermediate creative drawing)

Paired *t*-tests confirmed that children gave significantly higher scores to the final noncreative drawing ($t_{(49)} = -2.021$, $p < .05$). Differences between originality mean scores attributed to the creative and noncreative drawings realized during the intermediate ($t_{(49)} = -23.812$, $p < .001$) and the final ($t_{(49)} = -15.425$, $p < .001$) phases were statistically significant.

During the intermediate phase of the creative version, when children were requested to answer what the second character wanted to draw, 70% of the sample was still constrained to the idea of the flower. In particular, 40% focused on the details added by the second character (e.g., a flower with hands and eyes), whereas 30% recognized something of bizarre occurred, but such idea did not overcome the perceptual element (e.g., it is a magic flower, a dancing flower and so on). Only 26% of the whole sample identified the change indicating a human figure. Significant differences between age groups were obtained from a chi-square analysis: $\chi^2(4, N = 50) = 17.132$, $p < .005$. Figure 5.1 confirmed that older children recognized the change of perspective in the intermediate drawing identifying a different drawing. The younger group focused on the details, and the intermediate one tended to attribute creative characteristics to the flower, thus confirming the initial representation of the flower was still radicated.

During the final phase of the creative story, 84% of participants identified a human figure. Only 16% still focused on the flower even though they considered it a fantastic flower. Most children could leave a realistic and ordinary interpretation toward something creative. Children were asked whether they expected such final drawing when they looked at the first picture. In the noncreative version, 62% of participants did not expect it because they considered the intermediate drawing as the definitive one. In the creative version, most of the sample did not expect to find a sultan because they believed the final drawing reflected the initial object, that is, a common flower. Both motivations were grouped in the category *expectations coherent with initial meaning*. Other three categories were created as follows:

- *Confirmed expectations* (e.g., I supposed it would become some flowers/I imagined it would become a sultan)
- *Noncreative hypotheses* (e.g., I expected a flower with more petals)
- *Creative hypotheses* (e.g., I expected a wizard)

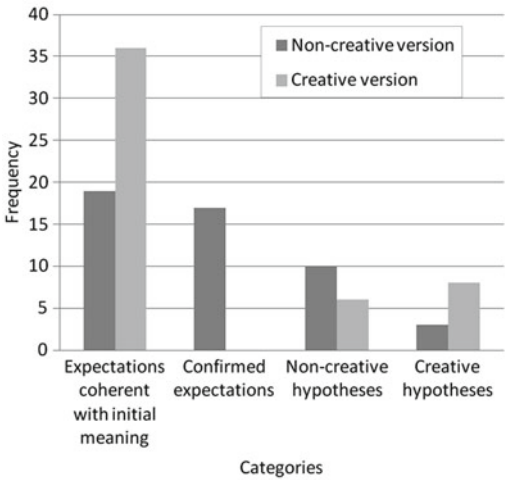

Fig. 5.2 Frequency of categories of answers about the expectations related to the final creative and noncreative drawings

A chi-square analysis indicated a significant difference in children's motivations with regard to the two stories they examined ($\chi^2(3, N=50)=25.520$, $p<.001$, see Fig. 5.2). The results confirmed the surprise effect generated by the restructuring process during the creative act.

The participants were asked whether the final drawing was different from what they usually drew. Near three quarters (78%) of the sample considered the final noncreative drawing similar to children's drawings, whereas 94% had an opposite opinion about the final creative drawing, thus confirming that children were aware about the rareness of creative artifacts. The chi-square analysis confirmed the significant difference between the final creative and noncreative drawings ($\chi^2(3, N=50)=49.123$, $p<.001$).

For motivational statement, 84% of participants stated that the idea of changing the initial meaning made the final creative drawing different from children's drawings. Children did not show graphical difficulties but they did not conceive the possibility to transform an ordinary object in something of creative. With regard to the role of the second character, only 22% of participants appreciated his/her contribution to the noncreative story. Such percentage considerably increased (62%) when the creative story was examined, thus confirming the ability of children to recognize the importance of restructuring. As reported in Fig. 5.3, such ability tended to increase significantly across age (χ^2 $(2, N=50)=8.320$, $p<.05$).

Children were requested to motivate the preference expressed for a given character in both stories. The answers were grouped in distinct categories according to the aspect emphasized by participants (the amount of work, the quality of work, the social attitude, the presence or lack of originality). Table 5.1 reports the percentage of answers provided by the participants to explain the preference for the first or second character in the noncreative and creative stories. The data supported the hypothesis that children were able to recognize the crucial role of the second character in the creative story and his/her contribution to the realization of a creative product.

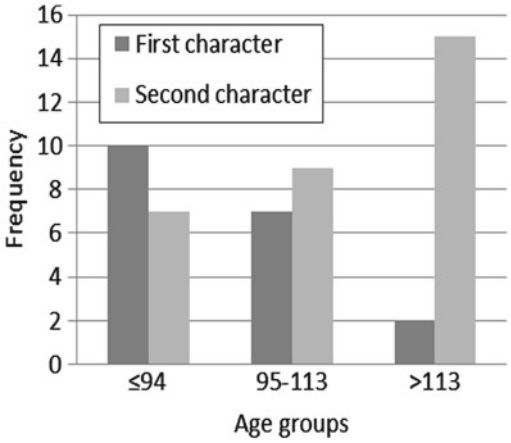

Fig. 5.3 Frequency of answers related to the preference for the first or second character involved in the creative story provided by groups

Table 5.1 Motivation statements to explain the preference for a given character: noncreative versus creative version

	Noncreative (%)	Creative (%)
He/she drew more	**7**	**6.7**
He/she drew better	**58.1**	**28.9**
He/she helped his/her friend	16.3	16.3
He/she had original ideas	**16.3**	**64.4**
He/she had no original ideas	2.3	
Total	93.7	100

Chi-square analysis was performed in order to find out significant differences between age groups in the motivations related to the preference for the first or second character of the creative story (χ^2 (4, N = 50) = 13.979, $p < .01$; Fig. 5.4). About 60% of younger children preferred the first character for his/her graphical abilities. Near 70% (69.2%) of intermediate group and near 90% (88.2%) of the older group appreciated the second for his/her original contribution suggesting to Marco/Anna (first character) the idea for completing the drawing in a different way.

The motivations related to the preference for a given character in both stories were further recoded in four general categories: the content of the drawing, the social quality, aesthetic qualities of the drawing, and the originality of the drawing. Table 5.2 shows two different trends. In the noncreative story, the preference for a character was affected by aesthetic qualities of the drawing, whereas the original element was evident in the creative story so that it was appreciated by participants.

To evaluate the ability of children to think others' thinking, children of the study were requested to articulate if the teacher would praise the first or the second character. Near all (90%) and three quarters (74%) of the participants believed that the teacher appreciated the first character respectively in the noncreative and creative story because he/she worked more and better than his/her friend. Such result highlighted the impact of context variables on beliefs about oneself and others' mental states.

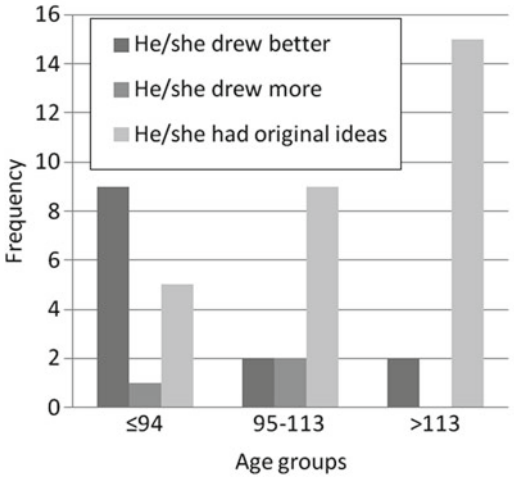

Fig. 5.4 Frequency of motivation statements related to the preference for a given character by age groups (the creative version)

Table 5.2 Motivation statement to justify the preference for a given character (in percentage)

	Noncreative	Creative
Content or the drawing	2	4
Social quality	12	0
Aesthetic qualities of the drawing	**68**	28
Originality of the drawing	14	**58**
Total	96	90

The chi-square analysis confirmed the presence of statistically significant differences between the percentages of answers related to the appreciation of aesthetic elements in the creative story and the percentages of answers related to originality in the creative one (χ^2 (3, $N=50$) = 28.044, $p < .001$; see Fig. 5.5)

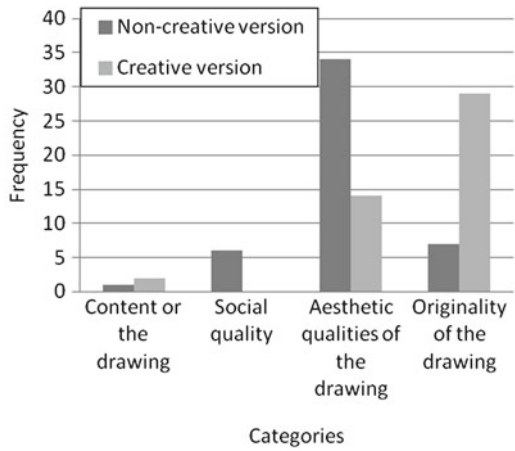

Fig. 5.5 Frequency of answers related to the appreciation of a given character (noncreative and creative versions)

The efforts and the amount of work were appreciated by teachers even though children recognized the importance of being original. The findings confirmed the importance of qualitative aspects in the noncreative drawing, especially for young children ($\chi^2(12, N=50)=22.635, p<.05$).

Younger children focused mainly on the qualitative and quantitative aspects of the drawing, despite the 23.1% of them considered the importance of the idea and the creative contribution. The 43.8% of older children believed that teacher considered important the creative contribution of the second character. Surprisingly, most of children of the intermediate group thought that teacher might prefer the first character because he/she drew better, thus allowing to conclude that scholastic context affected children's judgments and beliefs (χ^2 $(10, N=50)=19.201, p<.05$). The findings confirmed the importance of qualitative aspects in the creative drawing, especially for intermediate and older children.

Finally, children had to assign a score to both characters motivating their choice. They were requested to assign a score that the teacher should assign to Marco and Luca/Anna and Marta. Mean scores confirmed that the teacher should praise the first character in both stories, thus indicating the stereotyped image of teacher in the children's mind.

Paired *t*-test showed no statistically differences about the score given to the second character in the noncreative story. On the other hand, the judgment expressed in the creative one was similar for both characters. The difference between the scores given from teacher's point of view to the second character was significant in both stories. Luca obtained a higher score when he was involved in the creative drawing, thus indicating that children though the teacher could recognize the original idea of the second character that contributed to realize the sultan ($t_{(49)}=-2.478, p<.05$). Results showed that characters' gender did not influence the children's responses in the two versions of the story.

Creativity Tests

The tests that measured creative abilities were analyzed by two different observers, specifically trained. The correlation between the rating analyses conducted by two observers was considered highly significant[1] (Pearson *r* between .95 and .99, $p<.01$) for each criterion.

Creative-Noncreative Picture Completion Task

The children showed that they were able to differentiate their production between noncreative and creative. Children of the study obtained low-originality mean scores in the noncreative drawing ($M=1.06$; $SD=1.11$), whereas they tended to increase in the creative mean scores ($M=2.08$; $SD=0.99$). It is evident that children are able to produce original artifacts, distinguishing between what is creative and what is not

[1] $p<.001$.

Table 5.3 Mean and standard deviation of fluidity measure of picture completion subtest

Fluidity	*N*	*M*	SD
Up to 94 months	17	9.41	0.795
From 95 to 113 months	16	9.88	0.342
Over 113 months	17	9.94	0.243

creative and employing the stimuli adequately. It was noticed that children tended to add few details when they drew a noncreative drawing, whereas the opposite trend occurred when they were involved in the creative drawing (noncreative elaboration mean scores: $M=7.84$; SD=7.57; creative elaboration mean scores: $M=12.34$; SD=11.07). Paired t-test was computed to compare originality and elaboration mean scores obtained by children in both drawings. Statistically significant differences emerged: Originality scores were significantly higher when children created an unusual drawing, as well as the number of details was significantly higher in the creative version (originality: $t_{(49)}=5.681$, $p<.001$; elaboration: $t(49)=3.613$, $p=0.001$).

Picture Completion Subtest: TTCT

The same procedure of analysis was performed for the Picture Completion subtest of TTCT. Pearson's correlation coefficient showed a good interobserver agreement ($r=.979$, $p<.01$). Children of the study showed high flexibility scores ($M=7.88$; SD=1.19) as well as originality scores ($M=9.84$; SD=3.47). Mean number of details that each child added to the drawings was 33.24 (SD=27.05). It was noticed that most sample completed the ten incomplete figures. A one-way ANOVA was computed in order to compare mean scores obtained by different age groups in flexibility, fluidity, originality, and elaboration measures. Significant differences emerged only comparing fluidity mean scores. Fluidity scores were very high in all three age groups; in particular, the older group obtained the highest score ($F(2, N=47)=5.158$, $p<.01$, see Table 5.3).

In order to verify whether creative abilities were related to the understanding of metacognitive aspects underlying the development of a creative product, correlational analysis was conducted. The three tests were not related to one another, thus confirming that creative performance was not linked to the corresponding metacognitive skills.

Conclusions

Creativity in Systems

Our study highlighted the importance of investigating how children express and consider creativity. Their beliefs about their own creativity influence their views of creativity. According to Csikszentmihalyi (2006), it is important to consider creativity

more complex than an individual ability. He regards creativity as a system including the person, the society, and the culture. The social dimension of creativity includes individuals' judgments (Csikszentmihalyi, 2006) or implicit theories (Runco & Johnson, 2002). Runco (2007) expressed an opinion about implicit theories on creativity that is close to Csikszentmihalyi's claim. Creativity is a dynamic dimension, and it is affected by social, historical, and cultural changes. Since modern society requires creative individual, the need to satisfy social requests imposes the promotion of creativity in educational contexts. Educating teachers and children is a priority goal. Teachers are potential models for children (Graham, Sawyers, & DeBord, 1989; Runco, 2004). Teachers' expectations may be influential on children's development (Runco, 1984, 1989). As such, two important educational goals are educating teachers to creativity and providing them adequate instruments to foster children's potential. In conclusion, future researches might focus on the importance of dimensions related to creativity (such as implicit theories) and social variables that influence conceptions of children and that can foster or inhibit creativity.

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Chapter 6
Creativity and Early Talent Development in the Arts in Young and Schoolchildren

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Creativity as Learning Outcome in School Curriculum

The development of creativity in schoolchildren has become one of the major foci in educational reforms in different Asia-Pacific societies, including Australia, China, Hong Kong, Singapore, and Taiwan (Hui & Lau, 2010). In Australia, creativity is promoted in teaching and learning at schools; in China, it has been encouraged in science and technology in higher education; and in Hong Kong, creativity has been identified as one of the nine generic skills to be nurtured and defined as a behavior that is "the result of a complex of cognitive skills/abilities, personality factors, motivation, strategies, and metacognitive skills" (Curriculum Development Council, 2002, p. 45). Creativity is viewed as a desired learning outcome in Singaporean primary and secondary schools and is associated with "enterprising" in the economy. An official white paper on creative education published in 2003, "Establishing a republic of creativity for Taiwan," adopts a multilevel approach to fostering creativity at the individual, school, societal, industrial, and cultural levels. Creativity is defined as a concept incorporating the ability to question, make connections, innovate, problem solve, communicate, collaborate, and reflect critically (PricewaterhouseCoopers, 2010).

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_6,

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Creativity as Talent Development in Schools

Creativity designates both a gift and a talent. Creativity is identified as one of the six areas of giftedness in Marland Report (1972) on Education of the Gifted and Talented, also in Education Commission Report No. 4 (Education Commission, 1990), Hong Kong's first policy document on gifted education. Creativity is defined as high ability to invent something novel and elaborate unique ideas, in addition to the other five areas including (1) a high level of measured intelligence; (2) specific academic aptitude in a subject area; (3) superior talent in visual and performing arts such as painting, drama, dance, and music; (4) natural leadership of peers – high ability to move others to achieve common goals; and (5) psychomotor ability – outstanding performance or ingenuity in athletics, mechanical skills, or other areas requiring gross or fine motor coordination. Creativity subsumes under the umbrella term of giftedness as a specific area in gifted education. Models for gifted education include creativity as an indispensible component in developing talent achievement in all areas of giftedness, such as Purdue 3-Stage Model (Feldhusen, Kolloff, Cole, & Moon, 1988), the Differential Model of Giftedness and Talent (Gagné, 1995), and the Integrated Curriculum Model (VanTassel-Baska & Wood, 2010).

Some theorists insist that talent should be differentiated from giftedness, including Gagné (1995), Feldhusen et al. (1988), and VanTassel-Baska and Wood (2010). Giftedness refers to "untrained and spontaneously expressed natural abilities," whereas talent refers to "mastery of systematically developed abilities (or skills) and knowledge…in that field or fields" (Gagné, 1995). Gagné's (2007) latest model of Differential Model of Giftedness and Talent (DMGT) postulates four aptitude domains observable in every task children engage at school, namely, intellectual, creative, socioaffective, and sensorimotor abilities. Every individual possesses some level of these natural abilities. A creatively gifted child has exceptionally high creative ability that surpasses 90% of age peers. Gagné purposefully differentiated talents from gifts because he wanted to persuade educators and researchers that both concepts have qualitative differences. Talents refer to systematically developed skills in specific fields, such as academics, arts, business, leisure, social action, sports, and technology, while talents have greater association with occupations. A child is talented in a specific field if his/her skills exceed 90% of peers of the same age.

Interestingly, the nature of creativity possesses both domain generality like divergent thinking and domain specificity like being creative in arts and being innovative in business (Kaufman, Beghetto, Baer, & Ivcevic, 2010). Creativity enhancement calls for training regarding a continuum in which on one end is the mini-creativity or everyday creativity (Kaufman & Beghetto, 2009) where applicability to general domains is concerned. On the other end comes the professional-c or eminent-c which is creativity skills in specific fields possessed by competent highly skilled professionals in the fields. McKinsey and company's (2001) report on "War for talent: Organization and Leadership Practice" declares that instilling a talent mindset for managers at all levels is critical for the success of the organization. Managers with a talent mindset believe that talents are crucial and critical source of competitive

edge of their organizations and they work to recruit and develop these talents. The Chartered Institute of Personnel and Development also sets "Learning and Talent Development" as one of the modules in their advanced level qualifications. To educators and educational psychologists, talent development begins in school education, and to human resources and professionals in various fields, talent development extends from schools to their organizations. It is believed that creative performance of athletes and artists and the creative productions by scientists and novelists are expressions of professional and eminent creativity. The adoption of promoting creativity in the context of talent development aligns appropriately with existing practice in developing creativity from mini-creativity and everyday creativity to professional creativity and eminent creativity across the life span.

With reference to a talent development focus, Dai (2010) suggested diverse learners with diverse talents should be profiling their strengths and weaknesses in special fields. Similarly, Freeman (2000) summarized that developing talent through program provision should emphasized process-based and continuous development. A curriculum design with great emphasis on creativity and higher-order thinking skills in general classrooms for everyone is recommended as a good inclusive model for talent development for all learners in modern curriculum.

The rationale of adopting a gifted and quality education in Hong Kong focuses on developing thinking, creative abilities, and social skills through a 3-tier operation mode (Education Bureau, 2011). The first level adopts a school-wide and whole-class approach in which the core elements as advocated in gifted education, i.e., high-order thinking skills, creativity, and personal-social competence in the gifted curriculum should be delivered for all students. Echoing this value, Chan (2000a) suggests the talent approach should be included in education for all learners. Previous research on gifted and talented education in Hong Kong, however, has lopsidedly engaged gifted learners in pullout programs which include the methods on identification of gifted and talented students in general (Chan, 2000b), on enhancing family influence on talent development (Chan, 2005), and when running programs for those with leadership talents (Chan, 2007a), music (Chan, 2007b), and visual arts (Chan, 2008). However, few studies have focused on the relationship between the inclusive talent development approach and creativity in learners. Across the curriculum, which area is the most effective in fostering creativity?

Creativity and the Arts in the Curriculum

It is a common belief of art specialists, educators, and policy makers that arts education enhances creativity development in children and young people (Craft, 2011). "To stimulate children's creative and imaginative powers, and encourage them to enjoy participating in creative works" is listed as one of the objectives of arts education for preprimary learners (Curriculum Development Council, 2006, p. 20), and "developing creativity and imagination" as the objective in visual arts curriculum for primary and junior secondary learners (Curriculum Development Council, 2003).

However, researchers have yielded mixed and inconclusive findings on arts learning and its impact on creativity. Even if positive impacts are made, little is studied on how the gains are made possible.

In a large-scale study of 2,406 students from Grades 4, 5, 7, and 8 in four states in the USA by Burton, Horowitz, and Abeles (2000), creative thinking abilities as measured by the Torrance Tests for Creative Thinking (Torrance, 1974) were positively associated with integration of art of the classroom teacher and collaboration with art specialists in the classroom and curriculum planning. However, the association between art learning and domains of self-concept measured by Self-Description Questionnaire (Marsh, 1990) was not significant. But the correlational nature of the study does not entail causal relationship between art learning and creativity of elementary and secondary students.

In an extensive evaluation of school-based arts education programs in Australian schools conducted by Bryce, Mendelovits, Beavis, McQueen, and Adams (2004), problem solving, planning, communication, and working in teams were found to be significant learning outcomes and key competencies in participants of art rich group and music group when compared with nonart group and nonmusic group. Creativity, motivation in learning, and student engagement were also greatly enhanced in the qualitative reports from students and teachers in the arts education programs. Similar positive effects were reported on children's qualitative experience in arts engagement and their gains in creativity and use of imagination as reported in Harland et al.'s (2000) study in UK secondary schools. In addition to gains in creativity, enhancement of student engagement and increasing motivation in learning have also been evident in promoting arts education for students.

Studies on academic benefits of arts education in other subjects are also conducted. In a discussion of Dutch students learning the arts and its relation to academic achievement, Haanstra (2000) pinpointed that little empirical evidence was found in the direct and positive effects of arts education in academic achievement and further educational attainment in a quasi-experimental design. Elementary school students who took part in an extended day program each week for 2 years did not score significantly higher in standardized reading and mathematics achievement tests when compared with students who did not take part in any extended arts education programs. Secondary school students who took arts as an examination subject did not predict higher educational attainments, but participation in cultural activities at the age of 14 significantly predicted higher participation in cultural activities 10–20 years later. Haanstra commented that future studies should overcome the methodological flaws of quasi-experimental or ex-post de facto research design. He further suggested that new studies should look into the instructional process in art education. Observations of group dynamics and assessment procedures of teachers should also be studied to prove the effect of arts education.

Moga, Burger, Hetland, and Winner (2000) conducted a meta-analysis to test whether studying the arts engendered creative thinking. They found that there was a positive relationship between arts learning and creativity. In the ten correlational studies with a total sample size of 1,513, a mean effect size ($r = .27$, $p < .0001$) was found, but the range was wide, from $r = .09$ to $r = .43$. A clear association was shown

between studying the arts and performance on creativity measures, but it did not indicate a causal relationship. However, a mean effect size ($r = .05$, n.s.) was recorded in experimental studies with verbal creativity outcomes and a mean effect size ($r = .19$, $p < .0001$) with figural creativity outcomes. They concluded that more experimental studies were required to prove the causal relationship between the two.

Research Evidence in Creativity and Arts Education in Hong Kong

Empirical studies conducted in the area of arts education and creativity in Hong Kong mostly adopt a survey method in Leong's (2010) study, a quasi-experimental study (Cheung-Yung, Cham-Lai, & Mak, 2008; Hui, & Lau, 2006), or qualitative method (To, Chan, Lam, & Tsang, 2011). Seldom does one adopt an experimental design, although it is highly recommended by researchers (Winner, 2007). In a survey of 529 secondary school students on the arts learning experience, mainly in music and visual arts, in school, Leong (2010) found that the most commonly used assessments for creativity were singing/instrument examinations in music and creative activities in visual arts. In music, the common activities included singing and music appreciation, while the common activities in visual arts were creative activities and arts appreciation. Music students reported domain-specific activities, such as singing and instrument playing, and assessments (e.g., performance examinations) and failed to see a connection between developing creativity in their music education. However, visual arts students placed highest importance in creative enhancement through their learning. Whether the curriculum objective of creativity enhancement in arts education can be achieved becomes questionable if students remain unnoticed the objective of developing creativity through taking music.

To et al. (2011) interviewed principals, English teachers, students, and parents from an English drama project implemented in 38 primary schools in Hong Kong. Creativity was consistently reported as an observable outcome and stressed in both the learning and teaching processes. Learning English through drama has provided an effective strategy to initiate authentic discourses and increase student talk in the classroom.

In the following studies conducted by Hui and her associates, creativity is defined and operationalized as a behavior or a product which is novel and appropriate (Amabile, 1996). Measurements of creativity on children include an original story measured by the consensual assessment technique (Hui, Lee, & Choi, 2011), successful mastery of creative thinking skills as displayed in objective creativity tests, e.g., Test for Creative Thinking – Drawing Production (TCT-DP) (Hui, He, Tjia, Lee & Choi, 2011; Urban & Jellen, 1996), teacher- or parent-rated curiosity, and novelty expressed in daily behaviors as measured by the adapted version of Scales for Rating the Behavioral Characteristics of Superior Students (SRBCSS) (Hui, Wong, Cheung, & He, 2011). These studies have provided research evidence that creativity is related to arts learning experience.

The Enrichment Triad Model (Renzulli, 1994, 2005) has been adopted in these studies on creativity and talent development in arts education. Creativity, as an indispensible component in the model, serves dual functions, first as a criterion of identifying giftedness in learners, in addition to above-average intelligence and task commitment. Second, it serves as one of the program objectives and learning outcomes. Enrichment Triad Model was first designed to encourage creativity in gifted learners by exposing them to various areas of interest and knowledge domains, and it was further developed into the Schoolwide Enrichment Model (Renzulli, 1994, 2005) to include every learner. Provision of opportunities for schoolchildren to learn various forms of arts can serve as type I enrichment that exposes students to discipline and topics that normally exceed the regular curriculum. Engaging students with art specialists to promote creative production in small group or individual inquiry in the arts serves as type II and type III enrichments that emphasize acquisition of advanced content, skills, and process training with learning with artists, such as the artist-in-residence programs from the creative arts. Both school-based and out-of-school arts education programs entail the above three types of enrichments in the arts to schoolchildren.

In a correlational study of 803 elementary school students, Hui, He, and Lee (2010) found a positive association between arts learning experience and creativity. Significant differences were found between the four groups of art activity participation (within school, outside school, both within and outside school, and none within nor outside) and various art forms (music, drama, visual arts, and dance) on figural creativity measured by TCT-DP (Urban & Jellen, 1996) and self-reported creativity characteristics from a measure adapted from SRBCSS. Post hoc comparisons revealed that students with learning experience in the arts scored significantly higher on creative performance, communication, creativity and dramatic characteristics, and motivation in arts education than those who had not participated in any art activity.

Hui and her colleagues (Hui et al., 2011) conducted another study on the effectiveness of drama in education project in preschool and primary schoolchildren and their teachers. The project lasted for 3 years and was funded by the Quality Education Fund as an innovative initiative to link the arts professionals with the education sector, the Quality Thematic Network – Drama in Education Project. Teachers from five kindergartens and five primary schools and teaching artists collaborated in this partnership scheme in which teachers were given 24 h drama education training. After the training, four teachers from each school volunteered to work with teaching artists for ten more hours to design a drama-enhanced curriculum in their classrooms. Students from these classes belonged to the experimental group, whereas students from other classes became the control group. The project provided type I enrichment activities to the participants by exposing them to contents and skills exceeding the regular curriculum.

After the first year, students in the experimental group scored significantly higher in verbal creativity of a story-telling task (STT) as measured by the consensual assessment technique than those in the control group. The STT was conducted by a trained research assistant who disguised herself as a volunteer from an organization called “The Story Kingdom.” Each student was presented with an unseen picture

and was asked to tell a story about the picture. No time limit was set, and the student was asked if he or she wanted to add a title to the story in the end. Two different pictures were used separately for the pretest and posttest. Specifically, the whole story-telling scene was first videotaped, and the performance was then evaluated by two raters independently in accordance to ten criteria: understanding of topic, ability to describe the story, ability to organize the story, ability to express, ability to show emotions and speak in an audible tone, ability to add in conversations, ability to include humorous elements, ability to include creative elements, and ability to identify problems and find relevant solutions. The creativity and dramatic characteristics of SRBCSS (as) rated by the teachers in kindergartens and self-rated by primary school students, both were improved more significantly in the experimental group. Teachers in the experimental group also reported significantly higher in the Creativity Fostering Teaching Index (SFTI) (Soh, 2000) than those in the control group after the project. The teacher participants scored the following items to be significant gains on teaching and learning in the fostering independent learning and cooperative learning, encouraging self-evaluation among students, building on students' ideas, and providing opportunities for trial.

In the second year, the project was extended to 10 kindergartens, 10 primary schools, and 1 special school for mild mentally challenged students (Hui, Lee, & Choi, 2010), and in the third year, to 26 kindergartens, 22 primary schools, and 1 special school took part in the arts project (Hui et al., 2011). Similar assessment tasks (story telling, behavioral characteristics, and creativity-fostering teaching style) and procedures were employed. Consistently, significant gains were recorded in verbal creativity in the story-telling task in participants in the experimental group. Creative gains were also reported in students from the special school. Teachers scored higher on the items of fostering independent and cooperative learning, suspending their judgment, and providing students with tryout opportunities. Both students and teachers gained in this type I enrichment design.

Another project of Hui and her associates on the pilot study on promoting arts education in early childhood education was commissioned by the Arts Development Council (Hui et al., 2011). Art specialists from visual arts and drama provided arts training and curriculum coaching support for 60 h at least to preschool teachers throughout the project. Art specialists also delivered direct instructions to young children in the regular curriculum in which teachers served as collaborators. The project provided type II and III enrichment activities that enhanced acquisition of advanced content, skills, and process training in various art forms.

Significant gains were found in the posttest scores of both verbal creativity as measured by STT and figural creativity measured by TCT-DP. TCT-DP was developed to evaluate students' creativity in terms of quality, such as content, gestalt, composition, and elaboration, together with other components, such as risk taking and breaking of boundaries, unconventionality, affection, and humor (Urban, 2005). The test instructions to complete the drawing with the given fragments were adapted and translated into Chinese with a back-translation procedure. Creativity performance was scored by using 13 criteria (including continuations, completion, new elements, connections made with a line, connections made to produce a theme,

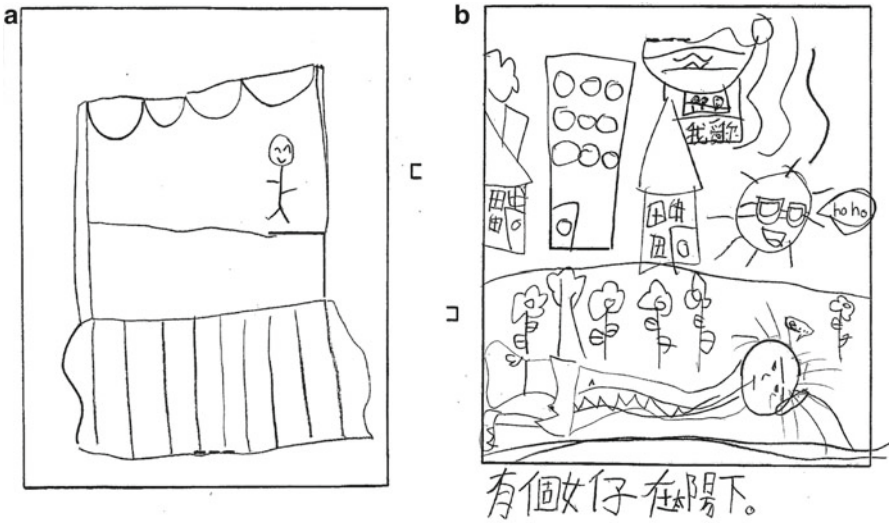

Fig. 6.1 (**a**) Child A's drawing in pretest. (**b**) Child A's drawing in posttest

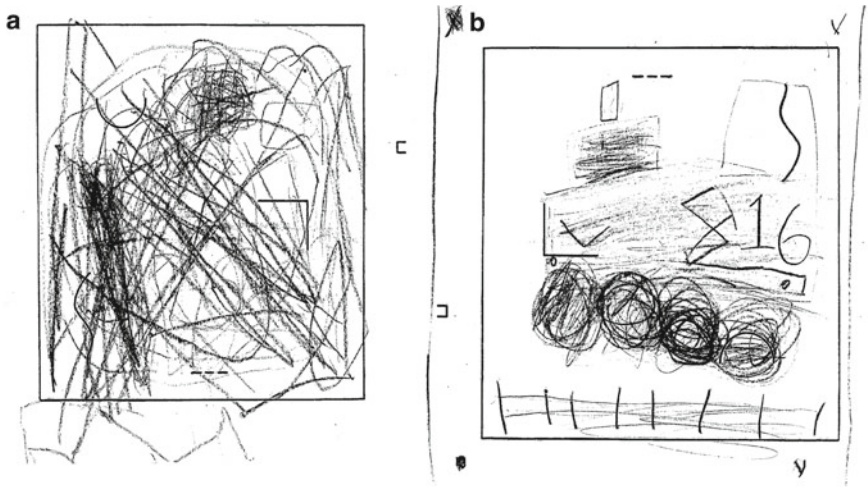

Fig. 6.2 (**a**) Child B's drawing in pretest. (**b**) Child B's drawing in posttest

boundary breaking, perspective, humor and affectivity, and unconventionality). We show sample pictures drawn by students who demonstrated significant gains in figural creativity. Figures 6.1a, 6.2a, and 6.3a were pictures drawn in the pretest, whereas Figs. 6.1b, 6.2b, and 6.3b were produced in the posttest. Child A added more new elements, e.g., flowers, buildings, and characters, and added a different perspective with a girl lying down under the sun in Fig. 6.1b. Child B turned scribbles

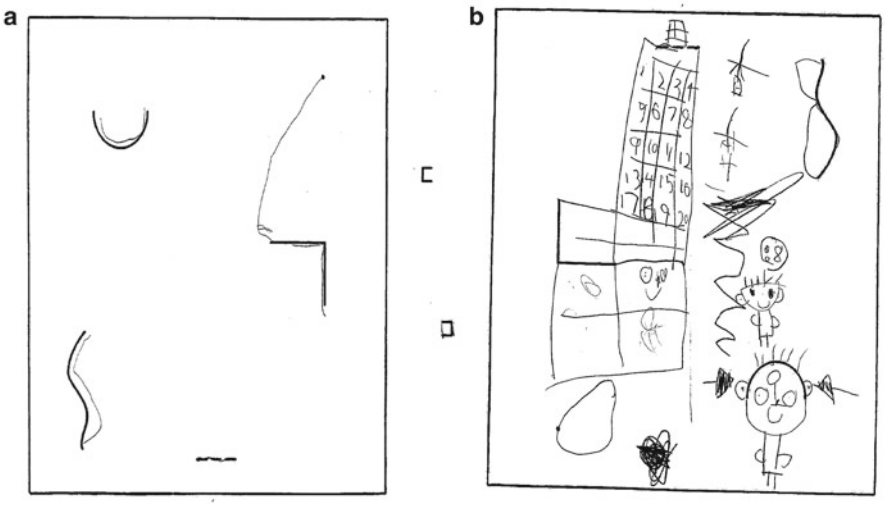

Fig. 6.3 (**a**) Child C's drawing in pretest. (**b**) Child C's drawing in posttest

into a car or a tank with a clear theme in Fig. 6.2b. Child C connected two given parts into a hopscotch and added two children characters in Fig. 6.3b.

The success of these partnership projects has provided a good base for educators and researchers to further examine how creativity enhancement is achieved through learning the arts by adopting an Enrichment Triad Model. To enhance creativity and imagination should be the foremost and fundamental objective in innovative partnership programs between arts specialists and educators to enhance talent development. Both teachers and students take advantages of the professional and artistic input of the specialists when guided by practicing artists in arts appreciation and production. The artists are skilled in scaffolding the knowledge and process involved in the arts and more sensitive in identifying talents in the arts. This type of collaboration echoes with type II and type III enrichment in the Schoolwide Enrichment Model (Renzulli, 2005). What educators also need to know is how the learning of the arts and learning through the arts can help to develop creativity in both typical and talented learners.

Winner (2007) has outlined eight possible areas called habits of mind in the arts for exploring the underlying learning principles. She examined critically 38 visual arts classroom taught by practicing artists in two high schools with strong emphasis in the arts curriculum in Boston. These teachers were also interviewed to talk about what they meant to teach and why they had chosen to teach that. She then formulated eight important components of habits of the mind. These eight habits delineate carefully what arts learning aims at developing in learners, including the skills to develop craft (technical skills), observe, envision, reflect, question and explain, evaluate, express, stretch and explore, engage and persist, and to understand the art world in terms of domain and communities. These objectives are achieved when students are working closely with the teacher-artists. All these habits can be demonstrated through dialogic instruction and inquiry when teachers engage in dialogue with students to

explain, clarify, model, and help students grasp new ways of describing the knowledge domain. Future studies on the effectiveness in developing these eight habits of the mind in various groups of students, such as typical and talented students, in the arts can be conducted.

Conclusion

The research evidence, however, should not undermine the aesthetic value of the arts for their own sakes. Jalongo (1990) argued from a right-based approach that it should be the child's right to the expressive arts, including music, art, drama, dance, and writing. Arts education is an invitation that cultures and the arts engage and encourage the younger generation to learn to interact in a process of communication and co-construction of value, knowledge, and skills in the art world (Winner, 2001). Learning in arts offers multiple explanations to the construct of creativity: an attitude, a process, a product, a skill, a set of personality traits, and a set of environmental conditions (Fox & Schirrmacher, 2012). Learning in the arts also provides cultures with opportunities to socialize the younger generation with cultural heritage and value and to establish a cultural identity (Choi, Papandrea, & Bennett, 2007). Creativity is embodied in both the process and product in arts education.

Creativity and talent development is no longer an area for the prodigy only but a strategy for quality education for all (Subotnik, Olszewski-Kubilius, & Worrell, 2011; Subotnik, & Rickoff, 2010). Providing enrichment opportunities in various forms of arts for all children is the first necessary strategy in enabling children to have optimal gains in creative development as suggested by the National Advisory Committee on Creative and Culture Education in the United Kingdom (Craft, 2010). More future studies should be conducted to examine what other variables are crucial for enhancing this positive association. These variables may include actual amount of time in arts exposure provided by the family (Amabile, 1989), creative parents and teachers (Moga et al., 2000), rewards for application by parents and teachers (Hennessey & Amabile, 2010), and experience in working with professional artists (Burnard & Swann, 2010). Longitudinal studies on how young children with different talents in the arts are identified and nurtured both in general classroom setting and also enrichment setting with professional artists should provide evidence in how effective each type of enrichments in developing children's creativity both as a gift and a talent.

A major limitation of the studies related to creativity and the arts lies in the inconclusive findings of cognitive transfer from the arts to other academic domains of knowledge, such as science and mathematics (Winner, 2001). Most of the previous studies are correlational in nature and cannot establish a causal relationship between learning the arts and academic achievement. Researchers, such as Winner (2007), suggested that more vigorous research design should be employed to investigate the creativity gains among participants taking part in learning arts. One possible solution is to employ the method of experimental study with a randomized controlled trial.

Acknowledgment The work described in this chapter was supported by three grants from the Arts Development Council and the Quality Education Fund of the Government of the Hong Kong Special Administrative Region and the City University Start-Up Grant. Correspondence regarding this manuscript should be addressed to Anna Hui, Department of Applied Social Studies, City University of Hong Kong, Tat Chee Avenue, Kowloon, HKSAR, China (e-mail: annahui@cityu.edu.hk).

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Chapter 7
Self-Regulated Learning in School Transition and as a Creative Process

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Introduction

> Students can be described as self-regulated to the degree that they are metacognitively, motivationally, and behaviorally active participants in their own learning process (Zimmerman, 1989, p. 329).

Guilford (1950) studied the processes of creativity and suggested that there is a relationship between creativity and learning—both creativity as a part of learning and a higher form of learning. Subsequently, Amabile (1983) proposed that task commitment and intrinsic motivation were the noncognitive components of creativity. Seemingly unrelated to the processes of creativity are the development of self-regulated learning and its associated strategies and their relations with academic performance. Theoretical discourse and empirical findings on the relationship between self-regulated learning and creativity have been insufficient until now.

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_7,

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This chapter attempts to explore the possible links between learning and creativity, as well as self-regulation and creativity.

Self-regulated learning (SRL) theories and models emerged during the 1980s. Recently, this area has become a major topic of research in contemporary education, distinct from externally regulated learning (Boekaerts, 1999; Zimmerman, 1989). SRL theories have a common view of students as metacognitively, motivationally, and behaviorally active promoters of their own academic achievement (Zimmerman, 1989). Self-regulation refers to the self-regulated thoughts, feelings, and actions for attaining goals (Zimmerman, 2000). In his series of studies, Zimmerman insisted on a formulation to explain self-regulated academic learning based on Bandura's (1986) theory of social cognition. It included self-monitoring one's activities, adopting proximal goals to motivate one's efforts and strategies, and exercising one's self-influence. In accordance with Bandura's (1986) model of SRL, these personal processes also interact with environmental and behavioral influences in a reciprocal fashion. Zimmerman suggested that based on this model, learners' efforts to regulate their own learning involve three classes of determinants, which include interactions among their personal processes, the environment, and their behavior. Such strategies enable student learners to personally regulate their behavior and environment, as well as their covert functioning. The capacity to regulate one's thoughts, motivation, affect, and action through this self-reactive influence constitutes one of the core properties of human agency within the conceptual framework of social cognitive theory (Caprara et al., 2008). Zimmerman and Martinez-Pons (1990) identified 14 learning strategies that self-regulated learners used, including self-evaluation, organization and transformation, goal setting and planning, seeking information, keeping records, monitoring, environment structuring, acknowledging self-consequences, rehearsing and memorizing, seeking social assistance, and reviewing records. Later, Pintrich and Schrauben (1992) designed a social cognitive model of SRL, which integrated motivational and environmental variables as possible determinants of this strategic process. Their motivational variables were derived from the expectancy-value theories of achievement motivation (Tang & Neber, 2008). SRL may also be different among learners and students in different developmental grades. Types of self-regulated actions involve diversity in grade, gender, and the surrounding environment. Thus, when engaged in a task, students in different developmental stages might engage in different types of self-regulated behavior (Kaplan, Lichtinger, & Gorodetsky, 2009).

The Application of Self-Regulation in Academic Domains

Self-regulation is defined as the self-generated thoughts, feelings, and behaviors that are planned and cyclically adapted based on performance feedback to attain self-set goals (Zimmerman, 1989).

Zimmerman and Schunk (2001) linked self-regulation to academic domains. Zimmerman (1989, 2000) developed a cyclical model of self-regulation from social

cognitive theory and empirical research and then applied it to education (Zimmerman & Martinez-Pons, 1990). Learning strategies are commonly combined with activities such as selecting and organizing information, rehearsing textbooks and materials, relating novel knowledge to what learners already have in memory, and creating fresh concepts and ideas from given materials. Self-regulated learners also engage in strategic planning. They search for and select appropriate strategies that they believe will enable them to accomplish their goals. Kitsantas (2002) defined this strategic planning style involving the following: (a) deeper processing of elaborative and organizational strategies, such as rewriting notes, selecting mail ideas, and outlining the text that is to be learned and (b) the use of rehearsal strategies for basic memory tasks, such as using mnemonics to remember the key stages of a theory. These strategies could be learned through social assistance such as peers, family members, and teachers or from information from nonsocial sources, such as books and the Internet (Zimmerman, 2000). In the area of cognition, SRL is defined in terms of the strategies that learners apply in a study context both in and outside of school, including their own home.

A Study on Self-Regulated Learning

Method

Participants

The sample survey was conducted among a sample of 1,687 students in eight elementary schools and six junior high schools, located in Tokyo, Japan. In the elementary schools, participants comprised 5th ($N=440$, male $N=220$ and female $N=220$) and sixth graders ($N=455$, male $N=208$ and female $N=247$), while the junior high schools included 7th ($N=439$, male $N=210$ and female $N=229$) and eighth graders ($N=353$, male $N=200$ and female $N=153$). All participants attended public schools in Tokyo. The survey period was the autumn of 2005 at each school. We did not ask participants on their age in the questionnaire.

Measures

Questionnaire

Participants were asked to complete an anonymous questionnaire that was developed for this study, called the "self-regulated learning ability" scale . This scale was meant to examine Japanese students' SRL. The questionnaire was adopted from the "study outside of school" scale, which was a part of the "Third Basic Research on

Academic Performance" performed by the Benesse Educational Research and Development Center in Japan (Benesse Educational Research and Development Center, 2001, 2007). The items for the "study outside of school" scale are available in the "Preliminary Report: Basic Research on Academic Performance, International Survey of Six Cities" (BERDC, 2007). The "Third Basic Research on Academic Performance" was originally written in Japanese, so in our survey, all scale items were also written originally in Japanese. In 1990, the "Basic Research on Academic Performance" was first held by BERDC in Japan. After this initial research, nearly every 5 years since, BERDC has administered a similar survey. In 2001, BERDC conducted a survey of attitudes toward study and actual learning among elementary and junior high school students in Japan ("Third Basic Research on Study," 2001). BERDC defined the purpose of the "Third Basic Survey on Study" as to help grasp students' attitudes and the actual conditions regarding study. The first (in 1990), second (in 1996), and fourth (in 2007) surveys have had similar questions to those of the third (2001), which consists of six subscales ("favorite subjects," "study outside of school," "grades, academic ability, and societal awareness," "level of intention to continue studies," "relationship with family," and "media usage"). (More information on the scale, psychometric properties, and sample items for each factor or dimension) We used the "study outside of school" scale (e.g., "I do all of my homework properly.") and revised it to fit an everyday classroom environment. We consulted with some of the teachers who helped administer our survey at the elementary and junior high schools we studied, in order to create new items in addition to those of the "study outside of school" scale. Our "self-regulated learning ability" scale reflected these teachers' views on SRL. The questionnaire consisted of 28 items presented on a 4-point rating scale, with responses ranging from 1 ("not at all true of me") to 4 ("very true of me"). All 28 items of "self-regulated learning ability" scale are shown in Table 7.1.

Results

Data Analyses

(a) Factor Analysis and Reliability of the "Self-Regulated Learning Ability" Scale
An exploratory factor analysis was conducted to examine the construct validity of the questionnaire. The exploratory factor analysis of the 28-item intercorrelation matrix, using the unweighted least squares extraction method with a promax rotation, suggested that six factors could be retained with eigenvalues greater than 1. The first factor, "preparation and review of classes," reflects students' constant study style at home in their daily life, concentrating on their attention to prepare for school the next day. The second factor, "ability to tie what is studied at school to daily life," reflects students' ability to connect the fresh knowledge that they learned at school with everyday activities such as

Table 7.1 Items of learning ability scale (a principal factor method/promax rotation)

Factor1: preparation and review of classes (α=.82)	F1	F2	F3	F4	F5	F6
1. When I go back to my house, I study until I am certain that I understand what I have learned at school.	**0.80**	−0.07	−0.07	0.01	0.02	0.06
2. When I am home, I recall what I learned at school that day.	**0.79**	−0.05	−0.08	0.01	0.08	0.00
3. I read textbooks at home so that I know what we will be studying for tomorrow.	**0.73**	0.04	0.00	−0.07	0.00	−0.11
4. I review what teachers taught me, because I don't know if I could understand all topics perfectly.	**0.69**	0.02	−0.04	−0.04	0.07	0.09
5. If I find what I don't understand what I will study tomorrow, I review it at home the day before.	**0.60**	0.10	0.09	−0.05	−0.02	−0.09
6. I always follow the same schedule at home.	**0.41**	0.00	0.11	0.20	−0.17	−0.04
Factor 2: Ability to tie what is studied at school to daily life (α=.78)						
7. I think that what I study at school is useful in solving difficult, everyday problems.	0.05	**0.76**	−0.13	0.01	−0.05	0.00
8. It's interesting to see in textbooks what I consider important in my daily life.	−0.08	**0.74**	0.02	−0.02	0.04	−0.11
9. It's easy for me to tie new knowledge to what I studied already at school.	0.02	**0.57**	0.09	0.02	0.02	0.01
10. What I study at school isn't useful in my daily life.*	0.05	**−0.53**	0.08	0.02	0.07	−0.18
11. I usually understand what I study at school in relation to daily life.	0.17	**0.48**	0.16	0.01	−0.05	−0.05
12. When new topics and theme are difficult for me to understand, I refrain from using what I have studied in the past.	0.12	**0.38**	0.04	0.06	0.04	0.02
Factor3: Ability to review material (α=.72)						
13. I look over what I don't understand with dictionaries and illustrated reference books.	−0.01	−0.05	**0.90**	−0.04	−0.02	0.05
14. When I find new words, I look them up in the dictionary.	−0.05	0.01	**0.78**	−0.05	0.03	0.00
15. There are dictionaries easily available for me to use at home.	−0.02	−0.02	**0.52**	0.12	0.03	−0.09
16. If there is a subject I want to know more about, I always look it up at the library and through the Internet.	0.13	0.06	**0.36**	−0.11	0.09	0.02
Factor4: Ability to study autonomously (α=.69)						
17. I prepare what teachers taught me to take, not to forget them at home.	−0.14	0.05	−0.04	**0.71**	0.10	−0.08
18. I always don't forget to my homework.	0.02	−0.02	−0.07	**0.62**	0.06	0.00

(continued)

Table 7.1 (continued)

19. I think what is necessarily tomorrow and prepare on my own.		0.01	0.08	−0.03	**0.48**	0.10	−0.02
20. I begin to study independently if my parents don't tell me to do so.		0.18	−0.08	0.08	**0.43**	−0.11	0.14
21. When I study at home, I turn off TV and game on my own.		0.12	−0.05	0.16	**0.41**	−0.09	0.04
Factor5: Note-taking ability (α=.69)							
22. In class, I take notes along my own rules, such as marking important issues in red so that I can see them easily.		0.04	−0.04	0.02	−0.04	**0.76**	0.01
23. In class, I copy in notebooks what my teachers have written on the blackboard.		−0.04	0.01	−0.01	0.18	**0.58**	−0.05
24. I take notes on both what teachers have taught me and what they have written on the blackboard.		0.07	−0.01	0.09	0.05	**0.53**	0.06
Factor6: Process orientation (α=.64)							
25. I usually care more for answers than for how I arrive at them.		−0.03	0.06	0.08	0.09	0.04	**−0.66**
26. I believe that it's enough to get correct answers even if I don't understand how to reach them.*		0.10	−0.04	−0.03	−0.02	−0.01	**−0.59**
27. I think it's important for me to get correct answers as well as know how I arrived at them.		−0.02	0.23	0.00	0.05	0.06	**0.47**
28. When tests are returned, I only care about how many points I have received.		0.02	0.01	−0.10	−0.03	−0.04	**−0.46**
Contribution		26.66	6.53	6.40	5.16	4.86	4.05
Cumulative contribution		26.66	33.19	39.59	44.74	49.61	53.66
Correlation among factors		F1	F2	F3	F4	F5	F6
	F1						
	F2	0.56					
	F3	0.55	0.53				
	F4	0.54	0.54	0.57			
	F5	0.35	0.34	0.34	0.50		
	F6	0.42	0.52	0.44	0.48	0.19	

Note: * items are reverse items. Values are pattern matrix factor loadings from a factor analysis using principal-axis factoring with a promax rotation. Values less than .35 were omitted from this table

playing with friends, buying daily necessities, and going to new places. The third ("ability to review material") and the fourth factors ("ability to study autonomously") reflect the self-determined behaviors of students to research on their own, on the basis of what they were taught in the classroom. We can explain these behaviors from the perspective of Deci and Ryan's self-determination theory (SDT; Deci, Ryan, & Williams, 1996). Without externally controlled

Table 7.2 Means and standard deviations for SRL for grade level and gender

		5th ($N=440$)		6th ($N=455$)		7th ($N=439$)		8th ($N=353$)	
Variables		Female	Male	Female	Male	Female	Male	Female	Male
Preparation and review of lessons	Means	13.23	12.16	12.17	11.52	13.02	12.04	9.88	10.88
	SD	4.31	4.41	3.89	3.77	4.14	4.31	3.31	4.18
Ability to tie what is studied at school to daily life	Means	18.65	17.97	17.58	16.90	17.17	16.67	15.08	16.04
	SD	3.50	3.89	3.64	3.64	3.51	3.85	3.75	3.63
Ability to review material	Means	12.10	11.95	12.00	11.67	12.55	11.28	11.35	11.04
	SD	2.93	3.03	2.95	3.09	2.83	3.55	3.28	3.37
Ability to study autonomously	Means	16.17	14.96	15.65	14.49	15.82	14.57	14.10	14.10
	SD	3.02	3.17	2.76	3.03	2.98	3.14	2.86	3.63
Note-taking ability	Means	10.06	8.92	10.29	8.45	11.04	9.90	10.88	9.96
	SD	1.90	2.09	1.79	2.24	1.29	2.04	1.44	2.05
Process orientation	Means	11.91	11.01	11.10	10.70	10.91	10.28	9.88	10.05
	SD	2.47	2.77	2.48	2.67	2.28	2.63	2.43	2.58

regulation, which is opposite of self-regulation, learners who have these abilities could study autonomously and showed self-determination, note-taking abilities, and the ability to review the study process. The fifth factor, "note-taking ability," is a skill that helps learners become more self-regulated. In many articles, "note-taking ability" has been pointed out as a self-regulatory strategy (Kitsantas, 2002). The sixth factor, "process orientation," is learners' engagement in mastery, rather than in performance outcome. Many researchers in motivation and self-regulation have suggested that the study process is more important than actual performance and grades. These results suggest that the "self-regulated learning ability" scale has acceptable scale reliabilities. Item-to-factor loadings, eigenvalues, and reliability estimates (Cronbach's alpha) for each of the six factors are shown in Table 7.1. For all factors of SRL ability, acceptable Cronbach's alpha reliability coefficients were revealed.

(b) MANOVA

As a preliminary check for robustness, the Box's M test for homogeneity of dispersion matrices was conducted. However, with the result significant at $p<.001$, robustness was not guaranteed. This may be related to the unequal sample sizes of the four subgroups. According to Tabachnick and Fidell (2007), in such circumstances, it is important to note the advantage of Pillai's trace criterion. Therefore, all the multivariate F values reported in the following parts are based on Pillai's trace.

Differences among groups were assessed by applying a 4×2 (grade × gender) multivariate analysis of variance (MANOVA) with the six subscales of SRL ability scored as dependent variables. Means and standard deviations are reported in Table 7.2. On the basis of Pillai's trace, and after analyzing the multivariate effect, univariate tests were performed. According to Huberty and

Table 7.3 Means and standard deviations for SRL for grade level

	5th ($N=440$)		6th ($N=455$)		7th ($N=439$)		8th ($N=353$)				
Variables	Means	SD	Means	SD	Means	SD	Means	SD	$F(3,1679)$	p	η^2
Preparation and review of lessons	12.70	4.49	11.85	3.82	12.53	4.28	10.38	3.90	25.19**	0.000	0.04
Ability to tie what students study at school to daily life	18.31	3.76	17.24	3.63	16.92	3.75	15.56	3.69	36.96**	0.000	0.06
To look over with materials	12.03	3.06	11.83	2.98	11.91	3.25	11.20	3.35	5.25**	0.000	0.01
Ability to study in autonomy	15.57	3.20	15.07	2.97	15.19	3.13	14.10	3.31	15.51**	0.000	0.03
Note taking ability	9.49	2.13	9.37	2.20	10.47	1.82	10.42	1.85	40.60**	0.000	0.07
Process orientation	11.46	2.70	10.90	2.57	10.59	2.49	9.96	2.51	23.58**	0.000	0.04

**$p<.01$

Morris (1989), a MANOVA followed by univariate analyses of variance keeps the experiment-wise error rate at the lowest level.

There was a statistically significant interaction between grade and gender, $F(18, 5028)=3.18$, $p<.001$, $\eta^2=.03$. All main effects for grade and gender were significant. An effect size was found for gender, $F(6, 1674)=34.96$, $p<.001$, $\eta^2=.11$, as well as for grade level, $F(18, 5028)=22.35$, $p<.001$, $\eta^2=.22$, though it was less pronounced.

Grade-Level Differences

According to the univariate tests, all of the variables of SRL were concerned. Post hoc comparisons using Tukey's HSD suggest that fifth and sixth graders in elementary school demonstrated higher SRL skills and strategies than seventh and eighth graders in junior high school, in most of the SRL strategies, except "note-taking ability." Means and standard deviations are reported in Table 7.3.

The univariate tests showed that the multivariate main effects of the factor "grade" were obtained for "preparation and review of lessons," $F(3, 1679)=25.19$, $p<.001$, $\eta^2=.04$. Fifth graders had higher scores than sixth and eighth graders, and seventh graders scored higher than eighth graders. There were no significant differences between 6th and 7th grade students. Significant main effects of grade were found also for "ability to tie what is studied at school to daily life" and

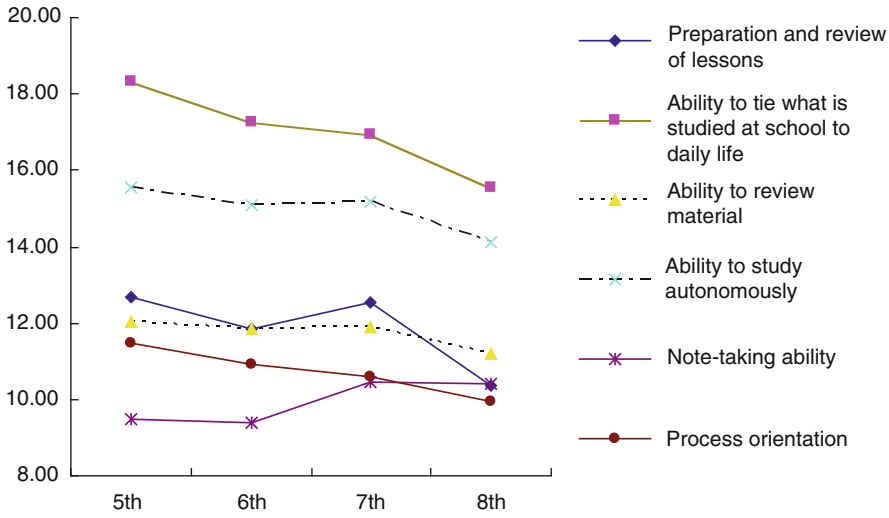

Fig. 7.1 Grade-level differences in SRL

"process orientation," $F(3, 1679) = 36.96$, $p < .001$, $\eta^2 = .06$, and $F(3, 1679) = 23.58$, $p < .001$, $\eta^2 = .04$, with fifth graders scoring higher than sixth, seventh, and eighth graders, and seventh grader scoring higher than eighth graders. No significant differences were found between 6th and 7th grade students. In addition, a significant main effect of grade was revealed for "ability to review material," $F(3, 1679) = 5.25$, $p < .001$, $\eta^2 = .01$, and "ability to study autonomously," $F(3, 1679) = 15.51$, $p < .001$, $\eta^2 = .03$. For each factor, eighth graders showed lower scores than fifth, sixth, and seventh graders. There were no significant differences among fifth, sixth, and seventh graders.

Only "note-taking ability" was reported as increasing in score as grade went up; it had a significant main effect, $F(3, 1679) = 23.58$, $p < .001$, $\eta^2 = .07$, with seventh and eighth graders scoring higher than fifth and sixth graders. There were no significant differences between fifth and sixth graders and between seventh and eighth graders (Fig. 7.1).

Gender Differences

For gender as a fixed factor, the multivariate test provided a significant result ($\eta^2 = .11$). Possible gender-related differences in the six SRL variables were tested by univariate analyses, whose results are presented in Table 7.4.

Gender-related differences were found in five subscales of the SRL, except "ability to tie what is studied at school to daily life." The univariate tests showed that multivariate main effects of the factor "gender" were obtained for "preparation

Table 7.4 Means and standard deviations for SRL for gender level

	Female ($N=849$)		Male ($N=838$)				
Variables	Means	SD	Means	SD	F(1, 1679)	p	η^2
Preparation and review of lessons	12.18	4.16	11.64	4.22	4.42**	0.036	0.00
Ability to tie what students study at school to daily life	17.25	3.81	16.91	3.81	1.57	0.211	0.00
To look over with materials	12.00	3.02	11.46	3.28	11.26**	0.001	0.01
Ability to study in autonomy	15.54	2.97	14.49	3.28	35.87**	0.000	0.02
Note taking ability	10.53	1.69	9.28	2.22	185.03**	0.000	0.10
Process orientation	11.00	2.53	10.48	2.67	12.39**	0.000	0.01

**$p<.01$

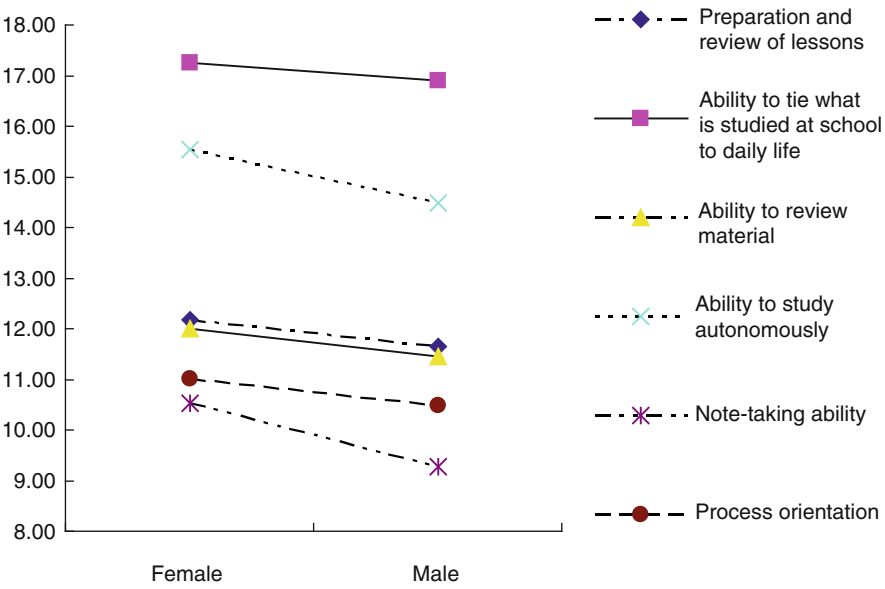

Fig. 7.2 Gender differences in SRL

and review of lessons," $F(1, 1679)=4.42$, $p<.05$, $\eta^2=.00$; "ability to review materials," $F(1, 1679)=11.27$, $p<.001$, $\eta^2=.01$; "ability to study autonomously," $F(1, 1679)=35.87$, $p<.001$, $\eta^2=.02$; "note-taking ability," $F(1, 1679)=185.03$, $p<.001$, $\eta^2=.10$; and "process orientation," $F(1, 1679)=12.39$, $p<.001$, $\eta^2=.01$. Female students demonstrated higher scores than males. No significant differences were found in "ability to tie what is studied at school to daily life" (Fig. 7.2).

Discussion

The present study investigated how SRL ability develops in the transition from elementary schools to junior high schools in Japan. One goal was to examine the relations between SRL, grade, and gender. It was hypothesized that some aspects of SRL ability of students in junior high schools decrease in the transition from elementary to junior high school, but some of them increase, as there are many types of SRL ability in psychology. In addition, female students would score higher in SRL than males, as supported by current research.

As we expected, grade-level differences were revealed. The scores for "preparation and review of classes," "ability to tie what is studied at school to daily life," "ability to review material," "ability to study autonomously," and "process orientation" decreased during the transition from elementary school to junior high school.

In the real world, social environment situations are ubiquitous. In the transition from elementary to junior high school, students experience many kinds of emotion, such as feelings of failure or shame at the grades or detentions they receive, which may undermine their intrinsic motivation (Ryan & Deci, 2006). This undermining of intrinsic motivation may lead to the decrease in SRL strategies and skills during this period.

As for the "ability to study autonomously," we could confirm that autonomy in SRL is important, because external regulation sometimes lowers engagement in tasks both in and out of school. Bandura (1989), a social cognitive theorist, defined autonomy as an action that is entirely independent of the environment. Deci and Ryan created a model of self-determination, which shifts from external regulation through introjected regulation and identified regulation to internal regulation (Deci, Vallerand, Pelletier, & Ryan, 1991). The term autonomy thus refers to regulation by the self (Ryan & Deci, 2006). Within the tradition of SDT, the importance of autonomy in human functioning has been examined in many studies. It is especially important for a learner to study autonomously, though such study apparently declines during adolescence. Further research is needed to improve this problem.

Autonomous SRL and self-initiated educational activity facilitate feelings of competence and motivation. On the other hand, negative feedback has generally been found to decrease motivation (Deci et al., 1991). It may be possible that when students graduate elementary school and enter junior high school, due to the change of the developmental and educational environment, they get not only more positive but also more negative feedback from their teachers, peers, and parents. This phenomenon might explain the decrease in SRL during this period.

The gender difference noted by many researchers was replicated in this study. In "preparation and review of classes," "ability to review material," "ability to study autonomously," "note-taking ability," and "process orientation," females scored higher than males; this was not so for "ability to tie what is studied at school to daily life." These gender differences have been shown cross-culturally by recent research.

For example, female students in both Eastern and Western European countries exhibit higher perceived self-efficacy to regulate their academic activities than do male students (Caprara et al., 2008; Pastorelli et al., 2001).

Self-Regulated Learning Process as a Creative Process

SRL as a Creative Process

Learners and students set their goals and monitor their thoughts, emotions, and behaviors during their learning process (Loyens, Magda, & Rikers, 2008). These processes—planning, monitoring, regulation, and evaluation—are integrated into metacognitive strategies, and as Kaplan (2008) mentioned, they lead to the use of tools and technology (e.g., "conforming creative"). In this meaning, SRL is a various creative process as Winne (2010) noticed, its observable indicators about cognition that students create as they engage with a task. Usually, self-regulated learners are proactive learners who incorporate various self-regulation processes (e.g., goal setting, self-observation, self-evaluation) with task strategies (e.g., study, time management, organizational strategies) and self-motivational beliefs (e.g., self-efficacy, intrinsic interest). Ziegler, Stoeger, and Grassinger (2011) separated various SRL strategies into three categories: (a) cognitive learning strategies, which are further differentiated according to their postulated functions (e.g., memorization, elaboration, organization); (b) metacognitive strategies that include, for instance, planning, self-monitoring, and self-evaluation; and (c) resource management, which can address both internal (e.g., regulation of motivation and emotions) and external resources (e.g., getting help). In sum, the SRL process is cyclical, in which steps are executed repeatedly. The processes that comprise SRL (self-evaluation, monitoring, goal setting, strategic planning, strategy implementation and monitoring, and strategic outcome monitoring) are practiced systematically over a long period of time (Boekaerts, Pintrich, & Zeidner, 2000; Schunk & Zimmerman, 2003; Stoeger & Ziegler, 2008). In addition, Tan, Oie, and Fujie (2011) insisted on the importance of investigating the relationship between SRL and creativity in a practical research plan. Self-regulation is an ability that allows one to adapt to a dynamically social environment. The human ability to generate new and meaningful ideas and experiences is termed as creative ability. Creativity and SRL are two essential constructs in psychology. Creativity is a part of learning. Eminent, historical creativity is accumulative of everyday, adaptive, and little creativity. Creativity is present when a person executes self-regulated tasks (e.g., strategic planning and goal monitoring) in everyday life and especially in times of uncertainty.

As noted earlier, SRL theory is based on Bandura's social cognitive theory and was developed by Zimmerman. Zimmerman (2004) assumed that self-regulated learners would regulate their academic behaviors and beliefs in three cyclical

phases: forethought (i.e., processes that precede any effort to act), performance control (i.e., processes occurring during learning efforts), and self-reflection (i.e., processes occurring after learning or performance). They insisted that the forethought processes influence the performance control processes, which in turn influence self-reflection processes. A cycle is completed when the self-reflection processes impact forethought processes during future learning attempts. It should be noted that these phases are cyclical, in that feedback from previous performances is used to make adjustments during future learning efforts (Zimmerman, 2000). These processes are creative, because learners refer to their past experience, knowledge, memory, and thoughts before and after their learning and performance, thus controlling how they study at both school and home. They involve the beliefs, attitudes, and processes that a student possesses, prior to engaging in a school-related activity such as studying or taking notes in class. Strategic planning involves selecting or creating a strategy that optimizes one's performance during learning attempts (Zimmerman, 2000). When autonomous motivation is undermined, there are well-documented costs in terms of performance, especially when it requires flexible and creative capacities (Ryan & Deci, 2006).

Autonomous motivation is advantageous for effective performance, especially on complex or heuristic tasks that involve deep information processing or creativity (Deci & Ryan, 2008). The effective use of self-regulatory strategies accomplishes a crucial part in enhancing autonomy, which are the motivational basis for SRL. A form of regulation, called intrinsic motivation, is also considered highly autonomous. Amabile (1983) demonstrated that extrinsically motivated behavior is less creative than behavior motivated by intrinsic interest. If one's motivation is authentic, then it is more likely to enhance creativity in the chosen activity (Deci et al., 1991). Amabile (1983) proposed that creative performance includes three major components—domain-relevant skills, creativity-relevant skills, and task motivation. Creativity-relevant skills determine the way in which problem-solving proceeds and relates to SRL.

Motivation and Creativity

Torrance (1974) demonstrated that a variety of motivational procedures affect creative functioning, thus furthering how the abilities involved in creative thinking are measured. In his theory, not only creative ability but also creative motivation and skills are necessary for creativity. Learners taught with a more controlling approach tend to learn less effectively, especially when learning requires conceptual, creative processing (Amabile, 1996; Ryan & Deci, 2000). Indeed, the literature has identified intrinsic motivation as the form of motivation that is most closely associated with creativity (Amabile, 1983). Thus, it is clear that both autonomous motivation and SRL strategies are necessary to elicit a learner's potential capacity for creativity.

Development of Creativity and SRL in Transition from Elementary School to Junior High School

"Fourth Grade Slump" in Creativity

In the 1960s, the psychologist Torrance, called the "father of creativity," examined children's scores on a creative thinking test he designed and found that scores tended to decline in fourth grade. He called it the "*fourth grade slump"* (e.g., Torrance, 1968). After a series of his studies, many researchers in the field of creativity also showed the presence of slumps around this age, which may be correlated with developmental transitions.

Development of SRL

Developmental motivation researchers have shown that as students make the transition to middle school, they often suffer decreases in self-motivation, task values, and intrinsic interest in academic tasks (Eccles et al., 1989). Eccles et al. (1993) argued that the motivational declines noted in middle school students are often the result of a poor fit between the students' psychological needs and the educational environment of middle schools (Eccles et al., 1993). The transition from elementary school to junior high school involves a major environmental change that can tax individual SRL (Caprara et al., 2008). While adolescents need to feel autonomous and are cognitively and developmentally able to take on greater levels of independence and personal control (Pintrich & Schunk, 2002), they often are not provided with sufficient opportunities to develop and exercise their autonomy within the classroom (Feldlaufer, Midgley, & Eccles, 1988). Students who struggle to study both inside and outside a school environment have a poor knowledge base of effective self-regulated strategies and do not understand how to select, evaluate, and adjust faulty strategies that are not working effectively (Cleary & Zimmerman, 2004). Therefore, we predicted some decline in SRL ability after the transition from elementary school to junior high school. The aim of this study was to investigate the developmental change of SRL ability from elementary school to junior high school.

Gender Differences in SRL

In addition to grade, gender is important for understanding differences in SRL (Ablard & Lipschultz, 1998). Zimmerman and Martinez-Pons (1990) found that girls reported greater use of SRL strategies than boys among middle and high school students. Another aim of the present study was to examine gender differences in SRL. As Ablard and Lipschultz (1998) noted in a study of SRL among seventh

graders in the United States, girls reported more frequent use of SRL strategies that optimize the immediate environment or personal regulation than boys. They used the Self-Regulated Learning Interview Schedule (SRLIS; Zimmerman & Martinez-Pons, 1986) to measure the seventh graders' SRL abilities. The SRLIS consists of eight contexts: remembering information from a class discussion, completing a short paper, completing math homework containing a problem that is not understood, checking homework assignments like science or English exercises, preparing for a test in reading or writing, taking a test, completing homework while faced with distractions, and studying at home. Some of these contexts might not be adapted easily to participants in an Eastern culture, because in classrooms at elementary and middle schools in Eastern cultures, both discussion and completing a short paper are sometimes not a part of the main teaching style. In the present study, we attempted to develop an SRL scale for Japanese pupils and students. We also investigated how SRL ability was influenced by gender during the transition from elementary school to junior high school in Japan. A further goal was to examine the relations of grade and gender to SRL ability. It was hypothesized that some aspects of the SRL ability of students in junior high school decrease in the transition from elementary school, while others may increase, as there are many different types of SRL ability. In addition, female students may score higher in SRL ability than males, as many researchers have mentioned. As noted above, female students apply more advanced self-regulatory learning strategies than male students (Ablard & Lipschultz, 1998; Zimmerman & Martinez-Pons, 1990), and compared with male students, female students exhibit higher self-regulatory efficacy and a lesser decline in SRL ability as they progress through the educational system (Caprara et al., 2008).

The issue of grade differences in SRL has received some attention (Zimmerman & Martinez-Pons, 1990). However, information is lacking regarding the developmental changes in students' strategy use. It was expected that an increase in grade level would be associated with greater development in SRL ability, so participants in this study were selected from both elementary and junior high schools. It was expected that female students would report greater use of SRL strategies compared with males. The possible interaction effect of grade and gender on SRL ability was also examined.

Creativity and SRL could be explained by "ability to tie what is studied at school to daily life." The process of being able to tie what students study at school to their daily lives is a kind of necessary creative ability, able to create new ways of solving problems in daily tasks and routines. As SRL is a variable creative process, its observable indicator of cognition is the way students create as they engage with a task. Usually, self-regulated learners are proactive learners who incorporate various self-regulation processes. The relationship between SRL and creativity must be investigated more practically in the future. For learners, SRL and creativity are connected to academic performance. For example, academic performance is significantly better when students receive training in creating mental imagery devices, such as keywords, than when they learn simple rehearsal techniques (Bulgren, Hock, Schumaker, & Deshler, 1995; Gettinger & Seibert, 2002). We should consider what the basis of autonomous motivation is as well as how it affects performance in

academic results. We could propose a view that self-efficacy has an influence on creativity, by serving as a mediator between motivation and creativity. Self-efficacy belief is a strong motivational force for creative production (Bandura, 1997; Tan, Lie, & Rotgans, 2011). Tierney and Farmer (2002) demonstrated that creative self-efficacy was an important motivational antecedent for creativity. Future research is needed to identify how exactly creative self-efficacy affects motivation and SRL in developmental phases from childhood to early adolescence.

Acknowledgment Preparation of this chapter was supported in part by a research grant from the Grants-in-Aid for Social Scientific Research (research project number 17011021) by Japanese Ministry of Education, Culture, Sports, Science and Technology.

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Chapter 8
Creativity Self-Efficacy and Its Correlates

Ai-Girl Tan, Tianchang Li, and Heinz Neber

Introduction

Creativity Self-Efficacy

Creativity self-efficacy refers to "the belief one has the ability to produce creative outcomes" (Tierney & Farmer, 2002, p. 1453). It is a form of self-evaluation that influences decisions regarding the amount of effort and the persistence level undertaken when encountering challenges creatively (Bandura, 1977). Self-efficacy belief is a major driving force for creative actions (Bandura, 1997). Creative self-image is an important motivational component in developing creativity (Ford, 1996).

Growing empirical evidence has manifested direct or reciprocal links between efficacy beliefs and creativity-related outcomes (Beghetto, 2006). Carmeli and Schaubroeck (2007) reported the influence of an individual's perceived expectations of their work supervisor, customers and family on the individual's creative involvement at work. The finding is consistent with that of McNatt and Judge (2004): Deliberately raising expectations led to sustained higher performance only among self-efficacious individuals.

In Tierney and Farmer's (2002) study, 584 (mostly blue-collar) and 158 (white-collar) employees from two firms participated in the survey. Job tenure, job

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_8,
© Springer Science+Business Media Singapore 2013

self-efficacy, supervisor behaviour and job complexity contributed to creativity self-efficacy beliefs. In addition, job self-efficacy was found to be the strong predictor of creative self-efficacy. The creative performance among white-collar employees was largely efficacy driven. Creativity self-efficacy predicted creative performance beyond the predictive effects of job self-efficacy.

Choi's (2004) study was based on longitudinal multisource data from 430 students on an introductory business course at a North American business school. In the survey, the underlying psychological processes included two aspects: creative self-efficacy and creative intention. Findings from a confirmatory structural equation modelling (SEM) analysis supported all hypotheses of the study. The study concluded that creative self-efficacy and creative intention mediate the effects of individual characteristics (e.g. personality and creative ability) and social influences (e.g. supportive leadership and open group climate) on creative performance.

Creative Personality

Studies on creative personality showed that the large effect sizes were observed for openness, conscientiousness, self-acceptance, hostility and impulsivity (Feist, 1998). King, Walker, and Broyles (1996) examined the relations among the five-factor model of personality, creative ability and creative accomplishments. Seventy-five subjects completed measures of verbal creative ability and openness to experience and listed their creative accomplishments. Openness to experience and extraversion were positively correlated with creative ability. Openness was also associated with higher levels of creative accomplishments. Agreeableness was negatively correlated with creative accomplishments. As for conscientiousness, the regression analysis showed no clear result. Interestingly, at low levels of creative ability, there was a positive relationship between creative accomplishments and conscientiousness. However, for those highest in creative ability, a negative relationship between conscientiousness and accomplishments could be seen.

McCrae (1987) investigated the connection between openness to experience and divergent thinking in a study of 268 male participants. The self-ratings of openness to experience were consistently associated with nearly all measures of divergent thinking. This finding was in line with Helson's (1999) view that openness and originality can be regarded as "cardinal characteristics" for creativity.

Characteristics such as conscientiousness and conventionality are observed predominantly in less creative scientists in science and arts (Feist, 1998). McMullan (1978) showed that creativity requires possession of a paradoxical personality (e.g. openness versus a drive to close incomplete gestalts, and acceptance of unconscious material into consciousness versus maintenance of a strong sense of reality). Based on the studies above, we suggest the first hypothesis (H1): Openness, extraversion, conscientiousness, agreeableness and non-neuroticism have a positive relationship with creativity self-efficacy.

Achievement Goal Orientation and Creativity Self-Efficacy

Beghetto's (2006) study examined creativity self-efficacy and its potential correlates. A total of 1,322 students with mean age of 14 years old from two middle schools and one high school located in Pacific Northwest America took part in the study. Results showed that students' mastery- and performance-approach beliefs and teacher feedback on creative ability were positively related to students' creative self-efficacy. Creativity self-efficacy was also linked to student reports of their teachers not listening to them and sometimes to feeling that their teachers had given up on them. In addition, students with higher levels of creative self-efficacy were significantly more likely to report higher levels of participation in after-school academics and after-school group activities than their counterparts whose creative self-efficacy was lower.

Hill, Tan, and Kikuchi (2008) explored the relationship between creativity self-efficacy and achievement goal orientation. A total of 416 international high school students in Singapore participated in their study. A 10-item creativity self-efficacy scale was adopted. According to their findings, creativity self-efficacy was positively correlated with a mastery-approach orientation. The relationships between the other three achievement goal orientations (performance approach, performance avoidance and mastery avoidance) and creativity self-efficacy were not as clearly established. Each subscale of achievement goal orientation positively correlated with some but not all aspects of creativity self-efficacy. With reference to the above review, we propose the second hypothesis (H2): Mastery goal orientation is a stronger predictor of creativity self-efficacy than performance goal orientation.

Individualism/Collectivism

Some attributes of creativity include independence, autonomy and willingness to overcome obstacles and defy the crowd by standing up to one's own conventions (Sternberg & Lubart, 1995, 1999). People who are judged as highly creative by their peers conform consistently less often to the group's opinion than do people judged as less creative (Sternberg & Lubart, 1995). Comparatively, these characteristics are imbedded in individualistic culture (Fiske, Kitayama, Markus, & Nisbett, 1998). Bond and Smith's (1996) meta-analysis suggested that Asians demonstrated a stronger tendency to conform than did Americans.

Goncalo and Staw (2006) conducted a study among 204 students at a large American university in an introductory course on organizational behaviour. The sample was made up of 59% Asian-American and 23% European-Americans. Their study found that individualistic groups were more creative than collectivistic groups. Individualistic groups instructed to be more creative were more creative than collectivistic groups that received the same instruction.

Zha, Walczyk, Griffith-Ross, and Tobacyk's (2006) sample included 55 American graduate students, born and raised in the United States, and 56 Chinese graduate students, born and raised in China. Creative potential was measured with the

Creativity Assessment Packet. Individualism–collectivism orientation was measured with the Individualism–Collectivism Test designed by Triandis (1994). As expected in the hypothesis, Americans displayed significantly higher scores on a measure of creative potential than the Chinese did. In addition, Americans showed greater individualism, while Chinese were more collectivistic. The study did not provide sufficient evidence to support the hypothesis that within each of the two cultures, individualism–collectivism was associated with creative potential. Accordingly, we suggest the third hypothesis (H3): Within one culture, individualism will be a stronger predictor of creative self-efficacy than collectivism.

Creativity Self-Efficacy and Extracurricular Activities

Beghetto's (2006) study, in which students' after-school activities were grouped into three categories – after-school academic activities, group activities and passive activities – showed that students with higher levels of creative self-efficacy were significantly more likely to report higher levels of participation in after-school academics and after-school group activities. Accordingly, the fourth hypothesis is proposed (H4): Students with higher creativity self-efficacy differ in their after-school activities as compared to students with lower creativity self-efficacy.

Method

Participants

A total of 545 students mainly from six secondary schools in Shanghai participated in this study. They consisted of 245 (45%) males and 300 (55%) females. The participants were aged between 12 and 19 years old ($M = 14.7$, $SD = 1.73$). They completed the survey online.

Measures

Creativity Self-Efficacy Scale (CSE)

The multidimensionality of creative self-efficacy is determined by the nature of self-efficacy (Bandura, 1997). The creative self-efficacy scale consisted of 29 items developed to assess the respondents' beliefs that they are capable of being creative. These items were phrased mostly in terms of "can do". The measure was developed based on multiple resources (e.g. Amabile, 1996; Beghetto, 2006; Tan, 2007;

Tierney & Farmer, 2002). The skewness and kurtosis of each item was computed to ensure that the item met the normality assumption and could be subject to further analysis. As all values of skewness and kurtosis were 1.64 or higher, the items were subjected to factor analysis. The exploratory factor analysis was computed using principal component analysis. Five factors were extracted from the analysis accounted for 62.82% of variance. The Kaiser–Meyer–Olkin Measure of Sampling Adequacy (KMO-MSA) is an index of comparing the magnitudes of the observed correlation coefficients to the magnitudes of the partial correlation coefficients. The Bartlett's Test of Sphericity (BTS) is a statistical test examining the presence of correlations among the variables. The KMO-MSA for all subscales of creativity self-efficacy ranged from moderate to high: .87 (factor 1), .85 (factor 2), .68 (factor 3), .89 (factor 4) and .89 (factor 5) at the BTS, $p < .001$. The eigenvalues for all factors are as follows: 13.74 (factor 1), 1.61 (factor 2), 1.27 (factor 3), 1.16 (factor 4) and 1.07 (factor 5). The cut-off point for the factor loading of each item was set at .40. The correlations of the factors ranged between .33 and −.53. Cronbach's alphas of the factors were high: *idea generation* (factor 1: $\alpha = .88$, seven items, e.g. I am good at combining existing ideas), *concentration* (factor 2: $\alpha = .85$, six items, e.g. I can focus on doing something valuable), *tolerance of ambiguity* (factor 3: $\alpha = .73$, three items, e.g. I can delay judgement when coming up with ideas), *independence* (factor 4: $\alpha = .88$, six items, e.g. I can work on task that allow for my evaluation) and *working style* (factor 5: $\alpha = .88$, seven items, e.g. I am willing to master knowledge I need for creative tasks).

Personality Scale

The mini Big-5 personality inventory consisted of 40 items (Saucier, 1994): extraversion, agreeableness, conscientiousness, neuroticism and intellect or openness. Responses for this scale were based on a 9-point scale ranging from 1 (strongly disagree) to 9 (strongly agree). Cronbach's alphas for the five subscales of the present study ranged moderate to high: openness (eight items, e.g. creative) was .60, extraversion (eight items, e.g. extroverted) was .68, agreeableness (eight items, e.g. kind) was .70, non-neuroticism (eight items, e.g. relaxed) was .76 and conscientiousness (eight items, e.g. efficient) was .71.

Mastery/Performance-Approach Scale

Students' achievement goal orientation was assessed using Elliot and McGregor's (2001) Achievement Goal Questionnaire. The original questionnaire was made up of four subscales, each examining one of the following factors: the students' performance approach, performance avoidance, mastery approach and mastery avoidance orientation. Three items for each of the four goals were devised. The result of the first pre-study showed that there was no significant correlation between creativity self-efficacy and the performance avoidance or mastery avoidance approach.

Accordingly, the subscales of performance approach and mastery goal approach were adopted. The three items for mastery approach were "I want to learn as much as possible from this class", "It is important for me to understand the content of this course as thoroughly as possible", "I desire to completely master the material presented in this class". The three items for performance approach were "It is important for me to do better than other students", "It is important for me to do well compared to others in this class", and "My goal in this class is to get a better grade than most of the other students". Responses were taken from a 7-point Likert scale ranging from 1 (not at all true of me) to 7 (very true of me). Cronbach's alpha for mastery approach of the present study was .83 and was .89 for performance approach.

Individualism–Collectivism (IC) Value Scale

The IC value subscale was part of the IC scale (Triandis, 1994) which developed to measure individuals' perceptions of their obligations to themselves and to society (i.e. the extent to which their culture of origin is individualistic or collectivistic). It was divided into three subtests (factors): self-concept (e.g. "What makes me feel good?"), attitudes (e.g. "What happens to me is my own doing") and values (e.g. "National security is not important to me"). In the two pre-studies, only the value subtest showed sufficient reliabilities, and thus only this subscale was adopted in the present study. The value subtest has ten statements, each requiring a self-evaluation ranging from 1(the value is rejected), 0 (value is not at all important to the participant) to 7 (value is of supreme importance). In both these two subtests, odd-numbered items stood for collectivistic value, while even-numbered items stood for individualistic tendency. Alpha reliability scale of the present study was .82 (five items, e.g. "national security") and that for the collectivistic value scale was at .85 (five items, e.g. "my own freedom of action and thought").

In addition, the participants of the study reported their age, gender and class. They rated their average weekly participation in after-school activities (i.e. after-school academic activities, group activities and passive entertainment) using a four-point scale ranging from 1 (never) to 4 (5/6 times a week or more).

Procedures

The participants provided their responses in a web-based or an online environment. They were directed to a weblink, were given a password and were allowed to complete the questionnaire in their own pace. The participants were ensured that the information they provided would be kept with high confidentiality. Two online pre-studies were carried out prior to the present study by 30 junior high school students, aged 14–15 years old (pre-study 1), and 50 high school students, with ages ranging from 13 to 18 years old (pre-study 2). The pre-studies served as feedback loops

of to ensure reliabilities and validities of the measures in the Chinese contexts (information of pre-studies will be provided upon request). As designed, questionnaires could not be submitted online without completing all the items. Consequently, there was no missing data.

Translation and Back-Translation

Two scales were translated into the Chinese language and back translated into the English language independently by two bilingual persons: creativity self-efficacy scale and the individualistic/collectivistic scale. To ensure equivalence in meaning, the translated and back-translated versions of the scales were compared. Expressions of items that showed discrepancies in meaning were modified. For example, the item "I am good at combining the existing ideas" was back translated to "I am good at integrating the existing ideas", suggesting that the word "combine" is synonymous with "integrate". However, "integrate" can imply processes such as organizing and summarizing. Consequently, the Chinese version was refined to ensure close meaning to the original version of the scale.

Results

Correlates for Creativity Self-Efficacy

Mean, standard deviation and correlations (bivariate, Pearson) of all scales were computed. Table 8.1 summarizes the findings. The findings did not support fully H1. Nearly all personality subscales (extraversion, openness, agreeableness and conscientiousness) correlated positively with all subscales of creativity self-efficacy. Emotional stability correlated positively only with creativity self-efficacy in concentration.

Predictors for Creativity Self-Efficacy

Both mastery- and performance-approach goal orientations correlated positively with all the subscales of creativity self-efficacy at Pearson correlation, $r = .28–.49$. All subscales of creativity correlated positively at $r = .11–.22$ with the individualistic value and collectivistic value (except creativity self-efficacy in idea generation). Results of linear regression analyses (stepwise) yielded inconclusive support for H3. Performance goal approach entered earlier than mastery goal orientation into regression for creativity self-efficacy in idea generation, working style and tolerance; vice versa was observed for creativity self-efficacy in concentration and independence.

Table 8.1 Mean, standard deviation and Pearson correlation of all measures

	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. cse_idea	3.85	.79	–													
2. cse_contre	4.04	.73	.61**	–												
3. cse_toler	3.64	.91	.52**	.50**												
4. cse_indep	3.83	.78	.73**	.67**	.54**											
5. cse_works	3.77	.78	.72**	.72**	.54**	.75**										
6. extravert	5.35	.86	.30**	.16*	.12**	.27**	.24**									
7. agreeable	5.85	.96	.22**	.31*	.20**	.24**	.28**	.36**								
8. conscie	6.55	.87	.28**	.41*	.28**	.33**	.41**	.22**	.47**							
9. emtion stable	5.79	1.00	-.01	.09*	.07	.03	.06	.22**	.43**	.36**						
10. openne	5.94	1.07	.56*.	.41**	.24**	.41**	.44**	.17**	.20**	.31**	-.10*					
11. mastery	5.99	1.13	.37**	.49**	.28**	.40**	.45**	.18**	.36**	.33**	.08	.56**				
12. perform	5.17	1.37	.36**	.40**	.28**	.38**	.31**	.15**	.20**	.38**	.00	.27**	.17**			
13. collect_v	5.81	.91	.08	.16**	.11*	.13**	.20**	.14**	.29**	.18**	.17**	.16**	.13**	.10*		
14. indiv_v	5.96	.92	.22**	.20**	.19**	.22**	.24**	.22**	.25**	.19**	.10*	.39**	.37**	.13**	.76**	

Note: $N = 545$, except for 12 -performance goal orientation, $n = 465$

* $p < .05$, ** $p < .01$

cse_idea creativity self-efficacy in idea generation, *cse_contre* creativity self-efficacy in concentration, *cse_toler* creativity self-efficacy in tolerance, *cse_indep* creativity self-efficacy in independence, *cse_works* creativity self-efficacy in working style, *extravert* extraversion, *agreeable* agreeableness, *conscie* conscientiousness, *emotion stable* emotional stability, *openne* openness, *mastery* mastery goal orientation, *perform* performance goal orientation, *collect_v* collectivism – value, *indiv_v* individualism- value

Support for H3 was more conclusive for individualistic value that entered earlier than collectivistic value (idea generation) or that entered alone (tolerance, independent, working style and concentration) into regression. Table 8.2 summarizes the findings.

Difference in After-School Activities Across Creativity Self-Efficacy Groups

A second exploratory factor analysis on the five subscales of creativity self-efficacy yielded one component structure accounted for 70.86% of variance (KMO-MSA = .88, BTS chi-square = 1621.24, $p < .001$). The eigenvalue of the component was 3.53, and the factor loadings of the subscales ranged between .71 and .89. The alpha reliability of the five subscales was .89. To generate one score of creativity self-efficacy, all scores of the subscales of creativity self-efficacy were summed and then divided by the number of subscales. The form two groups of participants based on their self-rated creativity self-efficacy scores, mean for all subscales of creative self-efficacy scale was first computed ($n = 545$, $M = 3.83$, SD = .67). The participants of the study with total score over 3.84 were grouped into a high creativity self-efficacy group ($n = 268$, $M = 4.39$, SD = .37), and those with a total score 3.83 and below were grouped into a low creativity self-efficacy group ($n = 277$, $M = 3.28$, SD = .38, $t[543] = 34.58$, $p < .001$, $d = 3$). The two independent t-test on after-school activities supported the hypothesis (H4) that the high creativity self-efficacy group differed significantly from the low creativity self-efficacy group in nearly all activities except "doing homework", with effect sizes ranging between .15 and .49. The resulting d values were interpreted using the general guidelines of .2 = small, .5 = moderate and ≥ .8 = large (see Cohen, 1988). Table 8.3 summarizes the findings.

Discussion

The study explored the construct of creativity self-efficacy and its correlates in a Chinese high school student's context. Five hypotheses related to correlations of creativity self-efficacy with personal and contextual variables were proposed. Nearly all positive aspects of personality (H1) correlated positively with all the subscales of creativity self-efficacy (i.e. idea generation, concentration, tolerance, independence and working style) (Table 8.1). As articulated in the mini-c theory (Beghetto & Kaufman, 2007), the transformation and interpretation of experiences into new understanding is ultimately a personal creative process (Runco, 2004).

As seen from the results of this study, the classroom environment played an important role in influencing whether students feel strong in creative self-efficacy. The findings were in line with the recommendation of Feldhusen and Treffinger

Table 8.2 Regression (stepwise) analysis with creativity self-efficacy scales as dependent variables

	Performance approach					Mastery approach				
	R^2	Adjusted R^2	*B*	*t*	*p*-value	R^2	Adjusted R^2	*B*	*t*	*p*-value
CSE_idea(1)	.17	.16	.13	4.51	<.001			.16	4.48	<.001
CSE_toleran(1)	.10	.09	.13	3.61	<.001			.13	3.00	.003
CSE_concent(2)			.10	3.83	<.001	.26	.25	.25	7.83	<.001
CSE_independ(2)			.19	5.27	<.001	.19	.19	.19	5.28	<.001
CSE_works(2)			.17	6.15	<.001	.25	.25	.19	5.55	<.001
		Individualistic	*Value*				*Collectivistic*	*Value*		
	R^2	Adjusted R^2	*B*	*t*	*p*-value	R^2	Adjusted R^2	*B*	*t*	*p*-value
CSE_idea	.07	.07	.33	6.14	<.001			−.19	−3.52	<.001
CSE_concent	.04	.04	.16	4.76	<.001					
CSE_toleran	.03	.03	.18	4.40	<.001					
CSE_independ	.05	.05	.18	5.22	<.001					
CSE_works	.06	.06	.20	5.79	<.001					

Note: (1) Performance approach entered into the analysis followed by mastery approach. (2) Mastery approach entered into the analysis followed by performance approach

Table 8.3 Mean, standard deviation, *t*-value *p*-value and effect sizes (Cohen's d)

	Creativity self-efficacy						
	High		Low				
	M	SD	*M*	SD	*t*	*p*	*d*
1. Working on homework	3.88	.40	3.81	.60	1.59	.12	.18
2. Meeting with tutor	2.09	.96	1.90	.75	2.49	.01	.20
3. Reading, writing or science activities that were not homework	2.43	.99	1.96	.80	6.15	<.001	.47
4. Other	1.45	1.49	.92	1.14	4.65	<.001	.36
5. Attending school activities like band, drama, art	1.79	.85	1.48	.64	4.72	<.001	.36
6. Practising or played on a sports team	3.15	.85	2.81	.89	4.56	<.001	.40
7. Attending Music, art, dancing or other courses	1.83	.92	1.52	.70	4.53	<.001	.36
8. Joining students` union or other school organization	1.84	.89	1.46	.66	5.70	<.001	.43
9. Other	1.08	1.31	.64	.96	4.49	<.001	.49
10. Playing video games	2.13	.98	1.98	.83	1.96	.05	.15
11. Watching Television	2.79	.85	2.57	.84	3.10	<.002	.26
12. Hanging out with friends	2.78	.96	2.50	.90	3.59	<.001	.29

Note: *n* of high creative self-efficacy group = 268, *n* of low creative self-efficacy group = 277

(1980), positive observation in Moore's (1997) study, providing a cohesive, investigative and task-oriented classroom environment for individual and group work and for students to integrate information to solve real-world problem.

Within the Chinese high school context, individualistic value is a better predictor of all subscales of creativity self-efficacy than collectivistic value does (H3). Instead of viewing individualistic values and collectivistic values as two dichotomies of the Asian and American cultures, we may begin to accept the fact that within a culture, individualistic and collectivistic values coexist. We may also like to accept the notion that creativity self-efficacy is a multidimensional construct. The inconclusive findings between mastery and performance approaches and creativity self-efficacy (H2) suggest the further investigation of the roles of various creativity subscales. Apparently, individualistic value explained between 3 and 7% of the various creativity self-efficacy subscales. Performance approach explained 9–16% of creativity self-efficacy in idea generation and in tolerance, whereas mastery approach explained 19–15% of creativity self-efficacy in concentration, independence and working style (Table 8.2). The finding has yet provided further evidence in terms of the relationship between academic goal orientation and creativity self-efficacy as suggested in the previous studies (Beghetto, 2006; Hill et al., 2008). High creativity self-efficacy group differed significantly from low creativity self-efficacy group in almost all after-school activities except working on homework (Table 8.3). The findings seem to suggest that students with high creativity self-efficacy are more active in various after-school activities than their low creativity self-efficacy friends do. Beghetto and Kaufman (2007) suggested that rather than focusing on academic grades and test scores, it is essential to help students consider what they did well and how they might improve in the future would be of more positive meaning.

The study enhanced our view that creativity self-efficacy is multidimensional. Each dimension may have different influence on the specific psychological process. The multidimensionality of creativity self-efficacy fits into the theory of self-efficacy of Bandura (1977) that self-beliefs exert influence on cognitive, motivational, decision-making and affective processes of a person. Creativity self-efficacy can be momentary which may vary according to experience (Tan, Ho, Ho, & Ow, 2008). Self-efficacy involves personal evaluation with reference to feedback and knowledge of a domain or a theme (Bandura, 1977). Accordingly, future studies on creativity self-efficacy shall adopt an experimental or an intervention study design to explore the possible change in dimensions of creativity self-efficacy in the presence of peer and teacher feedback, achievement (success) and skill or knowledge enhancement.

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Chapter 9
Personal Epistemology and Its Relationship with Creativity

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Personal Epistemology and Cultural Difference

Personal epistemology is a vital topic in developmental and educational psychology. It focuses on the individual beliefs of knowledge and knowing (Hofer, 2004). In 1950s, personal epistemology studies focused on the concept of knowledge and knowing of university students in the USA (Perry, 1970). The field of personal epistemology studies has expanded for the past decades. The studies explored people's beliefs on the definition, structure, source, construction, and evaluation of knowledge (Hofer, 2008), as well as the beliefs on speed of knowledge acquisition and on learning ability (Schommer-Aikins, 2004). The definition, structure, and influencing factors of personal epistemology were examined using semi-structural interviews, think-aloud protocols, self-rating questionnaires, and classroom observation. Examples of theories of personal epistemology are models of epistemological development, reflective judgment model (King & Kitchener, 1994; Perry, 1970), and embedded systemic model (Schommer-Aikins, 2004). Research was recently enriched by some cross-cultural comparisons (Hofer, 2007; Qian & Pan, 2002).

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_9,

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Reflective Judgment Model: Stages

Personal epistemology, according to the reflective judgment model (King & Kitchener, 1994), develops from viewing knowledge as definite and absolute to relatively uncertain, contextual, and subjective and from basing judgment on observation and lack of justification to using multiple ways of justification with criterion (King & Kitchener, 1994, 2004). It could be divided into seven stages and three levels. The three levels are pre-reflective level, quasi-reflective level, and reflective level. The pre-reflective level consists of three stages. People on the first stage consider knowledge as concrete and absolute, which is only derived from direct observation. Accordingly, justification is considered unnecessary. People on the second stage consider knowledge also as concrete and absolute. Moreover, they believe in authority. Thus, justification is not necessary or could be completed by authority figures. People on the highest stage of this level could distinguish between personal opinions and absolute truths; however, they do not know the connection between them. So from their perspective claims are either uncertain personal opinions or absolute truths. The fourth and fifth stages are at the quasi-reflective level. People on the fourth stage consider knowledge as ambiguous to some degree and justification as giving and choosing evidence. They are also aware of situational factors. People on the fifth stage understand the importance of contextual and subjective factors in understanding knowledge. They realize people's perception and criterion will influence judgment, and the inquiry and interpretation would help with their justification procedure. The highest level, reflective level, includes two stages. People on the sixth stage view knowledge as derived from different resources. It could be justified by comparing evidences, evaluating evidence according to some criterion, and finally making the decision. People on the highest stage consider knowledge as the outcome of inquiry, which is generally comparing and evaluating current evidence. They understand that reevaluation is necessary when there is new evidence, perspective, or tools. Additionally, they take criterion into consideration while making decision for a conclusion. Based on the criterion, value and risk calculation is possible. Actually, not every person can reach the highest level through life. A qualitative study (Baxter Magolda, 2004) investigated the characteristics of undergraduates' personal epistemology by asking series of questions of their learning activities. In this study, five stages instead of seven stages were identified: absolute knowing, transitional knowing, independent knowing, contextual knowing, and external formula. Most of the traits of the two theories are actually similar, which indicate that through stages personal epistemology of people becomes more flexible and complex.

Personal Epistemology: A Belief System

Personal epistemology as a belief system focuses on the content of epistemology. Perry (1968) divides personal epistemology as a belief system into the belief about knowledge and belief about the learners. The former includes several questions such

as whether knowledge is systematic, whether it is absolute, and whether it could be judged by empirical data. The latter includes questions such as whether learners are inherent and learning ability could also be developed.

Personal Epistemology as Embedded Systems

Personal epistemology as embedded systems (Schommer-Aikins, 2004) comprises cultural system, beliefs about knowledge, about knowing, about learning, class performance, and self-regulated learning. These systems are interacted with each other. This approach includes not only beliefs about knowledge and knowing but also questions about the individual and cooperative learning and learning contexts.

The Relationship Between Personal Epistemology and Creativity

Personal epistemology as a concept of basic cognition relates to ability or skill concepts, such as implicit intelligence and self-regulated learning (Braten & Strømsø, 2005) and mathematic learning strategies (Muis, 2004). Creativity is an ability that relies on such basic construe of knowing. A study conducted by Paletz and Peng (2009) implies some similarity between dialectic thinking and creativity. Dialectic thinking or dialectic epistemology (Benack, Basseches, & Swan, 1989) was regarded as a holistic, organized worldview in which phenomena are interpreted in terms of dialectic, comprising contradiction and change. It had a close relationship with epistemology or an overlapping definition with creativity. Tolerance of ambiguity and openness which are essential traits of the creative individuals (Barron, & Harrington, 1981) relates to the embedded beliefs such as the certainty and development of knowledge.

Creativity is measured by ill-structured problems. These problems and their concept spaces challenge people to possess knowledge and to use knowing beliefs to clarify doubts. Those types of the problem were used in measuring personal epistemology (RCI, Reasoning About Current Issues Test, King & Kitchener, 2004). The evidence listed above suggests the relationship between personal epistemology and creativity. Our study aims to explore Chinese students' personal epistemology system and to understand the relationship between personal epistemology and creativity.

Methods

The Participants

A total of 165 participants from four universities in Beijing, China, took part in the study. The participants included 65 males and 70 females. Their mean age was 21 years old (range: 18–25, and SD = 1.29 years old). Sixty-five of them

were freshmen or sophomores, and 70 of them were junior or senior students. They were students from departments of computer science, law, social work, and so on.

Measures

Personal Epistemology

A questionnaire was constructed with reference to King and Kitchener's (1994) reflective judgment model and reasoning about current issues test (RCI). Some questions requested the participants of the study to present their views on ill-structured problems (e.g., the reason of smoking addiction and the genetically modified food controversy). Some questions were related to dimensions. The questionnaire consisted of open-ended questions and multiple-choice items. Students ranked or used a Likert scale to rate an ill-structured issue and related evidence. In the smoking addiction issue, for example, the participants were asked to share their views on the reason of smoking addiction (biological or psychological), their prediction of the possibility of changing their answers, the way they ranked and evaluated some evidence, the way to find evidence, and their evaluation principles. The questionnaire and coding schema were organized in three parts.

The first part comprised questions about knowledge, including the uncertainty, need for justification, and complexity of knowledge. The complexity of knowledge denoted the individual's tendency to categorize knowledge, their concern of subjectivity, and the contextual factors of knowledge. An example of the question was related to smoking addition (e.g., how the participants thought of an absolute answer for the question, whether they considered subjectivity of some evidence and the contextual factors, how they thought of the possibility of justification). The second part comprised questions on knowing, including the source of knowledge and justification methods. For example, the participants were asked about where they would like to find supportive evidence for their argument, as well as how they evaluated and selected them in the smoking addiction issue.

The third part consisted of beliefs about the learners, including the speed of learning and the learning ability. The participants were asked to do multiple choices in this part. The second part included open questions investigating how students find knowledge and how they justify it.

Inter-rater reliability of the coding system (Kappa) was .70. The two coders of the study were graduate students studying psychology in Beijing Normal University. They were trained to code in advance but did the coding separately.

Each open question could be related to several codes. Taking smoking addiction issue, for example, the participants were asked how they dealt with a situation of contradictive evidence. The according dimension was justification. Four levels were differentiated by this item. The four levels were avoiding justification (or believing in authority, asking somebody who is more experienced, or using some other method

unrelated to justification), limited methods for justification (simply comparing), multiple methods for justification (suggesting at least two ways of justification and comparing), and connecting justification with criterion.

Creativity

The questionnaire comprises seven items (e.g., designing machines for picking apples, doing deductive reasoning for a murder case, using innovative and easy way to separate horses or get some amount of water, chess plate-coving problem, number-dividing problem, and game-organizing problem). Items of creativity test were selected from Torrance Tests of Creative Thinking (Torrance, 1966) and Scientific Creativity Test for Adolescent (Shen, Hu, & Lin, 2002). The former test is widely used. The latter test was developed based on former test. Scientific Creativity Test for Adolescent was widely used in China. It had a Cronbach α value of .89 indicating a substantial structure validity. All problems expected open and multiple solutions. Answers were scored with reference to criteria of creativity: flexibility, fluency, and uniqueness.

Procedure

The participants answered questions about knowledge resource and provided justification. After the study, the participants received gifts as a form of appreciation for their cooperation. Their answers were coded and analyzed. The relationship between their epistemology and creativity was computed. From the results of creativity test, high-creativity and low-creativity group were identified (29% of the total sample who ranked the highest and lowest), with each group 40 participants. Their characteristics of personal epistemology were compared. Chi-square test was applied for analyzing frequency data. ANOVA, correlation, and regression were conducted in order to know the relationship between personal epistemology and creativity.

Results

Characteristics of Personal Epistemology

The range of the participants' ratings was between zero and 100. Lower points indicated that the participants regarded knowledge as certain and absolute, simple without the need for categorizing, and is influenced from other subjective or contextual factors. The participants could not verify knowledge source or used some justification methods. They thought learning speed was quick or not at all. They

Table 9.1 Students' rating on dimensions of personal epistemology

Dimensions	*M*	SD
Knowledge	48.80	13.82
Uncertainty	49.40	25.93
Need for justification	73.22	16.82
Complexity	45.90	18.53
Categorizing	81.11	22.12
Subjective	28.73	28.35
Contextual	27.24	35.55
Knowledge source	57.04	22.86
Justification methods	14.71	11.68
Beliefs about learners	80.68	31.59

thought learning ability as fixed at birth. Higher points indicated that the participants considered knowledge as uncertain and complex, with the need for justification and the consideration of categorizing and with influence from other subjective or contextual factors. The participants could verify knowledge source by using some justification methods. They thought learning speed was gradual and thought learning ability as improvable. The latter is seemed to be on a higher developmental level of personal epistemology. Results of our study were summarized in Table 9.1.

Most of the participants of the study thought that knowledge could be developed, categorizing was essential to its building, the source of knowledge should be evaluated, learning speed was gradual, and learning ability was improvable. However, the participants thought less about the subjective factors, contextual factors, or specific justification methods, which were crucial components of personal epistemology.

There were items asking about the participants' actual knowledge sources, justification procedure and method, and ways in dealing with contradictive evidence. They tended to use interview and observation (85.10% of the total sample) and research report (75.40%) as their knowledge resource. Near one quarter (24.8%) of the participants avoided justification of the conclusion. Near 70% (69.9%) of the participants used some criterion to select the evidence and then arrived at the conclusion. Less than 10% (5.30%) of the participants used iterative procedure for evidence selecting and conclusion justification. Their preferred justification methods included verifying (55.60%), integrating (18.00%), and comparing (16.50%). Slightly more than 10% (11.30%) of them asked for a criterion of evaluation in decision making. When they found some contradictive evidence, 25.20% of the participant chose to abandon them both or believing in authority. Two thirds (67.20%) of the participants chose some justification methods to find a convincing answer. Nearly 10% (7.60%) of the participants considered the application of the conclusion and used that as a criterion to evaluate evidence.

In order to know the influence of the demographic variables on personal epistemology, MANOVA was conducted between lower and higher divisions, between males and females, and between national key universities and other universities (which indicated, by scores of the college entrance examinations, students in national key universities score higher than other students). Results indicated that there were significant differences between lower division (freshman and sophomore) and higher

Table 9.2 Regression for creativity by personal epistemology

Predictor	β	t	P	R^2	p
				.14	.001
Categorizing	−.21	−2.49	.01		
Justification methods	0.18	2.08	.04		
Learning ability	−.21	−2.38	.02		

Table 9.3 Ratings of students in high- and low-creativity groups on dimensions of personal epistemology

Dimensions	Low creativity	High creativity
Knowledge	47.25	53.89
Uncertainty	50.31	56.25
Need for justification	70.38	75.50
Complexity	45.51	46.67
Categorizing	85.00	77.50
Subjective	23.75	24.36
Contextual	15.39	23.75
Knowledge source	48.77	61.01
Justification methods	9.19	19.17
Beliefs about learners	90.31	69.06

division (junior and senior) on knowledge ($F=5.238$, $p<0.05$), source of knowledge ($F=12.498$, $p<0.01$), and justification methods ($F=8.280$, $p<0.01$). Higher division could consider the uncertainty, complexity, and the need for justification. They seemed to use objective knowledge source and to know about justification methods. Significant difference between male and female students on knowledge ($F=5.069$, $p<0.05$) was observed. Girls could consider the uncertainty, complexity, and the need for justification of knowledge more than boys did. Significant differences between national key universities and other universities on knowledge ($t=-2.469$, $p<0.05$), knowledge source ($t=-4.269$, $p<0.01$), and justification methods ($t=-3.889$, $p<0.01$) were observed.

Relationship Between Personal Epistemology and Creativity

There were several significant correlations between dimensions of personal epistemology and creativity. Creativity-related dimensions were categorizing of knowledge ($r=-.205$, $p<0.05$), contextual factors ($r=.191$, $p<0.05$) in the knowledge dimension, source of knowledge ($r=.217$, $p<0.05$), justification methods ($r=.211$, $p<0.05$), beliefs about learning speed ($r=-.201$, $p<0.05$), and learning ability ($r=-.233$, $p<0.05$). It was indicated that higher creativity correlated with less extreme tendency of categorizing, with consideration for the contextual factors, preference to objective evidence, and a variety of justification methods. People with higher creativity would consider learning speed as gradual and learning ability was determined at birth. Among those dimensions, there were three variables predicting creativity at a significant level (see Tables 9.2 and 9.3).

Table 9.4 Percentage of students using specific justification methods in high- and low-creativity groups

Dimensions	Low creativity (%)	High creativity (%)
Justification methods		
Avoiding	46.20	15.00
Justifying	53.80	77.50
Justifying and revise	0	7.5
Dealing with contradictive evidence		
Believing authority	5.30	15.00
Eliminating	26.30	2.50
Comparing	52.60	70.00
Integrating	13.20	2.50
Considering application and setting criterion	2.60	10.00

Results from *t*-test showed that there were significant differences between the high- and low-creativity groups: categorizing of knowledge ($t=2.07$, $p<.05$, $d=0.46$), knowledge ($t=-2.56$, $p<0.05$, $d=-0.57$), knowledge source ($t=-2.63$, $p<.01$, $d=-0.60$), justification methods ($t=-3.25$, $p<0.01$, $d=-0.73$), learning speed ($t=2.53$, $p<.05$, $d=0.57$), and learning ability ($t=2.80$, $p<.01$, $d=0.65$). Non-parameter comparison of the percentage of using some specific justification procedure in two groups showed that they were significantly different from each other on it ($p=0.001$). Table 9.4 outlines more people in high-creativity group using justification, believing authority, comparing, and application-related criterion to evaluate contradictive evidence.

For the low-creativity group, there was significant correlation between subjective factors and situational factors ($r=0.47$, $p<0.05$). For the high-creativity group, there were significant correlations between subjective factor and situational factor ($r=0.42$, $p<0.05$), between uncertainty and development of knowledge ($r=-0.35$, $p<0.05$), between uncertainty and subjective factor ($r=-0.33$, $p<0.05$), between uncertainty and situational factor ($r=-0.36$, $p<0.05$), and between development and situational factor ($r=0.39$, $p<0.05$). It indicated that there were more connections among dimensions of personal epistemology for high-creativity students. For high-creativity students, personal epistemology worked like a system instead of several separated beliefs.

Discussion

General Observations

Our participants of the study displayed the third or fourth developmental stage of personal epistemology (King & Kitchener, 1994, 2004). From the findings, we observed that Chinese undergraduates of our study considered knowledge as improvable.

They preferred objective evidence and considered learning as a gradual procedure and learning ability is incremental. They did not consider much about the uncertainty and complexity of knowledge and did not use various justification methods for evidence evaluation. We explain the outcomes above with reference to the type of questions with which Chinese students encounter in the college entrance examination. Students were requested to provide fixed correct answers. To prepare for this examination, students learn to solve problems instead of learning to do reflective thinking. This is some evidence for the differentiation of the functional level and optimal level (Fischer & Pipp, 1984) of students' personal epistemology. Performance of participants might rely much on the item stimulus. With reference to providing justification, the participants of the study seldom construct criterion from the actual problem and the application of the conclusion or construct some criterion for the evaluation of evidence or for the decision-making procedure. This indicated a lack of systematic and spontaneous argumentation skills for the participants of the study. It might also indicate the lack of items for the participants to perform on the optimal level (King & Kitchener, 2004).

The participants of the study who were in higher division scored high on uncertainty, complexity, and plasticity. They preferred objective knowledge resource and did better in justification. The tendency of categorizing, contextual factors, justification methods, and beliefs about learning had significant correlations with creativity. The tendency of categorizing, justification methods, and beliefs about learning can predict creativity. The participants of the study who were with higher creativity displayed characteristics of students on higher developmental stage of personal epistemology, with the exemption of beliefs on learners. They considered knowledge of high uncertainty, complexity, and need for justification. They tended to use objective evidence and used more justification methods. They regarded learning speed as comparably quick. They thought that learning ability is relatively fixed at birth.

Culture and Personal Epistemology

Cultural difference of personal epistemology has been referred as a promising area of studies (Hofer, 2008). It is still unknown that whether the developmental trajectory of personal epistemology is consistent across cultures or whether the higher levels of the schemes are taught in Western education system (Moore, 2002). Hofer (2008) pointed out that primary construct, initial research, and measurement of personal epistemology have been developed in USA. Cultural comparison research is needed to expand the comprehension of development of personal epistemology. In some earlier study, Chinese students showed different cognitive developmental patterns from the US students (e.g., Zhang, 1999). With reference to findings in the 1990s, we may claim that tertiary education system in China might be the cause for Chinese students to develop toward absolutism, with predetermined majors and selective way of evaluation. Qian and Alverman's (1995) and Youn's (2000) studies provide evidence on students' beliefs on learning.

In our present study, we observed some developmental characteristics for personal epistemology. The participants with higher division scored higher on uncertainty, complexity, and the need for justification than their counterparts with lower division. The former preferred objective knowledge resource and performed better in terms of justification. The findings were in line with the results of the American undergraduates (King & Kitchener, 1994). Gender and university levels influenced the level of personal epistemology. These findings were consistent with those of the Western cultures. Findings of our study indicated a general pattern of personal epistemology.

Links to Creativity

In terms of the relationship between personal epistemology and creativity, justification, beliefs about learners, tendency of categorizing, and contextual factors relate significantly to creativity. The participants who were with higher creativity have the following traits of personal epistemology: They tended to consider knowledge as uncertain, complex, and improvable. Knowledge is influenced by subjective and contextual factors. It needs justification. The participants knew that it was necessary to categorize. They did not emphasize categorizing. They preferred objective data in justification. They could use logical justification methods and criterion based on the specific problem, less limited by authority. Their beliefs were connected rather than separated. Their openness to ideas and strict justifying procedure were in correspondence to divergent thinking and converging thinking – two components of creativity. The above implied some relationship between flexibility and critical thinking of creativity. The weak prediction of personal epistemology for creativity indicated that the relationship was not so simple and direct.

Concluding Remarks

Main source of evidence of Chinese undergraduates included direct observation, interview, and research report. Many students did not categorize evidence or used specific justification methods (e.g., using scientific procedure such as experimental design). They seldom justified evidence or did deep processing with the information. Comparison and confirmation were the main justification methods mentioned by them. Most of them used some argumentation steps (point of view, evidence, conclusion). Not many of them could reflect upon their argumentation procedure with criterion, with consideration of external factors. It revealed somehow deficiency of argumentation skills in solving ill-structured problems.

Our study showed that the participants of higher creativity believed that learning gain could be observed in short term and learning ability is somehow determined. The above was different from that of higher developmental stage of personal

epistemology. We could explain this difference by claiming that flexibility of creativity needs the belief of speedy information processing. Perceived inborn learning ability might increase the confidence of the individuals of higher creativity. The finding indicated that beliefs about learners might have a quite different relation with other dimensions of personal epistemology, which needs further exploration.

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Part III
Conceptions and Studies on Creativity and Excellence in Organization

Chapter 10
Entrepreneurs' Creativity and Innovation: A Key to Performance

Dominika Dej, Meir Shemla, and Jürgen Wegge

Introduction

Entrepreneurship research builds on a business discipline that seeks to understand how economic growth and technological change happen (Baum, Frese, Baron, & Katz, 2007; Davidsson & Wiklund, 2000; Low & MacMillan, 1988). The belief that economic progress, employment creation and related social benefits emerge from individuals' entrepreneurial initiatives was developed by Schumpeter in the early 1920s (Schumpeter, 1934). From this point in time onwards, entrepreneurs have been defined as "destructive creators" who translate inventions into businesses, i.e. provide new and/or better products and services and contribute greatly to job creation and gross national product (Birch, 1979; Birley, 1986; Davidsson, 2005; Observatory of European SMEs, 2004; Picot & Dupuy, 1998; Reynolds, Bygrave, & Autio, 2004). Positive consequences of entrepreneurship – such as providing opportunities for minorities in society (Goffee & Scase, 1983), for instance through the integration of immigrants (e.g. Bjerke, 2007; Glazer & Moynihan, 1963), and women breaking through the so-called glass ceiling by starting new companies (Zimmerer & Scarborough, 2002) – have also been highlighted in the literature. Overall, entrepreneurship is viewed as a mechanism that counteracts inefficiencies in the economic system and as an indicator of a country's societal freedom and economic well-being.

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_10,
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Entrepreneurship, although considered "the engine of the economy" (Verheugen, 2006), is still a small-scale phenomenon at the level of individuals. For instance, in 2007, only 10% of Germany's labour force and, in 2005, only 9% of Europe's labour force was self-employed (BMWi, 2008). Indeed, it is alarming that, in spite of the substantial impact of entrepreneurship on societies and national economies, self-employment rates are this low. Furthermore, not all enterprises implement innovative strategies, target growth or improve key business domains (Carland, Hoy, Boulton, & Carland, 1984). In fact, most continue as small businesses with modest economic contributions. Another critical point is the high insolvency rate of entrepreneurial activity (Brüderl, Preisendörfer, & Ziegler, 1992). Almost 37% of newly founded ("liability of newness") and particularly small companies ("liability of smallness") fail within their first 5 years of existence (Brüderl, Preisendörfer, & Baumann, 1991). Hence, both the emergence of entrepreneurial activity and the sustainability of entrepreneurial ventures are prominent topics in entrepreneurship research (Rauch & Frese, 2000; Schenk, 1998).

Clearly, creation of new organisations (Gartner, 1989) and successful business management implies opportunity recognition and continuous development and implementation of appropriate, innovative business ideas (Wennekers & Thurik, 1999). Furthermore, as entrepreneurs typically face challenges such as a lack of security of benefits, disruptive changes and ambiguity, the generation and realisation of ideas with high potential to develop into appealing goods or services require high levels of creativity and innovativeness. From this perspective, successful entrepreneurship seems to be associated with the concept of giftedness, a phenomenon that includes disposition for exceptional achievements, motivation to apply them and creation of meaningful and innovative ideas and solutions (Runco, 2005).

In line with Schumpeter's vision, in this chapter, we consider entrepreneurial activity a manifestation of individual creativity and innovativeness. We begin by defining "entrepreneur" and by introducing two crucial models of entrepreneurial activity and success. We then present the results of a recent qualitative study on the definitions of success by entrepreneurs from two different sectors. Further, we address the personality factors that encourage people to choose an entrepreneurial career path and to become successful entrepreneurs. In particular, we focus on the link between creativity, innovativeness, business creation and performance.

Defining an Entrepreneur

In spite of scholars' great interest in entrepreneurship research, there is still no concise and universally accepted definition of entrepreneurs. The roots of the French word *entrepreneur* ("between-taker" or "go-between") go back to the twelfth and thirteenth century when entrepreneurs were merchant-adventurers active in trading and sought to sell goods successfully. These entrepreneurs signed a contract with a money person, who in the end received 75% of the profit. Although they had to bear

all risks, entrepreneurs received only the remaining 25%. Since this time, financial risk has become a central component of definitions of an entrepreneur. For instance, entrepreneurs were described as those who are willing "to buy at a certain price and sell at an uncertain price" (Cantillon, quoted in Blaug, 2000, p. 379) and agents who take on risk under conditions of uncertainty (Knight, 1921; Taussig, 1915). Since Schumpeter, the critical function of entrepreneur has been innovation (Schumpeter, 1934). According to this classical scholar, entrepreneurs are "destructive creators" who translate inventions into businesses and provide new goods, new production methods, new markets, new sources of materials or new organisations.

Israel Kirzner (Kirzner, 1973) proposes that entrepreneurs are *opportunists* looking for imbalances in the economic system. In Kirzner's sense, entrepreneurs were perceived as individuals who discover, evaluate and exploit opportunities, i.e. situations in which new products, services, processes, ways of organising or markets can be introduced (Shane & Venkataraman, 2000). Other authors define entrepreneurs with regard to the "creation of a new enterprise" (Low & MacMillan, 1988) or the "creation of new organizations" (Gartner, 1989), thus highlighting entrepreneurs' contributions to job creation and gross national product (Birch, 1979). Thus, entrepreneurs have been defined as risk-takers, innovators, opportunists and business builders. Current definitions of entrepreneurs therefore imply that (1) entrepreneurs are *"individuals who manage their companies on a daily basis and take financial, psychological, and social risks for the company*" (Rauch & Frese, 1998, p. 16; see also Hisrich & Peters, 1989) and that (2) entrepreneurs build new businesses through which they initiate innovation, create new jobs and accelerate economic growth, thereby contributing positively to society (Van Praag & Versloot, 2007).

Two Important Models of Entrepreneurial Activity and Success

In recognition of entrepreneurship's relevance in modern economies and societies (e.g. Audretsch, Van der Horst, Kwaak & Thurik, 2009; Reynolds et al., 2004; Verheugen, 2006), researchers in different disciplines have sought to identify key entrepreneurial activity and performance success factors. Such factors can be divided into three major groups*: individual level factors*, which relate to characteristics of potential and actual entrepreneurs; *interpersonal factors*, such as social networks and entrepreneurial role models; and *societal level factors*, which include the social, economic and political context. These factors' importance varies strongly between the different phases of the entrepreneurial process: the *prelaunch* phase prior to the starting up of a new venture, the *launch* phase (the launch and early operations) and the *postlaunch* phase (running the company). For instance, in the early phases, individual factors are crucial, because entrepreneurs recognise and evaluate opportunities, whereas later on, interpersonal and societal level factors prevail while entrepreneurs acquire the resources necessary to launch and run a company (see Baron, 2007).

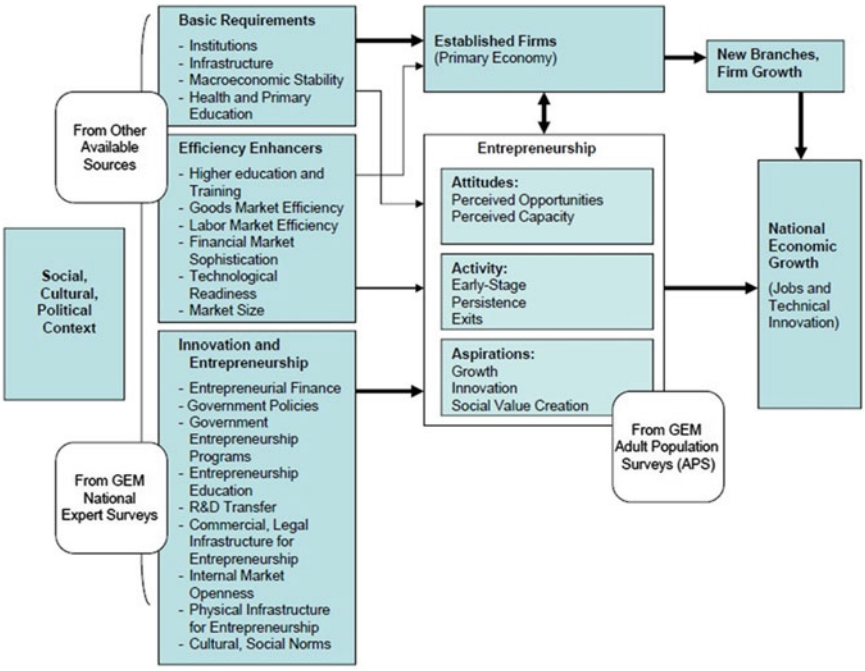

Fig. 10.1 Revised model of the Global Entrepreneurship Monitor (GEM) (Source: Revised model of the Global Entrepreneurship Monitor by Bosma, Acs, Autio, Coduras, & Levie, 2009)

In the following, we introduce two crucial entrepreneurship models; the first focuses on the socio-economic perspective, while the second is a psychological model that represents individual approach to business creation and success.

Global Entrepreneurship Monitor (GEM) (Bosma, Acs, Autio, Coduras, & Levie, 2009) offers a conceptual model to explain the emergence of entrepreneurial activity (prelaunch and launch phases) across countries. It considers and measures entrepreneurial attitudes, aspirations and activity as well as countries' key socio-economic framework conditions (see Fig. 10.1). GEM assumes that the broad social context – including political situation, government programmes, education, infrastructure and culture – is a relevant indicator of a country's potential to foster entrepreneurship. Specifically, the GEM model proposes that countries develop from factor-driven economies (which are primarily geared towards the creation of sustainable businesses that contribute to local economies, as well as to the health and education of the next generation) and efficiency-driven economies (in which entrepreneurs oriented to growth and technology are a major driver of development) to innovation-driven economies (which stimulate new combinations of products and markets) (see Porter, Sachs, & McArthur, 2002). In innovation-driven economies (e.g. Germany), innovative and opportunity-seeking entrepreneurship emerges as a significant catalyst of economic growth and wealth creation (Henrekson, 2005).

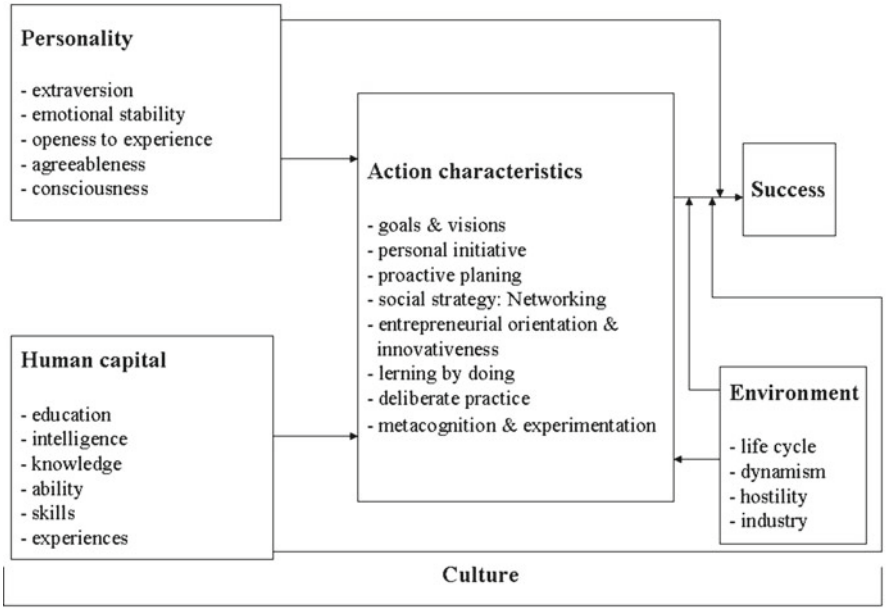

Fig. 10.2 The Giessen-Amsterdam model of entrepreneurial success (Source: Rauch & Frese, 2000, revised 2007; see also Frese, 2008)

Creativity and innovation seem particularly important in such economies, because they foster opportunity recognition and translation of innovative ideas into new products and services.

Unlike the Global Entrepreneurship Monitor model, the Giessen-Amsterdam model (Frese, 2008) represents a trait approach to entrepreneurial activity. Although it recognises the importance of environmental aspects such as organisational-level differences, company life cycles or national culture on business creation and success, this model focuses predominantly on personal-level variables (see Fig. 10.2). The Giessen-Amsterdam model describes how individual differences affect business creation and success. In particular, it proposes that the Big Five personality traits (i.e. extraversion, emotional stability, openness to experience, agreeableness and conscientiousness) impact specific traits that are associated with entrepreneurship (e.g. the need for achievement, risk-taking, innovativeness, autonomy, locus of control and self-efficacy) that, in turn, influence entrepreneurs' goals and action strategies, leading to business creation and/or success. In line with the model's assumption, traits matching entrepreneurship (i.e. the need for achievement, generalised self-efficacy, innovativeness, stress tolerance, the need for autonomy and a proactive personality) are positively related to business creation and business success (see Frese, 2008; Rauch & Frese, 2007).

The GEM and the Giessen-Amsterdam models provide a useful framework for understanding the factors associated with entrepreneurial activity and its outcomes;

these models highlight that entrepreneurial activity takes place at the economic, social and individual levels. Although neither model explicitly defines entrepreneurial success, it can be assumed that innovation, the creation of new jobs and economic growth are desired outcomes and that entrepreneurial success can thus be defined and measured in these terms.

Subjective Approach to Entrepreneurial Success

A large body of research recognise job creation (Birch, 1979; Van Praag & Versloot, 2007), innovation (Romer, 1990; Schumpeter, 1934), economic growth (Carree & Thurik, 2003; Cipolla, 1981; Lazonick, 1991; Wennekers & Thurik, 1999) and the advancement of a country's welfare (Baumol, 1990; European Commission, 2003; Lumpkin & Dess, 1996; Porter, 1990) as major outcomes of entrepreneurial activity and success. Hence, it is not surprising that success has been typically operationalised by business parameters such as company volume (e.g. size of assets), employee number and growth, increases in revenue and sales (e.g. Chandler & Hanks, 1993; Moser & Schuler, 1999; Murphy, Trailer, & Hill, 1996; Schenk, 1998) and/or market expansion (Littunen, 2000; Wang, Watkins, Harris, & Spicer, 2004), while entrepreneurs' subjective evaluations of success have received very little attention from researchers. However, the lack of awareness about subjective views on performance holds serious consequences for entrepreneurship research and practice. Because entrepreneurs have a central position in their companies, their entrepreneurial attitudes and aspirations are crucial to the entrepreneurship process. As proposed in GEM, positive attitudes to entrepreneurship in a given society can increase entrepreneurial activity, while high-growth aspirations are likely to result in innovative strategic practices and business growth, which are desired outcomes that enhance country's financial well-being. Essentially, based on entrepreneurs' aspirations, researchers distinguish between entrepreneurial ventures characterised by innovative behaviour considered highly desirable as well as businesses that do not engage in any new or innovative practices (Carland et al., 1984).

Against Schumpeter's vision of entrepreneurs as "creative destructors" and innovators, prior research has shown that, beyond growth, innovation and performance, entrepreneurs strive for personal goals such as self-actualisation (Ritchie, Eversley, & Gibb, 1982), independence (Birley & Westhead, 1994; Cromie, 1987; Hisrich & Brush, 1984; Ritchie et al., 1982; Shane, Kolvereid, & Westhead, 1991) and/or the need for approval (Scheinberg & MacMillan, 1988). Entrepreneurs' aspirations therefore seem to include a broad range of personal, social and economic criteria. Acknowledging this variety of success criteria held by entrepreneurs can significantly improve our understanding of entrepreneurial behaviours and decisions. For instance, some entrepreneurs remain in objectively underperforming firms, even though this seems ineffective from an economic perspective (De Tienne, Shepherd, & De Castro, 2008; Green, Welsh, & Dehler, 2003). However, it is very likely that such entrepreneurs strive for goals that have little to do with growth, innovation and the maximisation of profit.

Certainly, knowledge about what entrepreneurs value and desire contributes to our understanding of why some people engage in highly competitive entrepreneurial ventures while others do not. In the following, we will present the results of a recent qualitative study on entrepreneurs' subjective success criteria (Dej, 2010; Dej, Sztuba, & Stephan, 2010).

Study on Entrepreneurs' Subjective Success Criteria

This study on entrepreneurs primarily sought to explore entrepreneurs' unbiased views of success in an effort to extend the understanding of entrepreneurial success beyond how management and economic scholars and practitioners commonly define this concept (i.e. company growth in terms of profits, revenues, number of employees and innovation activities). We sought to gain an in-depth understanding of what success really means to entrepreneurs, rather than theories about entrepreneurs. Data was collected in Germany and Poland from 243 business owner-managers. Participants were on average 43 years old (SD = 9.04), 77% were men ($n = 186$) and 23% were women ($n = 57$). Their companies were on average 11 years old (SD = 5.96) and employed 16 employees (SD = 19.08). Entrepreneurs operated in the IT sector (information technologies focused on industrial activities, software development, hardware development and sales) (43%; $n = 104$) and in gastronomy (excluding snack bars and street hawkers) (57%; $n = 139$).

We conducted face-to-face, in-depth interviews and asked entrepreneurs to provide their definitions of success. The qualitative analysis of entrepreneurs' responses guided by *grounded theory* (Mayring, 2003; Strauss & Corbin, 1990) revealed that entrepreneurs' conceptions of success consist of five categories: *workplace relationships*, *company performance*, *personal fulfilment*, *community impact* and *personal financial rewards*. The final category system included 14 overall subcategories assigned to those five main categories of success (see Table 10.1). 41.56% of all sample entrepreneurs mentioned some kind of *company growth* in their success definitions (Rank 1), followed by c*ustomer satisfaction and loyalty* (Rank 2) and *employee and co-owner satisfaction* (Rank 3). Less than 10% of all participants defined success in terms of *market position*, *personal financial rewards*, *creativity and innovation* and/or *company survival* and *employee security*. Little mention was made of *free time and health* (Rank 13) and *company continuity* (Rank 14).

The success subcategory *creativity and innovation* included criteria referring to the opportunity to develop new ideas, implement one's concepts and be innovative. They were characterised by quotations such as "You are successful if you can implement your own good ideas", "I want to enjoy my creativity", "Creativity and innovation mean success for me", and "Success means when you have good ideas", "You are successful when you can realise your own good ideas". Since only 20 entrepreneurs mentioned this category, Schumpeter's view of entrepreneurs as "creative destructors" who provide new goods, new production methods and new markets and who contribute substantially to economic growth (e.g. Schumpeter, 1934) only marginally applies to this study's participants.

Table 10.1 Frequencies and rankings of success definitions

Category system	Number of entrepreneurs ($n=243$)	Relative frequencies ($n=243$) (%)	Ranking ($n=243$)
Workplace relationships	175	72.01	
Employee and co-owner satisfaction	61	25.1	3
Employee security	16	6.58	11
Customer satisfaction and loyalty	98	40.33	2
Personal fulfilment	131	53.91	
Goals and challenges	53	21.81	5
Personal satisfaction	46	18.93	6
Creativity and innovation	20	8.23	9
Free time and health	12	4.94	12
Community impact	39	16.05	
Reputation	34	13.99	7
Company continuity	5	2.06	13
Company performance	200	82.3	
Any kind of growth	101	41.56	1
Stability	60	24.69	4
Market position	22	9.05	8
Survival	17	7.0	10
Personal financial rewards	22	9.05	8
Total	567		

Note: Entrepreneurs were allowed to provide multiple answers

Furthermore, additional statistical analyses (i.e. logistic regressions) support the notion that different groups of entrepreneurs accentuate different aspects of success. For instance, well-educated entrepreneurs focus more on nonfinancial criteria, while less educated entrepreneurs focus on personal financial rewards. West German entrepreneurs (compared to East German and Polish entrepreneurs) value company growth, while entrepreneurs from the gastronomy industry value customer satisfaction and loyalty more than their counterparts in IT. Interestingly, entrepreneurs from the IT sector do not place greater emphasis on *creativity and innovation* when compared to gastronomy sector (OR = 62; p = n.s.). One way to explain this result is that, in contrast to entrepreneurs who seek profit and growth and pursue innovative behaviour, participants of this study represent small business owners whose companies seek to satisfy family financial needs and thus do not perceive creativity and innovation as critical for success (see Carland et al., 1984).

This study's contribution is that it demonstrates that entrepreneurs perceive company success in terms of various criteria and that the criteria used extend far beyond the narrow set of traditional company performance indicators used in management and economic research and practice. Thus, clearly, any model that seeks to comprehensively capture entrepreneurial success must include subjective success criteria in addition to traditional company performance criteria.

Entrepreneurs' Personalities: A Key to Success?

According to Hisrich and Brush, "Entrepreneurship is the process of creating something different with value by devoting the necessary time and effort; assuming the accompanying financial, psychological, and social risks; and receiving the resulting rewards of monetary and personal satisfaction" (1985, p. 15). Based on this definition of entrepreneurship, we can expect entrepreneurs to possess a set of specific traits that enable them to (successfully) pursue entrepreneurial activity. Indeed, research has produced a long list of personality traits associated with business creation and success; however, a distinction is made between broad personality traits and specific personality traits.

Broad personality traits can be organised according to the Big Five personality model, which integrates emotional stability, extraversion, openness to experience, agreeableness and conscientiousness (Costa & McCrae, 1988). Significant differences in the prevalence of Big Five personality traits among entrepreneurs and non-entrepreneurs have been established; according to a meta-analysis based on 23 published studies (Zhao & Seibert, 2006), entrepreneurs (when compared to managers) score higher on conscientiousness ($d = .45$) and openness to experience ($d = .36$), but lower on neuroticism ($d = -.37$) and agreeableness ($d = -.16$). Such findings are plausible, in contrast to managers who work within established companies with clear structures and established practices; entrepreneurs operate in weak situations, under unspecified and uncertain conditions. Furthermore, entrepreneurs are preferably low on neuroticism, since they typically must deal with new situations and face high psychological stress levels. Because entrepreneurial activity includes negotiation, following one's own interests and persuasion, it is not associated with agreeableness. Finally, entrepreneurs explore new opportunities and seek innovative and creative solutions (openness to experience). The successful transformation of ideas and solutions into products and services requires deliberation, responsibility and persistence in realisation (conscientiousness).

The relationship between the Big Five personality traits and entrepreneurial success is less evident. For instance, emotional stability and conscientiousness – traits that show consistently positive relationships with employee job performance across different sectors (Barrick, Mount, & Judge, 2001) – seem to be not directly related to entrepreneurial success outcomes (Rauch & Frese, 2007). Based on 116 published and unpublished studies (62 on company creation and 54 on success), broad traits (Big Five) correlated at $r = .12$ with business creation and at $r = .03$ with business success (see Frese, 2008; Rauch & Frese, 2007).

While broad personality traits seem to be only weakly related to entrepreneurial success, the relationships between specific personality traits (e.g. the need for achievement, risk-taking, need for autonomy, generalised self-efficacy and innovativeness; see Fig. 10.2) are substantially stronger. In line with the Giessen-Amsterdam model's assumption (Rauch & Frese, 2000, 2007) and the results of a recent meta-analysis (Rauch & Frese, 2007), the above-mentioned specific traits correlate positively with *company start-up and success* ($r = .25$). In the following section, we focus on the main research findings.

Need for Achievement

Since McClelland (1976), the need for achievement has been associated with entrepreneurship. This personality trait implies individual responsibility for setting and reaching goals, solving problems, conducting moderately difficult tasks and seeking knowledge about results and performance. Entrepreneurs, compared to other populations, show a higher need for achievement ($r = .23$; Rauch & Frese, 2007). Furthermore, entrepreneurs' need for achievement is positively correlated with business success ($r = .31$; Rauch & Frese, 2007). In a similar vein, the meta-analysis by Collins, Hanges, and Locke (2004) supports the positive correlation between need for achievement and company start-up and success ($r = .24$ and $r = .27$, respectively).

Risk-Taking

Even though risk-taking – whether financial, social or psychological – is a crucial component of probably all recent definitions of an entrepreneur, a recent meta-analysis demonstrates that that risk-taking propensity's effect on entrepreneurship and business success is fairly small, however positive and significant ($r = .12$; Rauch & Frese, 2007; $r = .09$, respectively). Another meta-analysis of the relationship between risk-taking and entrepreneurship (Stewart & Roth, 2004) based on 12 studies published between 1980 and 1999 indicates that entrepreneurs and people who intend to start up a company are significantly higher on risk-taking than managers ($d = .46$).

Autonomy

This personality trait implies that a person needs to do things in his or her own way, i.e. set goals and accomplish them. This striving to master one's own career might be one reason why people decide to become entrepreneurs. Indeed, the relationship between autonomy and entrepreneurship has been found to be significant ($r = .14$, Rauch & Frese, 2007). In a similar vein, autonomy was positively related to business success ($r = .16$).

Self-Efficacy

This trait refers to the optimistic belief to be able to cope with a variety of difficult demands and perform effectively (Bandura, 1997) and is highly positively correlated with business success ($r = .42$; Rauch & Frese, 2007). Entrepreneurs are also higher on self-efficacy when compared to non-entrepreneurs (Markman, Baron, & Balkin, 2005).

Internal Locus of Control

This trait describes an individual's desire to be in charge of his or her destiny and future, instead of believing that events are controlled by chance, others or external factors (Rotter, 1966). This perception of control over the environment and the belief that one's actions determine what happens is considered important for entrepreneurs. Indeed, small but significant correlations have been found between internal locus of control and success ($r = .11$; Rauch & Frese, 2007). Furthermore, business owners and nonowners differed significantly concerning internal locus of control ($r = .20$).

Innovativeness

Since Schumpeter (1934) used the term "creative destructors" to describe entrepreneurs, innovation has been associated with entrepreneurial success, growth and profit. Entrepreneurs have been described as innovators that are skilled at optimising situations and procedures (Goebel, 1991) and who introduce new products, processes and organisations (Patchen, 1965). At the individual level, the personal characteristic innovativeness "refers to a willingness to introduce newness and novelty by relying on creativity and experimentation" (Lumpkin, 2007, p. 248) and indicates that a person is willing to follow new ways of action (Patchen, 1965). Indeed, entrepreneurs have been found to score higher on innovativeness than non-entrepreneurs ($r = .23$).

Although innovativeness is a personal trait, implementation of innovation in the context of entrepreneurship must also be studied at the company level, because converting innovative ideas can typically not be realised only by one person – an entrepreneur. Company innovation may involve new products, services, processes, organisations or marketing strategies and can be of technological or non-technological character. Innovativeness at the individual level and innovation at the company level correlate significantly with business success ($r = .22$ and $r = .21$, respectively; Rauch, Wiklund, Lumpkin, & Frese, 2009). Presumably, innovative solutions are an effective way for entrepreneurs to outstrip rivals (Drucker, 1993; Kay, 1996; Stopford & Baden-Fuller, 1994) and are characteristic of the most ambitious entrepreneurship, desired in terms of national growth, job creation and technological innovation (see Cieslik, 2006).

Creativity

Entrepreneurial individuals are characterised by a creative behaviour style (Strzalecki, 2007), which includes openness to experience, intellectual and social independence and seeking novelty (Schmitt-Rodermund, & Vondrack, 2002). Although creativity has hardly been studied in entrepreneurship research

(Rauch & Frese, 2007), some authors propose that creativity is a significant predictor of entrepreneurial activity (Ardichvili, Cardozo, & Ray, 2003; Drucker, 1993; Ward, 2004) and performance (Rauch & Frese, 2007).

Overall, it seems that personality traits are crucial for both business creation and business performance. Clearly, attributes of creative individuals – such as openness to new experiences, independence, self-efficacy and positive attitudes towards novelty and diversity – are critical in the context of entrepreneurship (Cudowska, 2004). Creativity and innovativeness are particularly important for entrepreneurs as inventors and innovators mainly concerned with "problem-solving, developing different perspectives and learning new techniques in the expectation that these could be applied to be innovative" (Morrison & Johnston, 2003, p. 149). Such "Schumpeterian" entrepreneurs must challenge existing conventional assumptions and use their creativity (e.g. experimentation, lateral thinking) to generate new and original ideas, products and services. While implementing an innovation, entrepreneurs apply trial-and-error learning, as well as flexible and adaptive problem-solving strategies (see Isaksen, 1987; Nyström, 1993). Therefore, entrepreneurial activity – characterised by (1) the recognition and generation of new ideas and solutions, (2) the evaluation of their quality and (3) their successful implementation – requires creative, analytical and practical intelligence (Sternberg, 2004; Sternberg & Lubart, 1995) and could be viewed in terms of the notion of giftedness. Indeed, successful entrepreneurs seem to be talented individuals who unite intelligence, creativity as well as certain broad and specific personality traits, which make for outstanding achievements.

Conclusion

Successful entrepreneurship contributes significantly to the prosperity of any society, i.e. it fosters national growth, job creation, technological progress and innovation (e.g. Van Praag & Versloot, 2007; Schumpeter, 1934). Previous research investigated a broad range of socio-economic factors, including national framework conditions (e.g. political situation, education, infrastructure and culture), entrepreneurial activity, attitudes and aspirations, all of which are crucial for the emergence of (successful) entrepreneurship (Bosma et al., 2009). Since at the heart of every venture there is an entrepreneur who bears the responsibility for the entire company, research on entrepreneurs' personality and skills is crucial for business creation and performance (e.g. Rauch & Frese, 2007). Although some argue that the relationship between personality and entrepreneurship is overestimated (Krueger, Reilly, & Carsrud, 2000), entrepreneurship is typically described as the result of individual characteristics, especially the openness to experience, risk-taking, innovativeness and transgression (Drucker, 1993; Hisrich, 1990; Schumpeter, 1934; Strzalecki, 2003). Indeed, research findings strongly suggest that broad personality traits (Big Five) differ significantly between entrepreneurs and non-entrepreneurs, while specific traits such as need for achievement, internal locus control, autonomy, risk-taking, self-efficacy and innovativeness have been found to be strongly related to business creation and success (Rauch & Frese, 2007).

Surprisingly, creativity has hardly been investigated in the context of entrepreneurship. This is striking, since most definitions highlight creativity and innovativeness as prototypical attributes of successful entrepreneurs and important elements in entrepreneurial process. Furthermore, very little is known about entrepreneurial giftedness (see Shavinina, 2006, 2008). While most people would agree that Bill Gates, Richard Branson, Ted Turner and Michael Dell are talented entrepreneurs who have succeeded in business, entrepreneurial giftedness has to date not been an important research subject. To illuminate this phenomenon, future research could test the wisdom, intelligence and creativity (WICS) model of giftedness among entrepreneurs (Sternberg, 2005) to explain how synthesised wisdom, intelligence and creativity contribute to extraordinary performance. In particular, wisdom as a critical attribute of gifted individuals should be considered in the context of entrepreneurship.

Although research defines and measures entrepreneurial performance in terms of objective business indicators, such as number of employees, revenue and sales, as well as the growth of these parameters (Moser & Schuler, 1999; Murphy et al., 1996; Schenk, 1998), personal aspirations and goals also impact strongly on entrepreneurs' subsequent business decisions and business performance (Schenk, 1998). For instance, entrepreneurs who appreciate innovation and growth are likely to create entrepreneurial businesses, contributing significantly to societal well-being (Carland et al., 1984). As a result, one possible way to encourage entrepreneurship of high economic impact is to promote creativity and innovativeness among entrepreneurs and prospective entrepreneurs. This goal might be realised by means of education and training. Foremost, the formation of entrepreneurial personalities should be recognised as an important task in the curricula of children and teenagers (see Larson, 2000; Tan, 2003). It is noteworthy that the European Commission named 2009 to be the Year of Creativity and Innovation and sponsored attempts to help societies become competitive in the globalising world.

Clearly, individuals' creativity in the work context should not be limited to business ownership. It is crucial to also facilitate employees' personal initiative, creative involvement and innovative behaviours within companies (Hisrich, 1990; Luchsinger & Bagby, 1987; Stopford & Baden-Fuller, 1994). Creativity and innovation are crucial for high work motivation and team performance (see Wegge et al., 2010). Overall, future research might explore antecedents and triggers of creativity at the individual, team and company levels, both within and beyond the context of entrepreneurship.

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Chapter 11
Creating an Innovative Team: The Promise of Team Diversity

Meir Shemla, Dominika Dej, and Jürgen Wegge

Introduction

The globalization of today's society has changed the nature of organizations. Essential requirements for a firm's survival include striving to maintain a competitive advantage and the ability to change. These requirements are seeded in the capacity of an organization to innovate, to form new ideas, and to develop advanced products. Evidently, organizations adopt innovation for overcoming barriers to entry and posing competitive challenge to competitors. Innovation is a strategy to respond to the changing needs of the market (Cohen, 2010). Further, with the prospect of increasing competition and shortening product life cycles, innovation is seen as a key to organizational adaptation and renewal (Crossan & Apaydin, 2010). Organizational innovation, the process of generating, developing, and adopting novel ideas that address the current organizational situation, results from "the process of merging thought categories, or mental images, either across or within domains, in ways that have not been done before, in order to develop an original and appropriate solution to a situation or problem" (Kilgour, 2006, p. 82). Many organizations seek to encourage such processes by increasing their reliance on teams to generate the solutions required for sustained business success (Kozlowski & Bell, 2003). Especially when team members differ with respect to the information and expertise they bring to the table, teams may outperform individuals in terms of the novelty of their ideas and quality of the decisions they reach (Argote, Gruenfeld,

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_11,
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& Naquin, 2000). Organizing work in teams provides organizations with the flexibility of operation and the variety of skills and knowledge that is needed for the completion of complex tasks and services. As such, access to new sources of information, knowledge, and perspectives enhances the potential for organizational innovation by increasing the number of thought categories and mental images available for modification and recombination. Research has shown that organizations with access to a broader and more diverse range of informational resources are more effective innovators and are better able to develop and assimilate new processes into their ongoing operations (van Knippenberg & Schippers, 2007).

Teams may facilitate the processes of innovation due to two defining characteristics, task interdependence and the differences among team members in regard to demographical, informational, or other attributes. In this chapter, we would like to focus on the latter feature of teams, namely, team diversity. Diversity, "a characteristic of a social grouping that reflects the degree to which there are objective or subjective differences between people within the group" (van Knippenberg & Schippers, 2007, p. 519), offers a fertile platform for the rise of innovation in teams and organizations. If innovation results in a product, system, or process that is new and delivers a definable benefit to an organizational constituency, then the antecedent lies in the range of perspectives and the conflicts that are inherent in diverse teams. However, team diversity offers a promise that is not very often realized. In fact, reviews of the literature and meta-analytical analyses have come to the conclusion that diversity in regard to any attribute may result in both positive and negative consequences (Horwitz & Horwitz, 2007; van Knippenberg & Schippers, 2007). For example, in their seminal review of the literature, Williams and O'Reilly (1998) reported that while some papers found positive effects of tenure, age, gender, and racial diversity on team effectiveness and innovation, others revealed neutral or even negative influences.

Theoretical Perspectives on Team Diversity

Work team diversity refers to an almost infinite number of dimensions of objective and subjective differences between members, ranging from differences in age to nationality, from religious background to personality, and from work abilities to emotions (van Knippenberg, De Dreu, & Homan, 2004). The remarkable growth in diversity research over the last decade is no coincidence (Chugh & Brief, 2008). Given that increased globalization, demographical developments, and changes in organizational structure diversity has come to play a central role in organizational life (Jehn, Lindred, & Rupert, 2008). Especially when team members differ with respect to the information and expertise they bring to the table, teams may outperform individuals in terms of the quality of the decisions they reach (Argote et al., 2000). Indeed, a prominent perspective posits that team diversity holds great promise for team and organizational innovation. This approach, usually refers to as the "value in diversity" hypothesis (Cox, Lobel, & Mcleod, 1991), proposes that diversity

may improve team functioning through an increased range of knowledge and expertise. Accordingly, when members with diverse opinions and background share and constructively debate their unique viewpoints, teams are able to achieve more creative and innovative solutions than would have been possible with a homogenous team. This positive impact of diversity can be expected especially when the task can benefit from multiple perspectives and diverse knowledge. Thus, diversity may especially enhance group functioning in tasks that require innovation, creativity, and complex decision making (Bantel & Jackson, 1989).

However, while teams may stimulate innovation and facilitate problem solving, they often come with the cost of accentuating demographical differences as well as dissimilarities in personality, values, and attitudes which may result in conflicts (Harrison, Price, & Bell, 1998; Jehn, Northcraft, & Neale, 1999; Milliken & Martins, 1996; Phillips, 2003; Williams & O'Reilly, 1998). This school of thought draws on the social categorization theory (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) and similarity-attraction theory (Byrne, 1971). The starting point for the social categorization theory is the idea that individuals are assumed to have a desire to maintain a high level of self-esteem. This is often done through a process of social comparison with others. In making these comparisons, individuals first define themselves through a process of self-categorization in which they classify themselves and others into social categories using salient characteristics. Similarities and differences between team members form the basis for categorizing self and others into groups, distinguishing between similar in-group members and dissimilar out-group members (Ely, 1994). As people tend to favor in-group members over out-group members, to trust in-group members more, and to be more willing to cooperate with them (Brewer & Brown, 1998; Tajfel & Turner, 1986), diversity thus may lead to cognitive biases, discrimination, and conflict.

The similarity-attraction paradigm yields predictions that are consistent with the social categorization theory. Particularly, this paradigm proposes that people are attracted to similar others (Byrne, 1971). Individuals who are similar may find the experience of interacting with each other easier, positively reinforcing, and more desirable. This can lead individuals to identify more with team members that are more similar to themselves in terms of, for example, demographic characteristics or values. The result of such processes may be that work groups function more smoothly and that group members are more satisfied with and attracted to the group when it is homogeneous rather than diverse.

The predictions drawn from the social categorization and similarity-attraction theories are corroborated by findings from numerous laboratory and field studies. The empirical findings from these studies are consistent in showing that dissimilarity often results in group processes and performance loss (Murnighan & Conlon, 1991), including less positive attitudes, higher turnover (Jehn et al., 1999), decreased group cohesion (O'Reilly, Caldwell, & Barnett, 1989), and lower performance and innovation (Murnighan & Conlon, 1991). However, at the same time, a large body of empirical research also provides support to the predictions drawn from the "value in diversity" approach. For example, some studies find an association of diversity with higher performance (Jehn et al., 1999), higher innovation, and more creative problem

solving (e.g., Bantel & Jackson, 1989). The inconsistent impact of team diversity has also been captured by several meta-analyses and reviews. In particular, while Williams and O'Reilly (1998) reported that demographic diversity is associated with weaker social integration, poorer communication, and lower levels of group effectiveness, background diversity was found to be associated with positive influence on team performance. Similarly, while a meta-analysis by Bowers, Pharmer, and Salas (2000) reported that the combined effect sizes of 57 studies shows a small effect in favor of heterogeneous groups, and Horwitz and Horwitz (2007) found support for the positive impact of task-related diversity (i.e., diversity in ability and cognitive resources) on team performance, Van Dijk, Van Engen, and Van Knippenberg (submitted) found that team diversity resulted in both positive and negative outcomes.

In sum, evidence for the positive effects as well as for the negative effects of diversity is highly inconsistent (Bowers et al., 2000; Webber & Donahue, 2001) and raises the question of whether, and how, the perspectives on the positive and the negative effects of diversity can be reconciled and integrated. It seems that current literature shares agreement that a solution to these questions can be found in a contingency approach. Researchers recently begun abandoning the main effects approach and instead argue for models that are more complex and that consider contingencies in explaining the effects of diversity. As Wegge and Schmidt (2009) put it, "in evaluating the potential effect of diversity, it is critical which personal attributes, which team tasks, which task dimensions, and which dependent variables are examined." The main principles of this approach are summed up in the categorization-elaboration model (CEM; van Knippenberg et al., 2004).

The Contingency Approach

While diversity researchers have typically studied the information/decision-making processes (i.e., value in diversity approach) and social categorization processes in isolation, the CEM combines their predictions. Accordingly, the model's first principle posits that each dimension of diversity may elicit both information/decision-making and social categorization processes. This, of course, rejects previous ideas suggesting that certain types of diversity are more likely to be associated with negative outcomes while others are more likely to be associated with positive outcomes (Pelled, 1996). A second principle of the CEM assumes that diversity does not automatically lead to intergroup bias or to elaboration of task-relevant information within teams (Meyer, Shemla, & Schermuly, 2011; Shemla, 2011). Diversity research has often worked from a somewhat oversimplified conceptualization of social categorization processes. This has apparently led diversity research to largely ignore important contingencies of the relationship between diversity and social categorization and between social categorization and the negative consequences of categorization. Whether or not diversity results in categorization and intergroup bias or in elaboration of task-relevant information and perspectives depends upon

several moderators. For example, these moderators may include the type of task the team is engaged in, team members' motivation to process task-relevant information and perspectives, and members' attitudes about diversity. The focus on moderators is important not only to identify when diversity may be expected to have positive or negative effects but also because moderator effects observed may substantiate conclusions about the processes in operation. Attention to these processes is important because another major impediment to the advancement of the field, according to this research approach, is a tendency to assume rather than assess mediating processes (van Knippenberg et al., 2004). Often the occurrence of information/decision-making or social categorization processes is concluded from the observation of positive or negative effects of diversity on group functioning without evidence regarding the processes taking place during group interaction. The predicted outcome is not necessarily evidence of the predicted process, however, and relying on outcomes to determine process runs the risk of resulting in misleading conclusions.

The principles underlying the contingency approach are reflected in the theoretical work of other researchers as well. Wegge and his colleagues (Wegge, 2003; Wegge & Schmidt, 2009), for instance, proposed a model describing the relationship between age diversity in work groups and group effectiveness. The authors propose that it is expected that age diversity in work groups will have negative effects on group innovation, motivation, and health of group members. However, it is postulated in this model that, under favorable conditions, beneficial effects should be observed, too. Cognitive salience of age diversity and appreciation of age diversity (i.e., judgments regarding the value of age diversity in groups) are considered as potential moderating variables. Thus, similarly to the CEM, the ADIGU (Altersheterogenität von Arbeitsgruppen als Determinante von Innovation, Gruppenleistung und Gesundheit) model suggests two central contingencies for the influence of diversity: whether diversity is indeed observed by group members and whether members do or do not value the presence of diversity in their group. Moreover, the ADIGU model draws attention to the mediating influence of conflicts and to the need to differentiate between diversity in groups that engage in complex or routine tasks.

Paving the Road to Innovation: Realizing the Promise of Diversity

The research agenda set by contingency models and the principles that guide them inform the major part of current research efforts in the field (van Knippenberg & Schippers, 2007). Researchers are hence preoccupied with examining when (i.e., in the presence of what moderators) and how (i.e., through what mediators) different types of diversity either benefit or impede team functioning and innovation. Indeed, the research agenda set by contingency models has therefore proved useful for the purpose of integrating past contradicting findings and advancing knowledge of the processes underlying the effects of diversity. In the following we will review the

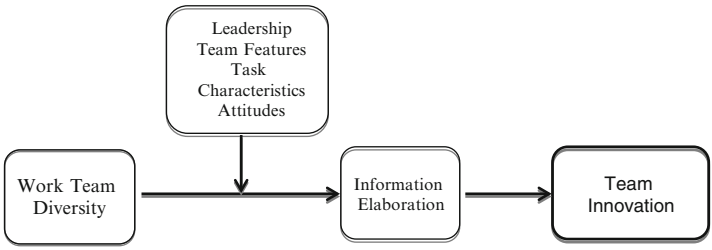

Fig. 11.1 Moderators and mediators of the relationship between work team diversity and team innovation

solutions that this line of research provides to the question of how to ensure that team diversity realizes its promise and leads to increased creativity and innovation in organizational teams. As summarized in Fig. 11.1 below, these solutions are associated with the moderating role of leadership, team features and processes, task characteristics, and attitudes.

The Role of Leadership

Previous research has examined the role of leadership behaviors in shaping the relationship between demographical, informational, and deep-level diversity and team outcomes. Recently, for example, Klein, Knight, Ziegert, Lim, and Saltz's (2011) investigated the moderating role of task- and person-focused leadership behaviors on the relationship between deep-level diversity and team conflict. Their findings indicate that leadership that is highly task-focused, in contrast to person-focused leadership, tends to restrict team members from expressing their individual values and thus lessens the extent to which values diversity yields team conflict. Other researchers have gone beyond specific behaviors and explored more general leadership styles. For example, Somech and Wenderow (2006) found that functional diversity interacted with participative leadership such that in teams with high diversity, participative leadership was positively related to team reflection, whereas in teams with low functional diversity, directive leadership was positively associated with team reflection. Moreover, Shin and Zhou (2007) as well as Kearney and Gebert (2009) explored the moderating role of transformational leadership. Shin and Zhou (2007) reported a positive impact of transformational leadership on the relationship between educational specialization diversity and team creativity. In a similar vein, Kearney and Gebert (2009) found that transformational leadership moderated the respective relationships between age, nationality, and educational background diversity with team performance. All of these studies underscore the importance of leadership as a moderator of the diversity-team outcome relationship.

The Role of Team Features

A growing body of research is dedicated to investigating how different characteristics of the team and features of the interdependence between team members influence the impact of team diversity on team innovation, conflict, and performance. For example, studies have reported that the positive effects of diversity are more likely to surface when there are high levels of outcome interdependence (Schippers, Den Hartog, Koopman, & Wienk, 2003), task interdependence (Jehn et al., 1999), and collective team identification (Van der Vegt & Bunderson, 2005). In other words, the realization of the promise of diversity requires team members' motivation to overcome conflicts, to commit to a shared goal, and to perceive others as equal partners for cooperation. Thus, an important prerequisite for a positive link between team diversity and team innovation is the motivation of team members to cooperate with other members and engage in goal-oriented action. Further, other researchers have found evidence for the role of team learning (Van der Vegt & Bunderson, 2005) and team reflexivity (Schippers et al., 2003). In particular, the capacity of teams to adapt to new situations, learn new skills, and reflect upon and modify their functioning has an influence of their ability to avoid the negative impact of team diversity while ensuring its positive consequences. Finally, several studies (e.g., Homan, van Knippenberg, Van Kleef, & De Dreu, 2007; van Dick, van Knippenberg, Hagele, Guillaume, & Brodbeck, 2008) have emphasized the central role that elaboration of task-relevant information plays in accounting for the positive or negative effects of diversity. Elaboration, a central behavioral construct in the CEM framework, is defined as "the exchange of information and perspectives, individual-level processing of the information and perspectives, the process of feeding back the results of this individual-level processing into the group, and discussion and integration of its implications" (van Knippenberg et al., 2004, p. 1011). Elaboration is critical for diverse teams' success and innovation because it is the utilization of the greater pool of task-relevant information and expertise that such groups may have at their disposal that enables them to, at times, outperform homogeneous teams (Homan et al., 2007; Kearney & Gebert, 2009; Kearney, Gebert, & Voelpel, 2009).

The Role of Task Characteristics

The nature of task itself has also been pointed out as a determinant of the relationship between team diversity and innovation. In particular, several researchers have suggested that the performance benefits of diverse groups in general should be most evident on complex group tasks since the successful solution of these tasks typically requires different perspectives and involves knowledge-based judgment (Pelled, 1996). The broad pool of knowledge, information, and perspectives that is inherent in team diversity may be used only in tasks that their complexity requires such richness

of outlooks. In routine tasks, diversity in teams not only cannot be utilized to advance innovation but can also hamper team performance due to the increased conflicts associated with differences among team members. Consistent with this assumption, several researchers found that diverse groups outperformed homogeneous groups only on complex tasks (e.g., Bowers et al., 2000; Wegge, Roth, Neubach, Schmidt, & Kanfer, 2008).

Similarly, there is evidence that the relationship between team diversity and innovation tends to be more negative when the task involves high time pressure. In these tasks, the limited opportunity for elaboration of task-relevant information and team reflexivity decreases the likelihood that diverse teams would be able to utilize the greater pool of task-relevant information and expertise at their disposal. Further, diverse teams are less likely to be effective in tasks characterized by high time pressure because such tasks require greater coordination among team members, effective communication, and high level of trust, all of which diverse teams may lack.

The Role of Attitudes

Researchers have identified organizational culture and attitudes as central influences on the consequences of diversity and as key elements in diversity management (van Knippenberg & Haslam, 2003). This line of research has advanced the theoretical notion that beliefs about the value of diversity to work group functioning are needed to harvest the benefits of diversity. In support of this proposition, it has been found that when individuals believed that diversity was facilitating the team's ability to successfully complete the task, diversity was positively related to group identification, whereas diversity tended to be negatively related to identification when individuals believed that similarity had greater benefits to the team (van Dick et al., 2008). Similar findings were also reported on the organizational level. For example, when organizational perspective on diversity emphasized cultural diversity as a valuable resource for the organization, higher quality of intergroup relations was found (Ely & Thomas, 2001). Positive beliefs about diversity remove an important barrier for diverse groups to benefit from their differences. In particular, it is proposed that pro-diversity beliefs increase elaboration of information and innovation in diverse teams for two distinct reasons. First, pro-diversity beliefs may decrease the salience of differences in the team and thus increase team cohesiveness. Second, positive attitudes about the value of diversity to the team may lead group members to respond favorably to the group and its diverse membership and thus avoid intergroup bias (van Knippenberg et al., 2004).

Investigating the role of attitudes in determining the impact of diversity on team innovation and effectiveness is especially promising because it offers the opportunity to compose pro-diversity teams through processes of selection and training. Indeed, in the decades since diversity has become a prominent concern for managers, organizations have experimented with a broad variety of diversity training programs

(Wegge & Shemla, 2011). While the intended outcome is shared – developing organizational units that value and gain from differences as well as similarities, thereby creating a more harmonious and productive work environment – these programs may vary in effectiveness. Recently, Bezrukova, Jehn, and Spell (2009) studied the effectiveness of diversity training programs in a review of 112 empirical studies. The authors explored which design characteristics of diversity training are most important for, among other outcomes, achieving attitudinal change toward diversity. The authors identified five diversity training design characteristics that determine the short- and long-term effectiveness of training. First, evidence suggests that integrated diversity training, training that is part of encompassing organizational diversity-related strategy, leads to better outcomes. In fact, most negative effects of diversity training reported in this review were found in respect to standalone trainings. Second, more positive impact was found in training programs that aimed at inclusiveness in general rather than taking a more narrow approach targeting specific types of diversity (e.g., race, gender). A third design feature refers to the extent to which trainings include a behavioral component (e.g., skill building training) in addition to the attitudinal change and cognitive learning components. The results provide evidence that combined trainings are likely to be more effective. A fourth training design characteristic that was found to positively impact the effectiveness of trainings was the use of multitude of instructional methods (e.g., lecture, video material, simulation exercises) rather than a single one. Finally, while the authors expected that voluntary training attendance would result in more positive results, the authors found no differences between training that had either mandatory or voluntary training attendance. An explanation might be that while compulsory training attendance may send a message of organizational commitment and seriousness regarding the issue of diversity, voluntary attendance may result in preaching to the converted, missing those who need the training most.

Conclusion

A large body of research on the relationship between team diversity and team effectiveness offers convincing support for the argument that teams and diverse ones, in particular, hold great promise for innovation in organizations. Under ideal conditions, work in diverse teams can be a way of improving decision making and problem solving, speeding up organizational change, and facilitating innovation processes (Jackson & Joshi, 2004). However, there is also empirical evidence demonstrating a negative relationship or no relationship at all (Williams & O'Reilly, 1998) between team diversity and team outcomes, and it is therefore accepted wisdom that we cannot categorically assert that team diversity leads to high performance or improves innovation among team members (Jackson & Joshi, 2004; Milliken & Martins, 1996). Nevertheless, a growing literature provides useful hints about the conditions and processes that may help organizations to leverage the increased benefits hidden in diversity. In particular, researchers underscore the role

of the leader in managing diversity effectively and emphasize the benefits associated with transformational and participative leadership. In addition, research shows that diverse teams may be a useful solution for increasing team effectiveness and innovation when the task at hand is complex and when time pressure associated with the task is low. Finally, it is suggested that creating conditions that enhance team members' reflection on the way in which the team operates and intensifies elaboration of task-relevant information increases the likelihood that the differences between team members would be utilized efficiently.

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Chapter 12
When Group Goal Setting Fails: The Impact of Task Difficulty and Supervisor Fairness

Jürgen Wegge and S. Alexander Haslem

Introduction

The primary goal of this chapter is to contribute to research on group goal setting, a common leadership strategy that is used to improve work motivation, creativity, and excellent performance in organizations (Locke & Latham, 2006: Tan, 2010). Even though teams have become the "primary building blocks of organizations" (Kozlowski & Ilgen, 2006), research on team goal setting is relatively thin on the ground. To date, studies have tended simply to investigate whether the goal-setting main effect for individual performance—such that difficult goals yield higher performance than easy or vague "do your best" goals—also emerges for teams. This is indeed the case, with research indicating that the performance of groups striving for a specific difficult group goal is almost one standard deviation higher ($d = .92$) than performance of groups that do not have challenging goals (O'Leary-Kelly, Marttocchio, & Frink, 1994). However, prior research has not answered two important questions: (1) Why do challenging group goals improve group performance? (2) Are there any important (pre)conditions for group goal-setting techniques to be effective? We seek to extend the rather limited knowledge about group goal setting by addressing both questions. To learn more about potential mediators of group goal setting, we investigate cognitive process variables (e.g., individual problem solving) and team motivation variables (e.g., group identification) that could function as a causal mechanism. To learn more about potential moderator variables, we analyze the impact of task difficulty and the fairness of a supervisor in negotiating performance goals with the team. We start with summarizing briefly what is known about mediating and moderating variables of goal setting for individual performance.

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_12,
© Springer Science+Business Media Singapore 2013

Goal Setting and Individual Performance: Important Mediators and Moderators

Based on some 400 laboratory and field studies, it can be concluded that setting specific, challenging performance goals typically leads to better performance than vague goals or "do your best" (DYB) instructions given by authorities (Locke & Latham, 2002, 2006). Moreover, research suggests that four mediating processes underpin the efficacy of goal setting as a means of improving individual performance. From the accumulated evidence, it appears that difficult and specific individual goals motivate people (a) to exert more effort (e.g., to work faster or harder), (b) to continue working on the task until the performance goal is reached (persistence), (c) to direct their attention to behavior and outcomes that are relevant for goal attainment (i.e., to focus on the task), and (d) to develop and use appropriate task strategies (i.e., engage in planning, see Locke, 2000).

Several moderator variables have been observed to contribute to goal-setting effects. Since performance improvements due to goal setting are about 8% for difficult task and about 16% for easy tasks (Locke & Latham, 1990, p. 30), task difficulty is a moderator. There are several explanations for this effect (Locke, 2000; Winters & Latham, 1996). In essence, though, it is assumed that on difficult tasks the use of existing knowledge and the development (learning) of new appropriate strategies is most important for achieving good performance. Therefore, in recent statements of goal-setting theory (Latham & Locke, 2007), it is suggested that for difficult tasks goal-setting procedures should be adapted—for example, by formulating learning goals and proximal goals instead of outcome goals. Other moderating variables that have been investigated are *goal commitment* (if there is no goal commitment, goal assignments of supervisors or others will have little or no impact on behavior, see Klein, Wesson, Hollenbeck, & Alge, 1999), the *availability of feedback* during goal striving (such that having feedback during goal striving improves performance—in particular, for complex tasks; e.g., Neubert, 1998), the *personality of followers* (e.g., Judge & Ilies, 2002, found that followers with high extraversion are most strongly motivated by goal setting), task-related *ability* (e.g., Locke & Latham, 1990, observed that when ability is high, goal-setting effects are more pronounced), and *situational constraints* (e.g., when information or material necessary for task completion is missing, goals are often not achieved, see Locke, 2000).

Group Goal Setting: Basic Evidence and Insights Regarding Mediators

In the only published meta-analysis on group goal setting, O'Leary-Kelly et al. (1994) identified ten studies. Since then, a number of new studies have analyzed the impact of group goals, and these confirm that goal setting works at the group level (Antoni, 2005; DeShon, Kozlowski, Schmidt, Milner, & Wiechmann, 2004; Durham,

Locke, Poon, & McLeod, 2000; Erez & Somech, 1996; Haslam, Wegge, & Postmes, 2009; Knight, Durham, & Locke, 2001; Wegge & Haslam, 2005). In the study by Knight et al. (2001), for example, three-person teams performing a computer-simulated military task achieved highest performance if they were assigned and, as a consequence, set themselves difficult team goals. Wegge and Haslam (2005) found that directive group goal setting by an authority in a friendly and convincing "tell and sell" manner (DGGS) as well as participative group goal setting (realized with a fair group discussion about goals, PGGS) improved brainstorming performance in teams more than DYB instructions. Such findings appear to provide a robust basis for recommending the use of group goal setting in different team tasks.

However, the mechanisms responsible for these effects have rarely been analyzed as researchers tend to assume that the processes that mediate group goal-setting effect are identical to those that are responsible for goal-setting effects in individual performance situations (e.g., increased effort, high persistence). At first glance, this proposition would appear plausible since individual performance is obviously a critical ingredient of team performance. Moreover, in support of this idea, DeShon et al. (2004) found that group goal-setting effects were mediated by team-related effort. Nevertheless, there are a number of reasons for questioning the proposition that group and individual goal-setting effects are routinely identical. In the first instance, the setting of group goals typically occurs in situations where groups of individuals perform complex tasks together. In itself, such situations can arouse specific (social) emotions such as evaluation apprehension that might impair performance (Wegge, 2000) or specific expectations (e.g., regarding how individual performance and team performance are linked). For example, if team members expect that their individual inputs to the collective product will not be evaluated or are redundant, they often display social loafing (Karau & Williams, 1993). However, if they believe that the team outcome relies on their individual outcomes and if they expect that other group members will perform poorly, then they may instead be willing to exert particularly high levels of effort in order to compensate for weaker team members (social compensation) and to ensure that the group succeeds (Karau, Markus, & Williams, 2000). In the same vein, group work typically involves additional processes such as communication and collaborative planning (Weldon & Weingart, 1993) or team feedback in addition to individual performance feedback (Deshon et al., 2004) that are not required or present in the case of individual performance. Building on this analysis, Wegge and Haslam (2005) hypothesized that positive effects of group goal setting on team performance might also arise because group goal setting counteracts typical motivation losses in teams such as social loafing (Karau & Williams, 1993). Moreover, striving for challenging team goals could further promote motivation gains arising from social compensation in teams and related cognitive processes, in particular high team identification. Consistent with this hypothesis, in their study it was found that group goal setting increased team identification, social compensation, and the perceived value of both group success and group failure. Taken together, there is evidence that additional variables (e.g., team planning, value of group success) come into play in team work and that variations in such team-specific processes can help account for variations in the

efficacy of group goal setting. Accordingly, our first aim is to garner more empirical evidence on this issue by examining two cognitive variables (individual problem solving, team planning) and four team motivational variables (value of group success, group identification, potency, social compensation) as potential mediating mechanisms of group goal-setting effects. Based on the arguments outlined above, we propose:

> H1: Compared to control instructions (DYB), typical group goal setting techniques (DGGS, PGGS) increase (a) work motivation in teams (e.g., value of group success), (b) promote strategy development and use (individual problem solving, team planning) and (c) both processes contribute to higher team performance.

What Are Important (Pre)Conditions for Using Group Goal Setting Effectively?

The key question here is whether the various moderating variables identified for goal-setting effects in individual performance (e.g., goal commitment, feedback) play a similar role in the realm of group work. As almost no empirical studies have examined this issue, we cannot answer this question empirically. From a theoretical point of view, it might be that some of the moderating roles of these variables are identical (e.g., commitment), that totally new moderating variables come into play in group contexts (e.g., task interdependence, see Weldon & Weingart, 1993), or that variables exerting weak influence at the individual level (e.g., participation) are more important at the group level because the group context intensifies the desire to have a voice in decisions (Haslam, 2004) or because directive supervisor behavior has less influence in group contexts, in particular when the going gets tough (Haslam et al., 2009). In this chapter, we seek to address this empirical and theoretical lacuna by analyzing two potential moderator variables.

Task Difficulty as a Potential Moderator at the Group Level

Weldon and Weingart (1993) proposed that task difficulty functions in a similar way to task interdependence. Task difficulty should moderate the relationship between group goals and group performance as planning is less important for simple group tasks than for difficult group tasks. Therefore, group goal-setting effects should be *stronger* on simple group tasks. However, these authors also note (p. 322) that "to date, the moderating effects of task complexity and work-flow interdependence on planning have not been tested." More than 15 years later, this situation is unchanged. Although there is a rich literature on communication and planning in groups (e.g., Kerr & Tindale, 2004) and even though there is considerable research on the effects of task difficulty in goal-setting research (Neubert, 1998), we know of no single study that has *simultaneously* manipulated task difficulty of a group task and

group goal difficulty. In particular, an experimental test that seeks to analyze the impact of task difficulty by manipulating this variable and holding basic group tasks constant (e.g., solving problems) has not been reported at the group level (see Winters & Latham, 1996, for the individual level). A second aim of this chapter is to fill this gap. In view of the consistent findings regarding the impact of task difficulty in goal-setting situations and based on the analysis of Welden and Weingart (1993), we propose:

> H2: Performance improvements due to typical group goal setting techniques (DGGS, PGGS) will be less pronounced on tasks that are difficult rather than easy.

Supervisors' Fairness as a Potential Moderator at the Group Level

The organizational justice literature provides considerable evidence that employees' perceptions of fairness are strongly linked to important organizational outcomes. For example, a meta-analysis conducted by Cohen-Charash and Spector (2001) found that perceptions of procedural fairness are significantly correlated with job performance ($r = .45$), job satisfaction ($r = .43$), and affective commitment toward the organization ($r = .50$). Thus, when employees feel treated fairly by management because the procedures used for decision making adhere to common justice rules such as the consistency rule, the bias-suppression rule, the correctability rule, or the ethicality rule, work motivation and job performance are high (Smith, Tyler, & Huo, 2003). Focusing more on the (un)fairness of the leader (supervisor), the available evidence also emphasizes the point that a leader's procedural fairness is positively related to leadership effectiveness (e.g., acceptance of decisions, follower satisfaction, performance, see van Knippenberg, De Cremer, & van Knippenberg, 2007, for a recent review).

As we are interested in performance of teams, the question arises as to whether these relationships also hold at the group level. Here, the relevant evidence (Cropanzano & Schminke, 2001, pp. 150–153) indicates that team satisfaction and team performance are also positively associated with fairness. However, Podsakoff, Bommer, Podsakoff, and MacKenzie (2006) discovered in a meta-analysis that group performance is more sensitive to the *punishment* behavior of supervisors than is individual performance. In group contexts, the punishment behaviors of supervisors had much stronger effects on team performance ($r = .23$ for performance contingent punishment and $r = -.36$ for noncontingent punishment behavior) than did those supervisors' reward behaviors (e.g., $r = -.03$ for contingent reward behavior). However, for individual performance, these associations are reversed. Here, individual performance was more strongly associated with the reward behavior of supervisors (e.g., $r = .21$ for contingent reward behavior compared to $r = -.09$ for contingent punishment behavior of supervisors). Podsakoff et al. (2006) speculate that this asymmetry may result from the social context in which punishment is administered as negative sanctions may be more visible (shared) in a social context than rewards. Thus, treating a group unfairly—for example, during a negotiation

about group goals that a group should achieve—might be particularly risky for supervisors as this can easily compromise team motivation and performance.

A third goal of our study is to collect evidence pertaining to this issue. This is necessary as prior research has not examined what happens if a supervisor treats his or her group in an *unfair* way during group goal-setting negotiations. Based on the available literature reviewed above, it has to be assumed that in this situation the work motivation of group members and their performance will be low. It might even be the case that goal assignments are totally rejected. Indeed, it was the likelihood of such a scenario that led Taylor (1911) to recommend isolating employees in organizations—observing that groups are more willing than individuals to engage in *soldiering* (p. 14). The phenomenon was given its name after the observation that soldiers started walking deliberately slowly once a trainer demanded almost impossible efforts from them. As Haslam (2004) describes in more detail, Taylor was unenthusiastic about teamwork in organizations because he observed that teams can be associated with a loss of ambition (social loafing) and, more particularly, because the team context empowers team members to protest and soldier against the injunctions of management through processes of active *resistance* (see Haslam & Reicher, 2006). Thus, if the performance standards suggested by an authority toward a group are perceived to be illegitimate, it is likely that a soldiering effect might occur. Here, group members do not accept the proposed goals and show a deliberate reduction of effort as a protest against the norms or desires of the supervisor (who is perceived to be representative of an out-group). In such a situation, the behavior of the authority is perceived as an unfair attack on the social identity of group members (i.e., the in-group). As a consequence, social identity salience should be increased, and this, in turn, will enhance conformity to group norms and the readiness to help and support other team members, also in form of social compensation within teams (Karau et al., 2000). As participative discussions about performance goals between a supervisor and a group always carry an attendant danger that goal conflict between employees and supervisors becomes obvious and because the supervisor often has to stick to his or her (organizational) goals and set these goals even if the group considers these goals to be unwarranted, we selected this scenario of unfair, pseudo-participative group goal setting for our investigation and propose:

> H3: Compared to a fair, participative group goal setting intervention (PGGS), an unfair intervention (UPGS) leads to (a) lower group goal commitment, (b) increased group identification and social compensation and (c) reduced performance (soldiering).

Method

Research Participants

The sample consisted of 50 male and 70 female students (mean age = 24.8 years, SD = 4.71) from a German university with different majors (not psychology). Participants were recruited by means of advertisements on notice boards in the

university. They worked together in 40 three-person mixed-sex groups. Each person received 12 Euros for participating in the study. No further financial incentives were provided.

General Procedure

On arrival, participants were informed by the experimenter that the purpose of the study was to analyze problem solving in groups. He then asked group members to complete a preliminary questionnaire (A) measuring demographic variables (e.g., age, sex). Next, participants had to work together on an anagram task that was developed for this study. Half of the groups were randomly assigned to solve lists of easy anagrams (containing four letters), and the other half had to solve lists of difficult anagrams (containing six letters). All groups were asked to solve three different trials of this task (see below). After trial 2 was finished, the experimenter determined which specific group goal condition a group would be assigned to. Then, he enacted the corresponding group goal manipulation (DYB, PGGS, DGGS, or UPGS, see below). Immediately after this manipulation and *before* trial 3 of the task, a second questionnaire (B) was distributed that assessed several variables (e.g., perceived participation as a manipulation check, indicators of work motivation). After completion of trial 3, individual problem-solving strategies were assessed by means of a third questionnaire (C). The experimenter was present in the room during the entire experiment to collect this information. Finally, participants were paid and debriefed.

Task and Experimental Design

Anagrams consist of letters to be rearranged to form a meaningful word (e.g., TSLI into LIST). The difficulty of anagrams is determined by several variables (e.g., the order of the letters in the anagram and the number of letters; Johnson, 1966). All anagrams used in this study had only one solution, and at least three of the four (easy anagrams) or five of the six letters (difficult anagrams) were in the wrong position. Moreover, no letter was on the correct position. This task was chosen because it allows for a simple manipulation of task difficulty (e.g., by changing the number of letters) even though the necessary cognitive processes to find a solution are almost identical for simple and difficult tasks. Moreover, it is also possible to administer this task in a group context where all team members participate in the solution process simultaneously. As a group, participants had to find the solutions for all anagrams written on the list. For this purpose, each group member received a copy of the complete list of anagrams for each trial. Group members were instructed to declare their solutions out loud, and the experimenter checked their suggestions, gave verbal feedback, and recorded only correct solutions on his solution list. Groups were also allowed to agree

on a strategy for dividing this work (e.g., many groups decided that each group member would start with a different part of the list). When asked, the experimenter informed the group which anagrams on the list still remained to be solved. Performance in this task was defined as the total time for solving *all* anagrams of a list by a group and was determined by the experimenter with a large stopwatch that was visible to all group members. To analyze communication processes in detail, all interactions were videotaped with the knowledge and agreement of participants.

The design for this experiment contains three factors, two between subject factors—task difficulty (easy vs. difficult) and group goal type (DYB, PGGS, DGGS, UPGS)—and one within subject factor—trials 1–3 (practice, DYB, specific goal instructions)—with repeated measurements. The manipulation of task difficulty was explained above. The other two factors were constructed in the following way.

Trials 1–3

All groups were asked to solve three trials of anagram tasks. Each trial presented a new, numbered list of anagrams. Trial 1 was a practice trial with a list comprising 12 anagrams. In trial 2, all groups were instructed to "do their best" (DYB) in solving a list of 24 anagrams to establish a baseline for group performance. In trial 3, a list of 24 different anagrams had to be solved, but on this trial, group goal instructions varied according to the selected group goal-setting strategy.

Group Goal Type

For control groups (DYB, $n = 10$), the DYB instruction was simply repeated in trial 3. Groups in the participative group goal condition (PGGS, $n = 10$) were asked to determine a specific group goal through group discussion. For this purpose, each group member first suggested an appropriate group goal. The mean value of these suggestions was computed and fed back to the group. As expected on the basis of pilot testing, this value was usually below 30% (15%). Next, the experimenter asked the group to discuss these suggestions and to generate a more challenging group goal. The experimenter accepted every group goal (the second suggestion by the group) that represented an increase in difficulty.

Following the rules of a yoked design, the ten group goals that were set participatively in PGGS conditions were assigned in a "tell and sell style" by the experimenter in the directive group goal condition (DGGS, $n = 10$). The experimenter referred to results from pilot studies and stated, for example, that 17% performance improvements from baseline are a challenging but reachable group goal. He then encouraged the group to strive for this goal and calculated the solution time (in seconds) that it would take to achieve this goal in the last trial.

In the unfair, pseudo-participation condition (UPGS, $n = 10$), the experimenter also informed group members that they should determine a specific, challenging

group goal for the last trial by means of a participative group discussion. For this purpose, each group member was asked to make a suggestion. However, the experimenter influenced these suggestions by proposing very simple improvement goals: 5 s for easy and 15 s for difficult anagrams. The expected anchoring effect was obtained as goal suggestions were easier in these conditions than in PGGS conditions. This provided the experimenter with the opportunity to complain about the behavior of the group. He did this by stating in a reproachful way that these goals were much too easy and that he could not accept the group's suggestions. Next, he mentioned that he had clear instructions regarding what he should do if participation failed because the groups wanted to make a fool out of him by generating very simple goals. He looked up information from a new folder (containing the goals of the previously tested PGGS groups) and determined a more difficult performance goal for each group (the mean increase in goal difficulty was 8.4 s for easy anagrams and 74.8 s for difficult anagrams; these values were selected in such a way that the final goal difficulty was the same as in PGGS conditions). These final goals were then assigned to the groups by the experimenter. As a consequence, group members were expected to experience this goal negotiation as rather unfair—since they did not intend to show low performance or to annoy the experimenter and had no chance to correct his faulty impression of them. Moreover, they should perceive this process as not properly participative since the supervisor's efforts at participation were a pretense.

Measures

Observation by the Experimenter

For each group, the experimenter noted on a special sheet in each trial as the *group performance* the time (in seconds) required to solve the complete list of anagrams. Moreover, individual suggestions for a group goal and finally chosen group goals were also noted by the experimenter in relevant conditions.

Questionnaire B

Participants responded to questionnaire items using a five-point Likert-type scale with responses ranging from 1 = "totally disagree" to 5 = "totally agree." All items were coded so that high values indicate high values of constructs. The following variables were assessed by self-report. *Perceived participation*. As a fairness manipulation check, participants with specific group goals answered the following two items: "I had a real voice in determining which group goal we selected to strive for" and "In comparison to the experimenter, my impact on the difficulty of group goal was low" (reverse coded). *Group Goal Commitment.* A scale comprising nine items

was used to measure commitment to group goals (e.g., "If the group reaches its goal, this will have pleasant consequences for me"; "It is highly probable that we are a little bit better than the group goal requires"; "I stick to the group goal even when I realize that my feelings divert me from this goal"). *Group identification* was assessed with four items (drawn from Haslam, 2004). Sample items were as follows: "My membership in this group has a lot to do with how I feel as a person" and "The group I belong to is an important reflection of who I am." To assess readiness for *social compensation*, three items were presented (e.g., "If other group members fail to solve the group task because they do not have enough ability, I will work especially hard to reach the group goal"). *Value of group success* was measured with the following item: "Please mark on the following scale how valuable a success of the group would be for you…." The value of success could range from 0="without value" to 5="of very high value." Finally, *potency* of the team was measured with eight items (taken from Guzzo, Yost, Campbell, & Shea, 1993; e.g., "This team has confidence in itself").

Questionnaire C

After trial 3, participants answered a set of four questions assessing their individual use of different cognitive problem-solving strategies during the last trial of the task (trying to find and checking complete solution words; searching for bi- or trigrams, changing the direction of attending to the letters, focusing on the beginning of a solution word). This list represents typical solution strategies that individuals use in trying to solve anagrams. In the following, we only consider the strategy "*checking complete solution words*" that was measured with the following question: "I generated a possible solution and checked whether it might be correct" as the other individual strategy variables were *not* significantly associated with performance differences. As will be shown below in more detail, using such a strategy is not recommendable because this is associated with low performance.

Video Data

The communication process was videotaped to analyze strategy discussions of groups. In the following, we consider one variable that was coded: the nature of the *cooperation strategy* that a team selected to work together on the task. This strategy was coded for each trial as a variable with four values: 0=no deliberate cooperation strategy was discussed or agreed on, 1=the group agrees that each group member tries to solve all words from the list, 2=the group agrees that each group member solves 1/3 of the list, and 3=the group agrees that each group member solves 1/3 of the list, but this is handled in a flexible way (e.g., by asking for help or doing a check of other parts of the list). The video data was coded by two separate raters with high inter-rater correlations ($r=.93$; $p<.01$).

Table 12.1 Average within-group agreement (Rwg), group means (M), standard deviations (SD), correlations, and alpha reliabilities (in parenthesis) of main variables

Variable	Rwg	M	SD	1	2	3	4	5
1. Goal commitment[a]	0.96	3.5	0.2	(.64)				
2. Identification	0.89	2.3	0.7	.20	(.88)			
3. Social compensation	0.90	4.0	0.4	.42*	.27^{+}	(.69)		
4. Potency	0.96	3.2	0.4	.55**	.29^{+}	.28^{+}	(.82)	
5. Value of group success	–	2.7	0.8	.41*	.20	.20	.13	–
6. Group performance (trial 2–3)	–	71.1	287	.02	−.23	−.03	−.08	.19

Notes: [a]$n = 30$ groups as commitment is not measured for DYB groups; $n = 40$ groups for all other correlations as well as for Rwg; $n = 120$ for alpha reliabilities
**$p < .01$;*$p < .05$; $^{+}p < .10$

Results

Level of Analysis and Statistical Group Comparisons

To test the hypotheses, two three-factorial MANOVAS (goal type X task difficulty X trial) were conducted. In the first, data from three group goal conditions (DYB, DGGS, PGGS) is analyzed for trials 2 and 3 using Helmert contrasts. This form of contrast is most appropriate because it compares (a) the first group (DYB) to the remaining groups (PGGS & DGGS, this reveals overall group goal-setting effects) and (b) the second group (DGGS) to the last group (PGGS, this reveals potential differences due to the amount of fair participation). The second three-factor MANOVA (goal type × task difficulty × trial) compared only data from the PGGS condition with that from the UPGS condition to investigate what happens if participative group goal negotiations are unfair and fail.

Measurement Reliability, Aggregation Justification, and Descriptive Data

Descriptive data of main variables across experimental conditions is presented in Table 12.1. Based on calculated alpha reliabilities, the measurement reliability of scales is acceptable to good. Thus, constructs are measured in a consistent way. In order to check whether aggregation is appropriate, we calculated within-group variance of variables with the Rwg index (James, Demaree, & Wolf, 1984). Mean values of this index for all constructs that were measured using scales are higher than .70, a value typically considered to indicate substantial within-group agreement. Accordingly, aggregation to the group level is justified.

Table 12.2 Means (M) and standard deviations (SD) of variables assessed as manipulation checks

	DYB		DGGS		PGGS		UPGS	
Easy problems	M	SD	M	SD	M	SD	M	SD
Solution trial 2 (sec.)	136.8	74	112.8	25	115.4	53	112.0	38
Perceived participation	–		3.2	0.7	4.3	0.3	2.7	0.7
Goal suggestion (sec.)	–		–	–	−18.8	10.5	−10.7	8.7
Goal (sec.)	–		−19.8	4.7	−20.0	9.1	−19.2	6.7
Goal (% baseline)	–		−17.5	1.6	−17.3	1.9	−17.1	1.8
Difficult problems								
Solution trial 2 (sec.)	666.6	506	775.6	350	798.6	337	738.4	287
Perceived participation			2.8	1.1	4,3	−0.4	3.1	0.7
Goal suggestion (sec.)			–	–	−135.5	−159	−63.1	45
Goal (sec.)			−140.0	104	−140.0	103	−137.8	103
Goal (% baseline)			−18.0	5.6	−17.5	5.8	−18.7	5.4

Notes: *DYB* "do your best," *DGGS* directive group goal setting, *PGGS* participative group goal setting, *UPGS* unfair, pretended participative group goal setting; goal suggestions and goals are presented as negative values (the time which teams planed to become faster)

Manipulation Checks

Table 12.2 presents data relevant to the effectiveness of experimental manipulations. Baseline performance did *not* differ across the four experimental conditions *within* the two levels of task difficulty (both $F < .20$). Thus, procedures to harmonize group performance in baseline trials were successful for groups solving easy and difficult tasks. Moreover, the data in Table 12.2 indicates that the manipulation of task difficulty worked perfectly. Solving difficult anagrams required about six times as much time as solving easy anagrams (the main effect is significant with $F(1,32) = 76.02$, $p < .01$, $\eta^2 = .70$). With respect to perceived participation, it was found, as expected, that across task difficulty manipulations, group members in participative groups (PGGS) reported having more input into the process of determining group goals than group members with assigned group goals (DGGS, $F(1,16) = 17.08$, $p < .01$, $\eta^2 = .52$). A similar comparison of PGGS and UPGS revealed that the perceived participation was significantly lower when participation was only pretended and failed ($F(1,16) = 32.91$, $p < .01$, $\eta^2 = .67$). Moreover, differences between UPGS and DGGS were not significant for this variable. This could be expected as in both conditions the experimenter was the person (finally) determining group goals. Thus, this manipulation also worked as expected. A final potential confound is group goal difficulty. Again, the data with respect to this issue (see Table 12.2) indicates that manipulations were successful.

Table 12.3 Means (M) and standard deviations (SD) of selected variables

	DYB		DGGS		PGGS	
Easy problems	M	SD	M	SD	M	SD
Trial 2 (sec.)	136.8	74	112.8	25	115.4	53
Trial 3 (sec.)	105.0	89	91.2	22	93.4	37
Improvement (2–3)	−31.0 (−23.3%)		−21.6 (−19.2%)		−22.0 (−19.1%)	
Goal commitment	–	–	3.6	0.2	3.4	0.1
Identification	2.1	0.4	2.1	0.5	2.1	0.4
Social compensation	3.8	0.5	4.2	0.2	3.8	0.2
Potency	3.2	0.4	3.3	0.4	3.2	0.3
Values of success	2.1	0.5	2.4	0.9	2.7	0.5
Difficult problems						
Trial 2 (sec.)	666.6	506	775.6	350	798.6	337
Trial 3 (sec.)	786.0	457	577.0	182	599.6	200
Improvement (2–3)	+119.4 (+17.9%)		−198.6 (−25.6%)		−199.0 (−24.9%)	
Goal commitment	–	–	3.5	0.4	3.6	0.2
Identification	2.0	0.6	2.5	0.9	2.0	0.4
Social compensation	4.1	0.5	4.2	0.2	3.9	0.4
Potency	3.3	0.4	3.4	0.5	3.0	0.2
Values of success	2.0	1.1	3.1	0.8	3.1	0.8

Notes: *DYB* "do your best," *DGGS* directive group goal setting, *PGGS* participative group goal setting

Test of H1a and H1b

Tables 12.3 and 12.4 provide the relevant data for testing these hypotheses. According to H1, fair group goal-setting techniques (DGGS, PGGS) should increase both work motivation (H1a, Table 12.3) and strategy use and/or strategy quality in groups (H1b, Table 12.4) compared to DYB instructions. The MANOVA yielded only one significant difference between groups for the work motivation variables. The value of group success was much lower in DYB groups ($M = 2.05$) compared to groups with specific, difficult group goals ($M = 2.82$ combined for DGGS and PGGS, $t(24) = -2.54$, $p < .02$). Thus, H1a was only supported with respect to the perceived value of group success. Are there any effects induced by fair group goal-setting procedures regarding individual strategy use or team planning? As documented in Table 12.4, this was not the case for team planning. We find a continuous increase in the cooperative strategies of teams over time as both comparisons across trials are significant: trial 1 vs. trial 2/3 ($F(1,23) = 24.33$, $p < .01$) and trial 2 vs. trial 3 ($F(1,23) = 4.84$, $p < .04$). However, there is no main effect for group goal setting on this variable. Nevertheless, for the use of individual solution strategies ("checking complete words"), this main effect was present as the values of DYB and PGGS/DGGS groups differ substantially ($t = 2.48$, $p < .02$) because groups with specific, challenging group goals used this strategy less often. As groups composed of individuals

Table 12.4 Use of specific strategies in the course of the experiment

	DYB		DGGS		PGGS	
Easy problems	M	SD	M	SD	M	SD
Cooperation[a] in trial 1	1.5	1.0	0.8	1.1	0.8	1.3
Cooperation in trial 2	2.6	0.6	2.4	0.6	1.8	0.8
Cooperation in trial 3	2.8	0.5	2.4	0.5	2.2	0.8
Complete words[b]	2.1	0.3	1.8	0.4	2.4	0.6
Difficult problems						
Cooperation in trial 1	1.2	1.1	2.0	0.7	1.0	1.4
Cooperation in trial 2	2.6	0.9	2.0	0.7	1.8	0.4
Cooperation in trial 3	2.6	0.9	2.6	0.5	2.2	0.8
Complete words	2.5	0.4	1.7	0.4	1.5	0.4

Notes. DYB "do your best," *DGGS* directive group goal setting, *PGGS* participative group goal setting

[a]The range of this variable is from 1 to 4, high values indicate more complex cooperation strategies

[b]This variable is in the range of 1 to 3, high values indicate the regular use of this specific cognitive strategy

who reported that they often used this strategy had less performance improvements from trial 2 to trial 3 both when solving easy anagrams ($r = -.52$, $p < .05$, $n = 15$) and when solving complex anagrams ($r = -.56$, $p < .03$, $n = 15$), it is clear that the use of this strategy is ineffective. Thus, reporting lower values of this strategy might explain a group goal-setting effect, and H1b is supported for the use of *individual*, cognitive solution strategies.

Test of H2

We expected to find a group goal effect solely for simple team tasks. Thus, the presence of such a group goal-setting effect should be indicated by a significant three-way interaction (DYB vs. DGGS&PGGS × trial 2 vs. trial 3 × easy vs. difficult tasks) for solution times. The expected three-way interaction (statistically represented by one planned corresponding Helmert contrast) was not significant with $t(24) = 1.69$, $p < .10$. Moreover, the observed mean differences were in the *opposite* direction to that predicted because performance improvements due to group goal setting (DGGS and PGGS vs. DYB) were less pronounced on easy tasks than on difficult tasks (see Table 12.3). Hence, it can be concluded that group goal setting failed to cause improved group performance. However, it could be also argued that there was a weak group goal-setting effect in our data which is only found in groups solving *difficult* tasks. We follow this later interpretation of the data as an additionally conducted regression analysis for calculating effect sizes was significant with a more conventional significance level of $p < .06$, cf. below.

Test of H1c

As performance improvements due to group goal setting could only be observed in groups solving *difficult* tasks, a search for potential mediating variables has to be adjusted accordingly. Thus, the above-mentioned effect for the variable "value of success" could only be an explanation for the weak group goal effect if this variable also varies across task difficulty conditions in a similar way. This is not the case as the interaction including task difficulty is not significant ($p > .20$). However, such an interaction was found for the variable "checking complete solutions" ($t(24) = -2.94$, $p < .01$). In general, groups composed of individuals who reported that they often used this strategy had less performance improvements from trial 2 to trial 3 (see above). Thus, it is plausible that differences in the use of this performance *hindering* strategy are responsible for the observed three-way interaction regarding performance. To test this idea directly, a hierarchical regression analysis was conducted. We computed a new dummy variable to represent the interaction between task difficulty and relevant group goal types (difficulty x DYB vs. DGGS/PGGS). As expected, a regression of this dummy variable on performance improvements from trial 2 to trial 3 yielded a significant effect (standardized $\beta = .35$; $R^2 = .12$, $F(1,28) = 3.91$, $p < .06$). Next, we tested whether this effect could be reduced by incorporating the proposed cognitive mediator variable in the regression. The strategy was a significant predictor in this analysis ($\beta = -.41$, $t = -2.18$, $p < .04$), and the prior significant interaction term was reduced ($\beta = .16$, $t = 0.86$, $p < .39$). This finding indicates that the individual cognitive strategy of searching and checking complete solution words is important in explaining why group goal-setting effects were found only for difficult tasks. On these tasks, this deficient strategy was *less often* used in groups striving for challenging groups goals compared to DYB groups. On easy tasks, there was no such difference. Thus, taken together, H1c is only supported for the use of individual solutions strategies.

Test of H3

Table 12.5 presents the relevant data for this hypothesis. It was expected that compared to PGGS, an unfair, pseudo-participative group goal-setting intervention (UPGS) would lead to lower group goal commitment, increased group identification, social compensation, and reduced group performance (soldiering). For group goal commitment (as well as for potency and value of success), no differences between conditions were found. However, the behavior of the experimenter in the unfair conditions increased group identification ($F(1,16) = 4.26$, $p < .06$, $\eta^2 = .21$) and readiness to engage in social compensation ($F(1,16) = 12.63$, $p < .01$, $\eta^2 = .44$). These effects were the same when solving easy and difficult tasks. With respect to performance changes from trial 2 to trial 3, there is no consistent pattern in UPGS conditions because unfairly treated groups solving easy tasks became slower whereas

Table 12.5 Means (M) and standard deviations (SD) of selected variables

	UPGS		PPGS	
Easy problems	M	SD	M	SD
Trial 2 (sec.)	112,0	38	115.4	53
Trial 3 (sec.)	117.4	60	93.4	37
Improvement (2–3)	+5.4 (+4.8%)		−22.0 (−19.1%)	
Goal commitment	3.3	.02	3.4	0.1
Identification	2.7	0.6	2.1	0.4
Social compensation	4.2	0.1	3.8	0.2
Potency	3.0	0.4	3.2	0.3
Value of success	2.9	0.4	2.7	0.5
Difficult problems				
Trial 2 (sec.)	738.4	287	798.6	337
Trial 3 (sec.)	517.8	380	599.6	200
Improvement (2–3)	−220.6 (−29.9%)		−199.0 (−24.9%)	
Goal commitment	3.6	0.3	3.6	0.2
Identification	2.7	1.2	2.0	0.4
Social compensation	4.4	0.3	3.9	0.4
Potency	3.3	0.7	3.0	0.2
Value of success	3.3	0.2	3.1	0.7

Notes: PGGS participative group goal setting, *UPGS* unfair, pretended participative group goal setting

unfairly treated groups solving difficult tasks became faster. However, if these changes are compared to data from PGGS groups, significant differences are found only for task difficulty. Nevertheless, it should be noted that four of the five groups solving simple tasks in the UPGS condition did become a little bit slower and therefore did *not* meet group goals whereas in the PGGS condition three of the five groups indeed achieved their group goals. This is a clear sign of protest against expectations formulated by the authority even though performance is still within an almost acceptable range. Taken together, hypothesis 3 received mixed support.

Discussion

The results of this study are important in several aspects. First, we found evidence for a group goal-setting effect in groups performing problem-solving tasks. However, this effect was only observed in conditions with difficult tasks (see below). Moreover, group goal setting yielded a significant overall improvement in work motivation by increasing the subjective value of group success. These findings add to what is already known about group goal setting and support models (e.g., Karau & Williams, 1993) which emphasize the role of values in explaining team motivation. We can conclude from these data that both commonly used group goal-setting strategies (DGGS and PGGS) have some positive impact as methods for promoting creativity and problem-solving performance in teams. Based on our

mediation analysis, we can further conclude that this effect is due mainly to the use of more efficient individual cognitive problem-solving strategies in teams solving difficult problems. Taken together, these findings support more complex models of group goal setting which emphasize the relevance of both motivational and cognitive processes in teams.

A second, more important, objective of this study was to investigate for the first time potential moderating variables of group goal-setting interventions as previous research has not examined the role of potential moderator variables at the group level. With respect to this objective, several new insights were gained. We can see this first by considering the impact of *task difficulty*. Following the analysis of Weldon and Weingart (1993), it was expected that group goal setting would enhance team performance more on easy group tasks than on difficult group tasks. However, the results of our study *contradict* this assumption because a group goal-setting effect was only found in teams working on difficult tasks. How can this be explained? As the manipulation of task difficulty was successful, our experimental manipulation definitely worked. However, there are two important issues that should be taken into consideration.

First, our hypothesis implies that for difficult tasks (a) requirements with respect to the use and development of new, task-appropriate strategies are higher than for easy tasks and that (b) groups often do not have the time (support) to develop effective individual strategies and coordination strategies. The second part of this assumption is critical. Communication in groups solving easy anagram tasks was very intensive because, on average, every 4–5 s a group member suggested a new solution to the experimenter. In groups solving difficult tasks, this happened on average every 25 s. Thus, the manipulation of task difficulty used in this study might have had the *unintended* side effect of precluding group members from reflecting on the appropriateness of the cognitive problem-solving strategies they were using—in particular when groups had to solve easy tasks. Second, task interdependence is obviously higher in groups solving easy tasks as all group members have to coordinate their cooperative problem-solving efforts in order to achieve the group goal, and there was much *less time* for this subtask when groups solved easy tasks (i.e., the whole process was more dynamic). Taken together, there are two plausible explanations for our unexpected finding and—based on these assumptions—our findings are in accordance with goal-setting theory. At the same time, though, our results also indicate that we cannot simply assume that all moderator variables found in individual goal-setting research function in the same way at the team level.

A second, previously unexplored, potential moderating variable that we examined in our study was the *fairness of a supervisor in goal negotiations*. Our corresponding hypothesis was mainly based on social identity theorizing (e.g., Haslam, 2004; Haslam et al., 2009). Specifically, it was assumed that goal commitment would be reduced in unfair conditions, that social identity salience would increase and hence that a soldiering effect would ensue. The corresponding findings are—at first sight—not very impressive. Only groups solving easy tasks did not achieve their group goals and therefore showed a mild form of protest against experimenter's unjust treatment of them. Groups solving difficult tasks, however, did achieve the performance goals

set by the experimenter. Thus, we might conclude that group goal setting is very robust and works even if supervisors act in a pseudo-democratic way by merely pretending to participate and then setting their own performance goals.

In our view, such an interpretation of the data would be misleading for at least two reasons. First, it was also found that group identification and the readiness to compensate for weak group members was strongly enhanced by this leadership behavior in groups that solved both easy and difficult tasks. It would appear that all group members felt offended (or at least challenged) by the authority and, as that, as a consequence of their shared unpleasant fate, changed their self-definition to see themselves more as part of the group. Some groups reacted by showing a soldiering effect (on easy tasks), and other groups attempted to prove that the assumptions of the authority were wrong by working very hard, so that they ended up surpassing the goal assignments of the authority (a form of social laboring on difficult tasks; see Haslam, 2004). Thus, it is very plausible that *both* kinds of behavior represent a *protest* against the authority, and future studies should search for potential variables (e.g., differences in the self-definition of the group, perceptions of time pressure) that can explain the *form* and *direction* in which protest is expressed. If we also consider that the groups participating in this experiment were ad hoc groups without history and future, the observed "mild" form of protest against the authority is actually quite impressive. Second, we believe that these findings should not be judged as just another example of the effectiveness of goal setting for teams since the soldiering behaviors of teams working on simple tasks are a clear evidence for the failure of group goal setting. The problem of soldiering effects in goal-setting research has generally been overlooked in prior research because the phenomenon will be found more often at the team level. Accordingly, we recommend exploring this phenomenon in much more detail in future group goal-setting studies.

Limitations and Future Directions

This study has several limitations. First, we have to acknowledge that some potentially influential factors were not measured (e.g., perceptions regarding justice of procedures, time pressure) and not manipulated in this study (e.g., task interdependence). Future research should address this lacuna by examining these variables and the impact of task interdependence during teamwork. As our experiment reveals that manipulation of task difficulty in the context of group work probably affects task interdependence (see Antoni, 2005 for a similar observation), future studies should seek to decouple both variables. Based on the data from this study, one way to achieve this goal would be to use lists of anagrams with six or eight letters as stimulus material. In these conditions there should be no severe time pressure hindering group coordination. Thus, the potential impact of variations in task difficulty could be analyzed when interdependence is stable.

Another fruitful line of extending this research would be to analyze the impact of difficult learning goals or combinations of learning goals and outcome goals in group problem solving. Recent developments in goal-setting theory suggest that the

formulation of challenging learning goals is more appropriate than the setting of outcome goals for complex tasks (Latham & Locke, 2007). Thus, performance improvements on solving difficult problem-solving tasks might be much larger if appropriate group goals are formulated.

Finally, it should be emphasized that on the basis of this study's findings we would recommend using *fair* group goal-setting procedures because supervisors using a pseudo-democratic approach (pretending to participate and then setting their own performance goals) face the danger of encouraging soldiering effects. Offended groups may adopt damaging strategies (e.g., overt protest) if this behavior is repeated (Haslam et al., 2009; Reicher & Haslam, 2006)—especially if there is no surveillance by the authority. Hence, we encourage researchers to investigate the consequences of using unfair group goal-setting procedures.

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Part IV
Studies on Educational Excellence

Chapter 13
The "Hector Seminar": A New Enrichment Program for MINT/STEM Talents

Kurt A. Heller

Introduction

The Hector Seminar is an extracurricular enrichment program, which has been implemented in the northern part of Baden-Württemberg (Germany) for promoting the most talented gymnasium (college prep high school) students in the areas of mathematics, informatics (computer science), natural sciences, and technology (MINT). The US American counterpart of MINT is STEM (science, technology, engineering, and mathematics). The program was scientifically evaluated during its pilot phase (2001–2008).

Program Evaluation as an Integral Component of the Promotion of Talented Students

The H.W. and J. Hector Foundation, which has been financing the MINT support program since 2001, provided some additional funding for empirical evaluation during the 8-year pilot/project phase. A complete evaluation of a support program must, according to the CIPP Model of Stufflebeam (2000), include at least four components: *c*ontext evaluation, *i*nput evaluation, treatment or *p*rocess evaluation, and output or *p*roduct evaluation. For further detail, see Heller and Neber (2004, pp. 1–7) as well as Heller (2009).

Remarks
This chapter is an updated version of a paper presented at the International Conference on Creativity in Business and Education, organized by Ai-Girl Tan and Detlef Urhahne at University of Munich (LMU), Germany (June, 2010).

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_13,
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Method of the Program Evaluation Study "Hector Seminar"

A key role is played on the *predictor* side by the intellectual, creative and social talent dimensions. At the level of performance (*criteria* variables for excellent achievement), the areas of mathematics, informatics, natural sciences, and technology are the primary focus. The "mediating" *moderator* variables between ability predictors and achievement criteria (treatment effects) were curricula-relevant individual and social characteristics about learning and study habits, (academic) self-concept, attributional styles, various interests and motivations, as well as achievement, emotions, etc., on the one hand and organizational, curricular, and educational aspects on the other. The operationalization of various study variables is shown in Table 13.1 below.

The *talent search* for the Hector Seminar, i.e., the recruitment of the "Hectorians", was also a subject of evaluation. The selected Hectorians (treatment group) were made up of the top 1% of MINT-talented gymnasium students. A control group was included during the pilot phase, which consisted of the top 2% of the gymnasium students. In contrast to the Hectorians, these students have not been supported by the Hector Seminar. They did however take part in the yearly retests and the individual test result feedbacks and consultants; for more information, cf. Heller and Perleth (2008, 2009).

Sample Design

The selection of the "Hectorians" was made at the beginning of each school year. Initially a screening was implemented to preselect the 10% most MINT-talented gymnasium students in North Baden (the greater area of Heidelberg, Mannheim and Karlsruhe with a population of ca. 750,000). The teachers at the gymnasium nominated those students in their classes who, with regard to intelligence, creativity, and social competence, belonged to the top 10% of their class; cf. Table 13.1. The teachers used the criteria shown in Table 13.2 for their evaluation.

The treatment group (TG) represents the top 1% of the gymnasium students and those who were chosen to participate in the Hector Seminar. The control group (CG) was composed of the test students who made up the top 2%. The complete sample design is shown in Table 13.2.

Study Design

The following scales were used in the admittance exam: KFT-HB 4-12+ (V, Q, N, GL), AW, SP, APT, and KRT-S. In addition, a very challenging mathematics test was employed to determine mathematical abilities that are already present (preknowledge); cf. Table 13.3 below. The rest of the scales in Table 13.3 were only used to evaluate the program during the yearly retests for the developmental analysis

Table 13.1 Excerpts from the teacher screening

Mathematics: Natural phenomena:			Subject teacher				Biology: Geology:		Subject teacher		
No.	Name of students	m/f	Intelligence		Creativity		Social competency		Evaluation		
			1	2	1	2	1	2	Certain	Less certain	Outside information
1											
2											
3											
4											
5											
6											

Scoring: 1 = is among the top 10%
2 = is among the top 20%, but not to the best 10%

Table 13.2 Sample checklist (criteria for the teacher evaluation during the screening)

Intelligence	Possible criteria for creativity	Social competency
Logical, analytical thinking	Curiosity, thirst for knowledge	Ability to adapt to various social situations
Abstract thinking	Richness of ideas, fantasy	Self-assertion, self-confidence, and assertiveness
Mathematical thinking	Alternative thinking	Initiative in social situations
Technical, scientific thinking	Creative and inventive thought	Empathy, dealing with others
Verbal skills (rich vocabulary, good expression of thought, foreign language skills)	Originality, search for unusual solutions	Cooperation and conflict resolution ability
Learning ability (quick comprehension, good memory, perfect recall, active and exploratory learning)	Flexibility in thinking, ability to look at problems for more than one angle	Leadership qualities and preparedness to take on responsibility
Combinatory ability	Independence and individuality in thinking and decision making	Popularity in the class
Broad general knowledge	Interest-based independent study of problems	Ability to work integrated in a group
Fundamental special knowledge about one or more special area/s	Large number of interests Long-term interests	

of the students (TG and CG). In addition to the *predictor* variables from the MHBT-S (KFT-HB: V, Q, N, GL; AW, SP, APT; KRT-S, resp., BIS-HB; math admittance test), (individual and social) *moderator* variables were (only) retested in program students (Hectorians). These are listed in Table 13.3 according to the measurement instruments in the MHBT-S as well as MINT questionnaires, which were specially developed for the Hectorians and control group students.

The *criteria* variables were taken from final grades, mathematics tests, evaluative lists of the course teachers (the latter only for Hectorians) as well as awards, participation quotas in (MINT) competitions, university studies including MINT subjects, etc. For the corresponding measurement instruments, see Table 13.4.

Evaluation Design

The evaluation design here can be considered to be a quasi-experimental field study. Longitudinal analysis of five measurement periods, which covered a total of 8 years in the first two graduating classes, served to demonstrate long-term effects of the program; for the organization chart of the 8-year pilot phase, see Heller, Collier, and Senfter (2009, p. 156).

Table 13.3 Measurement, grades, and number of Hectorians (TG) and control group students (CG) of the cohorts 1 through 6 (including substitutes, who moved up)

	Admittance test	1st retest	2nd retest	3rd retest	4th retest
Cohort 1:	Sept. 2001 (grade 6)	Feb. 2004 (grade 8)	Feb. 2005 (grade 9)	June 2006 (grade 10)	Dec. 2007 (grade 12)
TG	*62*	*55*	*54*	*54*	*46*
CG	*54*	*54*	*35*	*26*	*32*
Cohort 2:	Sept. 2002 (grade 6)	Feb. 2004 (grade 7)	Feb. 2005 (grade 8)	June 2006 (grade 9)	Dec. 2007 (grade 11)
TG	*65*	*58*	*57*	*53*	*49*
CG	*51*	*51*	*31*	*26*	*24*
Cohort 3:	Sept. 2003 (grade 6)	Feb. 2005 (grade 7)	June 2006 (grade 8)	Dec. 2007 (grade 10)	
TG	*67*	*59*	*58*	*52*	
CG	*53*	*52*	*32*	*33*	
Cohort 4:	Sept. 2004 (grade 6)	June 2006 (grade 7)	Dec. 2007 (grade 9)		
TG	*61*	*59*	*54*		
CG	*57*	*57*	*36*		
Cohort 5:	Sept. 2005 (grade 6)	Feb. 2007 (grade 7)	Dec. 2007 (grade 8)		
TG	*63*	*55*	*54*		
CG	*62*	*60*	*41*		
Cohort 6:	Sept. 2006 (grade 6)	Dec. 2007 (grade 7)			
TG	*61*	*53*			
CG	*54*	*54*			

The evaluation of the Hector Enrichment Program is based on a pretest treatment-posttest design with a training or treatment group (Hectorians) and a control group (without training). The predictor variables were treated as *independent* variables and the criteria variables as *dependent* variables in a quasi-experimental design. The so-called moderator variables serve as "intervening" variables; for greater detail, see Heller and Perleth (2008, pp. 173–188, 2009, pp. 115–120), Heller et al. (2009, pp. 155–160).

The main purpose of the data analysis was to determine the developmental paths of and the program effects on participants of the Hector Seminar. The evaluation is therefore mainly concentrated on the developmentally supportive differences in MINT areas between Hectorians (TG) and the control group (CG). In addition, the ability and achievements and relevant personality variables of sex differences were studied.

In order to compare the TG and CG participants at a particular point in time (ET or RT), either *univariate* (one dependent variable) or *multivariate* (with several dependent variables) analyses of variance were employed. When longitudinal data was present, the differences between ET and RT were calculated using analysis of variance with repeated measurements, otherwise nonparametric methods were used with the nominal or ordinal scale data. For greater detail, see Heller, von Bistram, and Collier (2010, p. 445).

Table 13.4 Overview of measurement instruments, their dimensions, information sources, and measurement periods

Instrument	Dimension studied	Source of information	Measurement period
Kognitiver Fähigkeitstest für Hochbegabte (KFT-HB 4–12) (Cognitive abilities test for highly gifted, grades 4–12) [a]	Verbal thinking ability (KFT-V)	Hectorians (TG)	ET
	Quantitative thinking ability (KFT-Q)	Control group (CG)	
	Nonverbal thinking ability (KFT-N)		
	Cognitive ability level (KFT-GL)		RT
Test "processing" (AW) and "mirror images" (SP) [a]	Spatial representations (MINT-relevant space factors)	TG	ET
		CG	RT
Test "tasks from physics and technology" (APT) [a]	Physical-technical problem-solving abilities	TG	ET
		CG	RT
Creativity questionnaire (KRT-S) [a]	Originality, flexibility, curiosity, interests, etc.	TG	ET
		CG	RT
Questionnaire social competency (SK-S) [a]	Social cognitions: assertiveness, cooperation, conflict resolution, etc.	TG	ZT
			RT
MINT questionnaire I	Interest in math (IT)	TG	ET
	Self-concept of math talents (SK)	CG	RT
	Preference for cooperative vs. competitive study forms (COOL/COML)		
	Implicit personality theories in the area of mathematics (IPT): modifiability (MB, MFD) vs. stability (SB) of one's own mathematical potential		
	Motivational orientation in mathematics (MOT): goal-directed (LZP), avoidance-directed (VZO) vs. goal-approach orientation (AZO)		
	Faith in one's own mathematical abilities (VER)		
	Control beliefs in math (KON)		
	Causal attributions about success and failure in mathematics (KA)		
MINT questionnaire Ia	Four creativity scales from the BIS-HB by Jäger et al. (2006): complete a drawing (ZF), layout (LO), object design (OJ), combine a drawing (ZK)	TG	ET
		CG	RT
	Five motives of altruism from the PSMQ by Boehnke (1986) and Silbereisen, Boehnke, Lamsfuss, & Eisenberg (1991): conformity, task orientation, self-interest, altruism/other interest, hedonism		

Interests questionnaire (IFB) [a]	Interests-preferences	TG	ZT RT
Questionnaire on achievement motivation (LM-S) [a]	Hope for success Fear of failure Striving for achievement	TG	ZT RT
Questionnaire about thirst for knowledge (FES) [a]	Thirst for knowledge, insight, etc.	TG	ZT RT
Questionnaire about work habits (AV-S) [a]	Test anxiety Test worries General anxiety General self-esteem Scholastic (talent) self-concept Causal attribution (internal vs. external) Stability of thought processes Structuring of study content Direction of attention	TG	ZT RT
Questionnaire about school climate (SCHUL) [a]	Various dimensions of the school atmosphere	TG	ZT RT
Questionnaire about family climate (FAM) [a]	Various dimensions of the family atmosphere	TG	ZT RT
MINT questionnaire IIa	Various aspects of the instruction at the students' regular school classes Group climate in the Hector Seminar Use of leisure time/leisure time activities	TG	RT
MINT questionnaire IIb	Group climate in the Hector Seminar [b] Aspects of Hector courses [b] Home study situation Diverse characteristics of social status Use of leisure time/leisure time activities	Parents of the Hectorians (TG)	RT

(continued)

Table 13.4 (continued)

Instrument	Dimension studied	Source of information	Measurement period
MINT questionnaire IIbb	Diverse characteristics of social status Use of leisure time/leisure time activities	Parents of the control group (CG)	RT
MINT questionnaire IIc	Aspects of the Hector courses (from the teachers' point of view)	Teachers at Hector Seminar (TG)	RT
MINT questionnaire III	Aspects of the Hector courses (from the Hectorians point of view)	TG	RT
Mathematics test	Math problem-solving competencies or performances	TG	ET
		CG	RT
Grades/report cards	Scholastic achievements (via grades)	TG & CG	RT
Evaluation list	Indicators of MINT effects	Teachers	RT
Student questionnaire	Awards/prizes, participation in competitions, etc.	Hectorians	RT
	Choice of university subject/degree program	Control group	

[a]MHBT-S by Heller and Perleth (2007)
[b]Parent evaluation (of their own child)
Comments: ET [Eingang test] refers to the admittance exams administered each fall (last weeks of September), *ZT* [Zusatz Test] refers to the extra tests that only the Hectorians had to complete – and which were only used for the course evaluation (Hector Seminar). The ZT followed the ET testing after a brief interval, for which reason the data is combined with that of the admittance exam (in the Hectorians)
RT [retest] refers to the retests which were administered approx. 12–15 months later, i.e., the 1st, 2nd, 3rd, and 4th retesting of the Hector course 1 groups as well as their control groups; the 1st, 2nd, 3rd, and 4th retesting of the Hector course 2 groups as well as their control groups; the 1st, 2nd, and 3rd retesting of the Hector course 3 groups as well as their control groups; the 1st and 2nd retesting of the Hector course 4 and 5 groups as well as their control groups; and also the 1st retesting of the Hector course 6 groups and their control groups. The last retests are identical with the final exams in December 2007 (Hectorians) or January 2008 (control group). Starting with the 7th-year test (ET 2007), no more retesting was undertaken, and as of September 2007, no more control groups were formed

Selected Results of the Program Evaluation

General Treatment Effects of the Hector Seminar

The main focus of the evaluation was on the treatment effects of the Hector Seminar. The first question evaluated was the further *development of MINT-relevant abilities*. Significant changes in Hectorians (TG) vs. nonparticipants of the Hector Seminar (CG) could provide first indications of program effects. In fact, the "developmental gains" made by the Hectorians were clearest in the MINT-relevant competencies of the cognitive abilities test for highly gifted (KFT-HB). At the same time, the increases tended to be smaller in the space factors and the less MINT-relevant factors of the so-called crystallized intelligence. These TG/CG differences were less often significant. There is a plausible explanation for this. Cattell (1973) differentiates between two general factors: a so-called fluid intelligence (a general and innate ability to deal with problems and complexity) and a so-called crystallized intelligence (knowledge and abilities) in his two-factor theory of intelligence. The *fluid intelligence* is genetic predisposition; the *crystallized intelligence* is those abilities that develop out of the fluid intelligence through appropriate training and support measures, such as socialized by schools and families. Crystallized intelligence according to Cattell (1973, p. 268) is more or less the final product of fluid intelligence and schooling. Thus, if positive developmental effects take place in the gymnasium students in the Hector enrichment program, they must show up to the greatest extent in the MINT-relevant competencies as seen in comparison to the bright to very bright students in the control group.

This hypothesis could be confirmed to a large extent by the results of the evaluation. As expected, the differences between the training and control groups are greatest with regard to *mathematical* abilities (Q) in the KFT-HB. The curves vary in their distance to one another depending on the content and continually rise over the measurement periods and stabilize at a very high level. Surprisingly, the advantage in *verbal* competencies (that the Hectorians entered the program with) remained over the test periods, although verbal abilities were not expressly promoted or supported in the Hector Seminar. Apparently it is also not impeded but indirectly encouraged. The nonverbal N scales of the KFT-HB can be interpreted as indicators of more hereditary intelligence dispositions (fluid intelligence) that are relatively independent of socialization. It was then expected to discover smaller TG/CG differences in some cases on the N dimension. In contrast, the TG showed a great increase in physical-technical competencies (as measured by the APT). This earmarks one of the clearest treatment effects of the Hector Seminar. It is only topped by the competency increase in the space dimension as measured by the AW-test.

Creativity was measured with two different measurement instruments. The MHBT-inventory scale KRT-S is based on (hidden) self-evaluation of various creativity aspects. The results can, however, be influenced by the social desirability effect. The two groups showed little, but nonsignificant differences, however, the Hectorians tended to be more realistic in their self-appraisals. The objective

test scales from the new BIS-HB were implemented as a control. But this measures only graphic/drawing creativity aspects. On the whole, the TG/CG differences of *creative achievement* are less than those in the MINT-related basic competencies (especially measured by KFT-Q, APT und AW); for greater detail, see Heller (2009).

There were no significant differences between the groups with regard to the *non-cognitive (personality) variables*. It was also not expected that there would be substantial differences in the motivation and achievement learning conditions between the two top groups of gymnasium students (top 2%). This makes it even more impressive that differences in *performance indicators* did show up in the retests with the (very challenging) mathematics test and in final grades of the school year included in every retest.

The development of the students' grades over the entire gymnasium attendance period was no less impressive. In Fig. 13.1, we see an example of cohort 1 using their final grades (JZ) of the year in various school subjects. Here, the lower scores correspond to better school performances – in accordance to the German school grade scale. As was to be expected, the TG/CG grade differences in the MINT subjects were greatest (Fig. 13.1a). In the subjects closely related to MINT subjects (e.g., biology) or languages (Fig. 13.1b), although the TG/CG grade differences were more modest, the Hectorians still tended to higher average grades. Thus, the time-consuming participation in the Hector Seminar in no way put a strain on scholastic achievements as was feared by detractors of programs for the gifted. Rather, the development of competencies in the MINT subjects was sustainably promoted (without effecting the other academic achievements or leisure time activities).

There are clear differences in the positive program effects on the degree programs chosen by the first graduating class that completed the entire Hector Seminar. The former Hectorians prefer MINT degree programs; technical degree programs are chosen equally frequent by both the Hectorians and the control group. The control group favored business and medical degree program (in addition to technical and scientific subjects). The group with the greatest relative size is that of the undecided (Fig. 13.2). The Hector Seminar clearly has a salient effect on the decision of what to study. The remaining degree programs were not interpreted more closely due to the low case numbers. For greater detail, see Heller (2009, pp. 165–214).

Differential Program Effects

The analysis of sex differences is of special interest here. Whereas mathematics and sciences were chosen as degree programs about equally by graduates of both sexes (with the exception of physics), the males prefer technical and informatics subjects. Females, however, (CG more so than TG graduates) made up the largest group of medical students as well as political and social sciences – a finding made also by other studies of the gifted (for an overview cf. Stoeger, 2007, see Fig. 13.3).

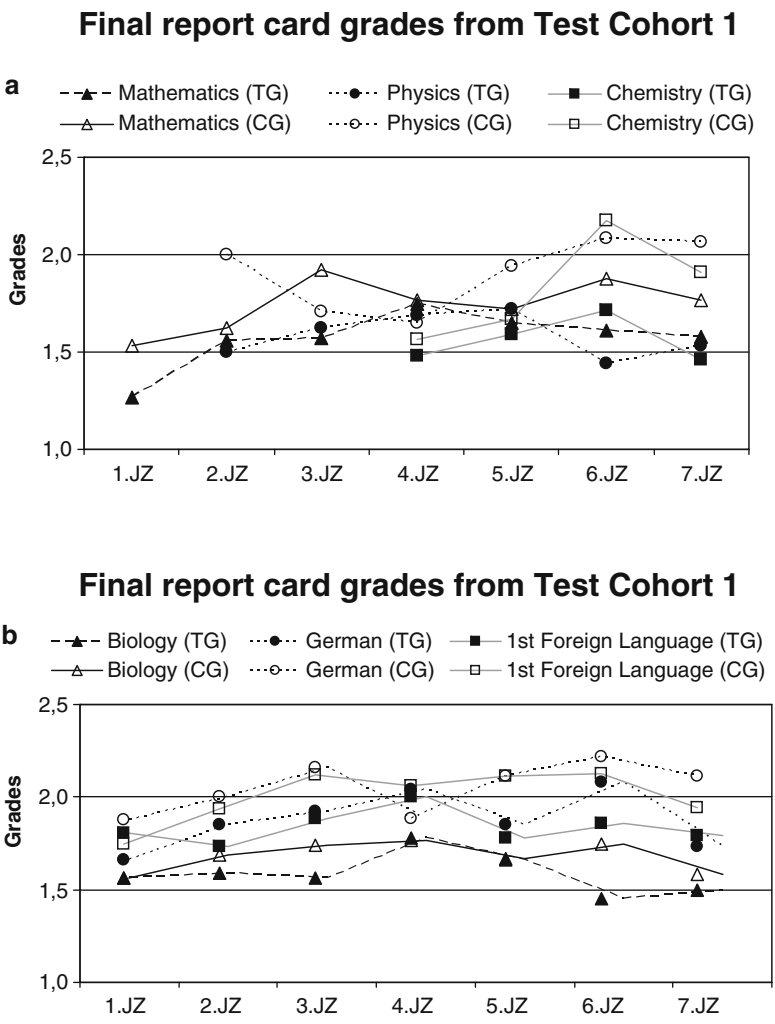

Fig. 13.1 (**a**) Grade development of cohort 1 (Part 1). (**b**) Grade development of cohort 1 (Part 2)

It is especially gratifying to note that the girls in the Hector Seminar used study opportunities more intensively than their male counterparts. This is perhaps due to their development acceleration during adolescence or with more pronounced educational goals and girls' more effective study strategies. There was no indication of discrimination of boys by the course teachers. The teachers and parents judged the selection of Hectorians to be nondiscriminatory so that the differential program effects cannot be due to preferential treatment of the girls by the teachers. The girls also participate more actively on MINT competitions outside of the Hector Seminar than the boys (for greater detail, see Heller, 2009, pp. 215–256).

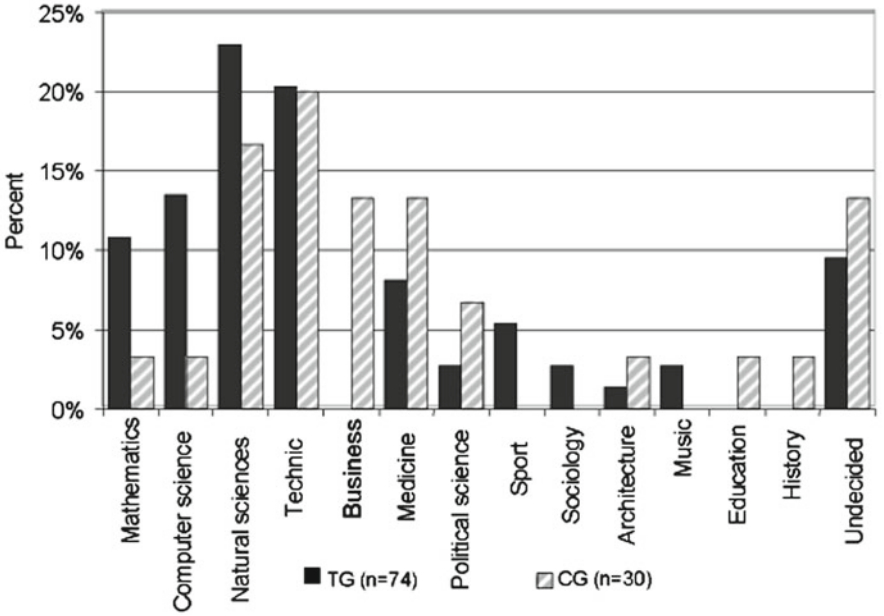

Fig. 13.2 Degree program options of the age cohorts 1 und 2 in a TG/CG comparison

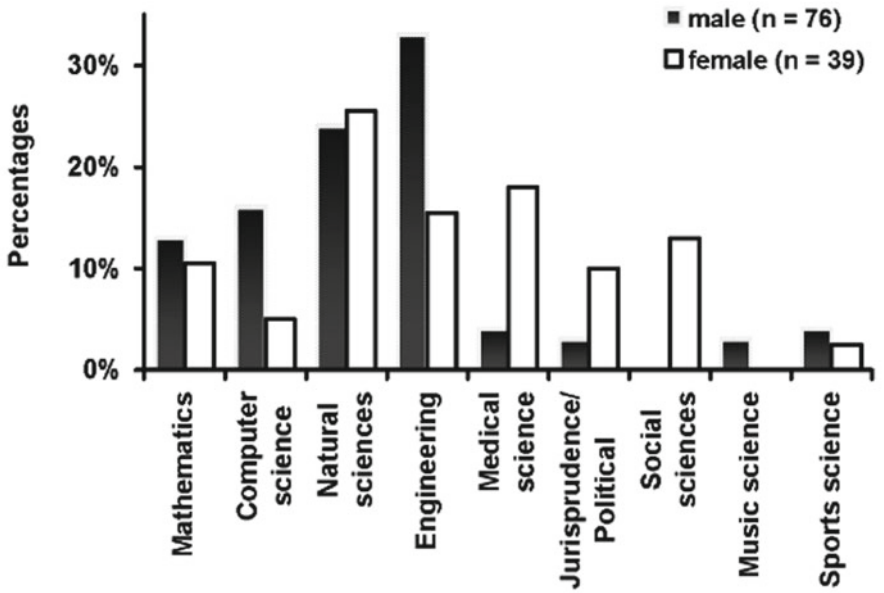

Fig. 13.3 Degree program options (only Hectorians) of the first four "Abitur" cohorts (2008–2011) in male/female comparison – according to Heller (2011, p. 260)

The participation in the Hector Seminar documents manifold positive program effects especially with regard to girls talented in MINT. It remains to be seen whether these unusually great effects will continue in the tertiary educational phase or even be increased (in the sense of a Matthew effect, effectively increasing itself). An evaluation of study success is therefore very desirable. This would be possible at the bachelor and/or master's level as well as at the postgraduate level (e.g., PhD).

Conclusion

Analogous to new medical treatments, educational specialists must test new and innovative supportive measures and programs with regard to their effectiveness. The academic standards of the program evaluation were demonstrated on the basis of the MINT enrichment program "Hector Seminar."

The results of the evaluation show clear program effects from the Hector Seminar in the MINT-relevant areas of competence. "Especially missing are evaluations of academically rigorous enrichment programs" was the complaint of the National (US) Mathematics Advisory Panel in their final report (March 2008). The MINT evaluation study of the Hector Seminar is a salient contribution to reducing this deficit.

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Chapter 14
Joint Function of Perceived Classroom Goal Orientations and Personal Goals on Students' School Success

Yanhua Zhao and Rudolf Tippelt

Introduction

Achievement motivation as an individual difference characteristic has been frequently associated with students' achievement-related outcomes and emotions (Daniels et al., 2009; Pekrun, Elliot, & Maier, 2006; Pintrich, 2000). This individual-focused approach can underestimate contextual influences (Urdan & Schoenfelder, 2006) on individual achievement goals and on school-related well-being and achievement (Murayama & Elliot, 2009; Tuominen-Soini, Salmela-Aro, & Niemivirta, 2008). In this chapter, we consider how classroom focus may influence student well-being and achievement generally, as well as the role of student achievement goals in mediating these processes.

We take the classroom practices which encourage intellectual development through effort and engagement in challenging activities as *mastery-oriented* and practices in which comparison and competition are the norm as *performance-oriented* (Maehr & Midgley, 1991). Compared with classroom goal orientations, *personal goals* (or personal goal orientations) refer to the specific goals that individuals strive to attain in achievement contexts, which are dimensioned into mastery and performance orientation as well (Urdan & Schoenfelder, 2006). *School success* including both subjective well-being and academic achievement (Osher, Dwyer, & Jimerson, 2006) is our focused outcomes. Subjective well-being cares about the manner in which people experience their life in positive ways, including cognitive appraisal and affective consequences (Diener, 1984). Positive affect, negative affect, and life satisfaction are taken as three components of subjective well-being (Andrews & Whithey, 1976) and will act as school success indicators in our work.

In a structural model, we first examined the role of personal goals in explaining school success when the students providing data came from Chinese secondary school. Second, we estimated the predictability of students' perceptions of classroom

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_14,
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goal orientation on school success. Third, we investigated the predictability of student-perceived classroom academic orientation on students' own goal orientations. Afterwards, we tested personal goals as mediators of the relationship between students' perceptions of classroom orientations and school success. As a whole, the hypothesized model presents the relationships between classroom and personal goal orientations, their respective effects on school success, and how personal goals mediate the relationships between students' perception of classroom goal orientations and school success.

Role of Personal Goals on School Success

Many studies have documented that personal mastery and performance-approach goals are associated with divergent sets of well-being and achievement. Previous studies have linked mastery goals with students' positive affect (Daniels et al., 2008; Linnenbrink, 2005; McGregor & Elliot, 2002; Pekrun et al., 2006), general well-being (Kaplan & Maehr, 1999; Oishi, 2000; Tuominen-Soini et al., 2008), and achievement (Daniels et al., 2009; Harackiewicz, Barron, Tauer, & Elliot, 2002; Rhee, Zusho, & Pintrich, 2005).

Kaplan and Maehr (1999) argued that personal goals affect learning and achievement and make contribution to students' action, affect, and general well-being. They found that the well-being indices (e.g. positive emotional tone, peer relationship, and positive affect) were positively associated with pursuit of mastery goals and negatively related to the pursuit of performance-approach goals. Linnenbrink (2005) confirmed that personal mastery goals are beneficial for multiple outcomes ranging from positive emotions, low negative emotions, test anxiety, and depression (Sideridis, 2005) to high achievement. A recent study (Tuominen-Soini et al., 2008) examined whether students with different achievement goal orientation profiles differ in terms of subjective well-being and have found that goals related to self-improvement and growth were positively associated with various indices of well-being, whereas goals validating or demonstrating one's competence were linked with different types of adjustment problems. Many studies examined the negative relationships between performance-approach goals and well-being indices and proposed that performance-approach goals were more psychological costly than mastery goals (Daniels et al., 2008).

Personal performance-approach goals have been connected positively with achievement in some studies (Barron & Harackiewicz, 2001; Church, Elliot, & Gable, 2001; Elliot & Church, 1997; Elliot & McGregor, 1999) where mastery goals were the protagonists. But a few studies argued that performance-approach goals exert negative effects on achievement (Linnenbrink, 2005; McGregor & Elliot, 2002). In a chemistry sample, Church et al. (2001) found that both mastery and performance-approach goals positively predicted student grade when controlling for classroom characteristics. Overall, both mastery and performance-approach goals may have positive effects on task commitment and achievement,

but students who possess higher performance-approach goals may be more susceptible to adjustment problems.

Role of Classroom Goal Orientations on School Success

Student perception of school environment may influence their motivation and emotion at school, which may in turn exert a great influence on their school success. Academic culture of the learning environment was examined within the framework of achievement goal theory (Maehr & Midgley, 1991) and was critical to student perception of school emphasis and future success (Roeser, Urdan, & Stephens, 2009). Perception of the school as emphasizing task goals (mastery orientation) was related to positive psychological well-being, whereas perceiving the school as emphasizing ego goals (performance orientation) was related to negative psychological well-being (Kaplan & Maehr, 1999). Anderman (1999) connected classroom context with students' affect at school and found that a mastery goal-oriented classroom predicted the increasing of positive affect, but a performance goal-oriented classroom increased the experiences of negative affect. In Loukas and Murphy's study (2007), performance-oriented classroom negatively predicted students' school satisfaction but positively directed to depression. Classroom mastery goal orientation is advantageous to student well-being, whereas performance goal orientation is detrimental.

Mastery classroom goal orientation is often discussed with achievement-relevant outcomes. Mastery classroom goal orientation may foster student involvement and strategies using in learning (Ames &Archer,1988); may foster intrinsic motivation, academic self-concept (Murayama & Elliot, 2009), and self-efficacy (Greene, Miller, Crowson, Duke, & Akey, 2004); and may promote the skills of achieving school success (Rimm-Kaufman, Fan, Chiu, & You, 2007). In contrast, the effects of classroom performance goal orientation on achievement-related outcomes were varied due to sample and design (see Murayama & Elliot, 2009).

Personal Goals as Mediators Between Classroom Goal Orientations and School Success

Not a few studies documented the relationship between classroom goal orientations and personal goals (Ames, 1992; Anderman & Midgley, 1997; Kaplan & Maehr, 1999; Roeser, Midgley, & Urdan, 1996) almost across all student groups. Classroom mastery goal structure has been often associated with personal mastery goals, whereas classroom performance goal structure was associated with personal performance-approach goals (Urdan & Schoenfelder, 2006). The indirect influences of classroom goal orientations on achievement-relevant outcomes through personal adoption of achievement goals have been observed (Kaplan & Maehr, 1999;

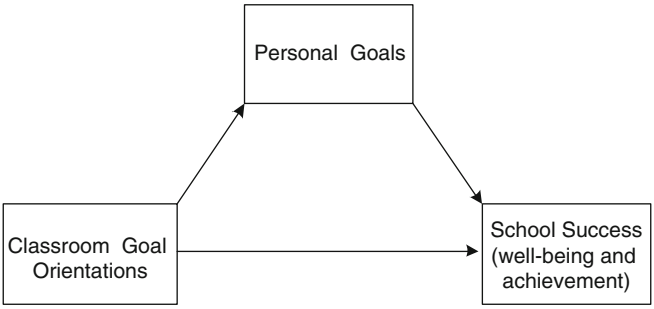

Fig. 14.1 Proposed model with personal goals mediating perception of classroom goal orientations and school success

Murayama & Elliot, 2009; Patrick, Ryan, & Kaplan, 2007; Roeser et al., 1996). Fewer studies have conducted in investigating either the direct influence of classroom goal orientation on well-being indices or the indirect influence through the pursuit personal goals. Kaplan and Maehr (1999) reported that mastery goals positively mediated the effects from classroom mastery orientation to positive well-being and negatively mediated the effects from classroom performance orientation to well-being, whereas performance-approach goals performed a converse function between classroom goal orientations and well-being.

Conceptual Model and Hypotheses

We developed several hypotheses in a sequential model and situated our predictions in school-related variables (see Fig. 14.1). The model consists of four conceptual components: The first component addresses personal goals as antecedents of well-being and achievement; the second component assumes classroom goal orientations as predictors of well-being and achievement; the third component proposes classroom goal orientations as antecedents of personal goals; and the last component supposes that personal goals are mediators between classroom goal orientations and school success variables.

Method

Participants and Procedure

The sample consisted of 507 students (mean age = 16.86, *SD* = .68) from two Chinese secondary schools. From an original sample of 520 students, 13 were excluded prior to data analysis because of their extreme responses (means exceeding ± 3 *SD*). Majority of the sample was female (314 female and 190 male), and three participants

did not report their genders. In building database, self-report data were collected in classroom settings and then merged with institutional data (e.g. GPA). Participants were asked to complete an eight-section questionnaire including personal information voluntarily. Classroom goal orientations, personal goals, and school success were assessed through paper questionnaire survey. Students were assured that their responses would be kept confidential and no one except the researchers would have access to their answers. The data set has approximately the following ethnical distribution: 95.5% Han Chinese, 3.4% ethnic minority, and 1.2% missing.

Measures

Classroom Goal Orientations

Two dimensions of classroom goal orientations were taken from Patterns of Adaptive Learning Survey (PALS) designed by Midgley et al. (2000). Classroom mastery goal orientation assumes that students' perceptions of class emphases are to develop competences. Classroom performance goal orientation represents that classroom emphases are to demonstrate abilities and to get better grades. Six items for mastery orientation (sample item "In our class, trying hard is very important") and three items for performance orientation (sample item "In our class, getting good grades is the main goal") were rated on a 5-point Likert scale ranging from 1 (*not at all true*) to 5 (*very true*). Confirmatory factor analysis was conducted to examine the two-factor structure of classroom goal orientations. Original model fits the data not well because two items from mastery goals loaded highly on both orientations. After removing these items, results provided adequate fit, χ^2 (13, N=507)=44.17, CFI=.96, RMSEA=.07 (LO .05-HI .09), and SRMR=.05. Both scales showed adequate internal consistency (α=.70 for classroom mastery orientation and α=.80 for performance orientation).

Personal Achievement Goals

Personal mastery goal orientation scale was employed from Patterns of Adaptive Learning Survey (PALS) (Midgley et al., 2000). Mastery goals assume that student's goals in an achievement setting are to develop their competences (sample item "It is important to me that I learn a lot of new concepts this year"). Personal performance-approach goals represent a concern with demonstrating competences to others (sample item "It is important to me that other students in my class think I am good at my class work"). A 10-item scale (five for each) was rated on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Confirmatory factor analysis was conducted to examine the two-factor model of personal goals which resulted in adequate fit, χ^2 (19, N=507)=36.87, CFI=.99, RMSEA=.04 (LO .02-HI .06), and SRMR=.03. Both mastery goals (α=.78) and performance-approach goals (α=.86) showed high internal consistency.

Positive and Negative Affect Scale (PANAS)

A 20-item scale of positive and negative emotion states was employed (Watson, Clark, & Tellegen, 1988). We asked participants to show the extent to which they experienced these emotions in their school life of last year on a 5-point Likert scale ranging from 1 (*very slightly or not at all*) to 5 (*extremely*). Confirmatory factor analysis was conducted to examine the two-factor model of affect, but the original model fits the data not well. In order to best represent target factors, items with lowest total item correlations and factor loadings were removed. Finally, A 10-item scale was built, which provided good fit for the data, χ^2 (34, $N = 507$) = 5.57, CFI = .99, RMSEA = .03 (LO .01-HI .05), and SRMR = .04. Sample items are "interested (positive)" and "scared (negative)". Both dimensions showed good internal consistency (positive emotions, $\alpha = .80$; negative emotions, $\alpha = .76$).

Satisfaction with Life Scale (SWLS)

Life satisfaction is one of the three components in subjective well-being (Diener, Emmons, Larsen, & Griffin, 1985). The SWLS was developed as a 5-item survey of satisfaction with life (sample item "In most ways my life is close to my ideal"). Participants answered on a 7-point Likert scale rated from 1 (*strongly disagree*) to 7 (*strongly agree*). Confirmatory factor analysis was conducted to validate the one-factor model of life satisfaction which resulted in super model fit, $\chi^2 (2, N = 507) = 1.18$, CFI = .99, RMSEA = .01 (LO .01-HI .07), and SRMR = .01. Scale showed acceptable internal consistency ($\alpha = .76$).

School Achievement

We asked students to circle their GPA and to score three main subjects: Chinese, Math, and English (sample item "Please scale out your Math grade in the last final semester exam"). Four items were rated on a 5-point Likert scale ranging from 1 (*lower than 60*) to 5 (*upper than 90*). A confirmatory factor analysis was done to avoid future problems in model specification (Byrne, 2001), which resulted in super fit indices, χ^2 (2, $N = 507$) = 4.12, CFI = .99, RMSEA = .05 (LO .01-HI .10), and SRMR = .01. Scale showed good internal consistency ($\alpha = .85$).

Results

Plan of Analyses

We did our analyses in following steps. As preliminary analysis, we calculated the variable means, correlated the study variables, and examined the mean-level gender differences. In order to estimate the effects of students' perceptions of classroom

goal orientations on shaping their own learning goals and on fostering school success, the proposed model was validated by using AMOS 17.0 (Arbuckle, 2008) with the method of maximum-likelihood (ML) estimation. Afterwards, the model invariance was tested across gender. We used well-established indices such as CFI (Bentler, 1990), RMSEA (Browne & Cudeck, 1993), SRMR (Quintana & Maxwell, 1999), and the chi-square test statistics (Bollen, 1989) to examine the model fit. The direct effects are reported in using standardized betas. We also statistically tested the proposed meditational effects. In estimating indirect effects of multiple mediators, bootstrapping is the most powerful and reasonable method in majority situations (Preacher & Hayes, 2008). Thus, we calculated the specific indirect effects of proposed mediators by using Preacher and Hays's SPSS syntax with a method of bootstrapping indicating 95% confidence intervals.

Preliminary Analyses

Correlations

Descriptive statistics and zero-order correlations among variables are presented in Table 14.1. Classroom mastery goal orientation was positively correlated with personal goals and positive success variables and negative related to negative affect. Classroom performance goal orientation was positively correlated to mastery and performance-approach goals and negative affect. As we expected, mastery goals were positively associated with positive success variables and negatively with negative affect, and performance-approach goals were positively related to negative affect.

Gender Differences

Significant mean-level gender differences were found in five instances. Means, standard deviations, and *t*-test of gender differences are reported in Table 14.2. Female students had significantly higher scores than male peers in pursuing personal mastery goals and achieving grades. Men reported higher scores than women in perceiving classroom performance goal orientation, pursuing personal performance-approach goals, and experiencing negative affect. In perceiving classroom mastery goal orientation, female reported relatively higher score than male students. No mean-level gender differences for positive affect and life satisfaction were found.

Testing Structural Equation Model

A structural model was tested to investigate the role of classroom goal orientation in promoting school success. Our main hypotheses were the following: Classroom goal orientation would predict students' school success and personal goals would

Table 14.1 Means, standard deviations, and zero-order correlations for variables

		M	*SD*	1	2	3	4	5	6	7	8
1.	Classroom mastery orientation	3.80	.64	_							
2.	Classroom performance orientation	3.10	.95	.18**	_						
3.	Mastery goals	4.01	.67	.51**	.13**	_					
4.	Performance-approach goals	2.40	.94	.07	.37**	−.08	_				
5.	Positive affect	3.17	.70	.19**	-.01	.19**	.02	_			
6.	Negative affect	1.98	.71	−.12**	.17**	−.10*	.23**	−.03	_		
7.	Life satisfaction	3.96	1.15	.13**	.01	.10**	.04	.24**	−.17**	_	
8.	School achievement	2.85	.94	.18**	.07	.23**	−.06	.09*	−.08	.01	_

Note: * $p < .05$, ** $p < .01$

Table 14.2 Means, standard deviations, and *t*-test on gender differences

	Male		Female				
	M	*SD*	*M*	*SD*	*t*	*p*	*d*
Classroom mastery orientation	3.73	.69	3.84	.61	1.86	.06	.17
Classroom performance orientation	3.25	1.03	3.01	.89	2.69	*	.24
Mastery goals	3.89	0.69	4.08	0.64	3.07	*	.27
Performance-approach goals	2.63	.98	2.25	.88	4.53	**	.40
Positive emotions	3.19	0.72	3.16	0.70	.51	.61	.05
Negative emotions	2.16	0.80	1.88	0.64	4.37	**	.39
Life satisfaction	3.92	1.16	3.99	1.14	.65	.52	.06
School achievement	2.45	0.92	3.08	0.88	7.58	**	.68

Note: *N* 504
*$p < .01$, **$p < .001$

mediate the effects of classroom goal orientations on success. We built three sets of direct paths in meeting the theoretical and methodological requirements: (a) from classroom goal orientations to personal goals, (b) from personal goals to success, and (c) from classroom goal orientations to success. Correspondingly, the paths from students' perceptions of classroom goal orientations to school success were built both directly and indirectly. The hypothesized model contains 20 direct paths and 16 indirect paths, which were tested simultaneously. So it was possible that a significant indirect effect accompanied by nonsignificant direct effects.

Proposed structural model demonstrated good fit, χ^2 (473, $N = 507$) = 791.32, $p < .001$, CFI = .94, RMSEA = .04 (LO .03-HI .04), and SRMR = .05, which suggests that it was plausible for the data. All standardized ML estimates of observed variables

represented their respective latent factors adequately ($\beta > .48$). Thus, hypothesized model illustrates the predictive relationships from classroom goal orientations to personal goals and to school success. However, according to Byrne (2001), the assumption of multivariate normality was violated (multivariate kurtosis 168.6, critical ratio 39.49). We examined whether the nonnormality affected the stability of parameter estimates by requesting the AMOS to perform a bootstrap (suggested by Byrne, 2001; Zhu, 1997) on 1,000 samples in using ML estimator and providing bias-corrected confidence intervals (the 95% level is default) for each of the estimates. All of the paths kept the same significance after bootstrapping as the original standard ML estimates. So the nonnormality did not inflate the accuracy of parameter estimates, and we reported the results from standard ML estimate.

We tested the structural model for gender invariance by comparing the chi-squares of the initial multigroup model and the path-constrained model (Byrne, 2001). We first entered gender groups without constraining any path, the goodness of fit of the model was plausible, χ^2 (946, $N = 504$) = 1397.93, CFI = .92, and RMSEA = .03 (LO .03-HI .04). After we constrained all structural paths to be equal between female and male groups, the fit indices were still plausible, χ^2 (966, $N = 504$) = 1409.86, CFI = .92, and RMSEA = .03 (LO .03-HI .04). Moreover, the χ^2 difference between the multigroup test and omnibus test was 12.0, with 20 degrees of freedom, which was not statistically significant. Therefore, the model was reported for both genders (see Fig. 14.1).

Paths Analyses

Paths Predicting Personal Goals

As expected, students' perceptions of classroom goal orientation predicted their personal goals (see Fig. 14.2). In predicting personal mastery goals, both classroom mastery ($\beta = .66$, $p < .01$) and performance orientations ($\beta = .11$, $p < .05$) were positive contributors. As to performance-approach goals, classroom mastery goal was a negative contributor ($\beta = -.09$, $p < .10$), whereas performance goal-oriented classroom was a positive one ($\beta = .39$, $p < .01$).

Paths Predicting Well-Being

The hypothesis that personal goals would predict well-being was partially supported. We found a predictive relationship between performance-approach goals and negative affect ($\beta = .22$, $p < .01$) but have not found significant effects of personal mastery goals on well-being. Generally, findings supported that classroom goal orientation predict well-being directly and mediated by the students' personal goals. For direct effects, classroom mastery goal orientation was a positive predictor of positive affect ($\beta = .26$, $p < .01$) and life satisfaction ($\beta = .24$, $p < .01$) and was a negative predictor of

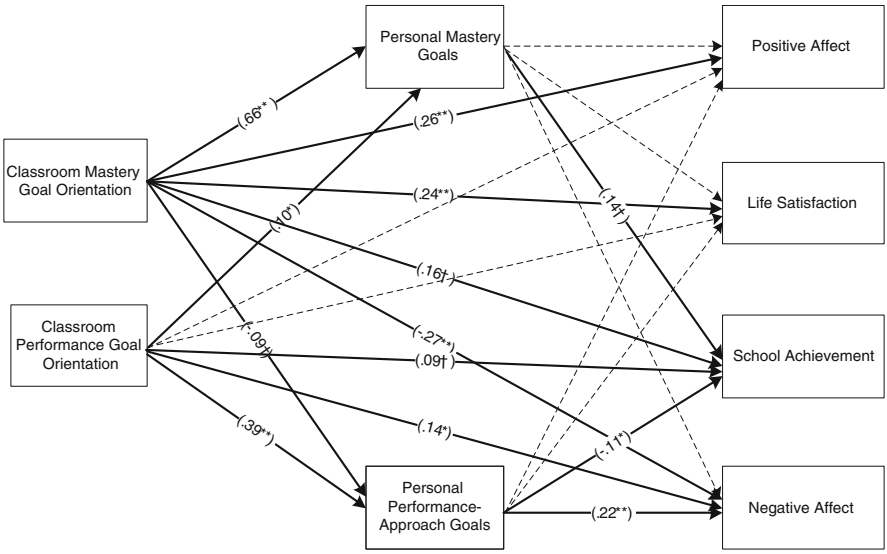

Fig. 14.2 A final path analysis model with standardized coefficients. Note that lines in *bold* represent significant paths. † $p < .10$, *$p < .05$, **$p < .01$

negative affect ($\beta = -.27$, $p < .01$). In contrast, classroom performance goal orientation positively predicted negative affect ($\beta = .14$, $p < .05$) but did not predict positive well-being as we expected. As to indirect effects, bootstrapped confidence intervals (see Table 14.3) showed that personal mastery goals partially mediated the effects of classroom mastery goal orientation on positive affect ($z = 2.54$, $p < .05$) and the effects of classroom performance goal orientation on positive affect ($z = 2.45$, $p < .05$), negative affect ($z = -1.86$, $p < .08$), and life satisfaction ($z = 1.79$, $p < .08$). The partial mediation function of personal performance-approach goals was only observed between classroom performance goal orientation and negative affect ($z = 3.48$, $p < .01$). Overall, the model explained 13% of the variance in positive affect, 16% of the variance in negative affect, and 7% of the variance in life satisfaction.

Paths Predicting Achievement

We found that mastery goals ($\beta = .14$, $p < .10$), classroom mastery goal orientation ($\beta = .16$, $p < .10$), and classroom performance goal orientation ($\beta = .09$, $p < .10$) were positive predictors of achievement, and performance-approach goals ($\beta = -.11$, $p < .05$) were negatives. For mediation effects, personal mastery goals partially mediated the effects of classroom mastery goal orientation ($z = 3.35$, $p < .01$) and performance goal orientation ($z = 2.50$, $p < .05$) on achievement. No significant mediation function of personal performance-approach goals was observed from either mastery or performance classroom orientation to achievement. Overall, the model explained 9% of the variance in achievement.

Table 14.3 Tests of significance of mediation

			Product of coefficients				BC[a] 95%	
Independent variables	Proposed mediator	Dependent variables	Point estimate	SE	*Z*	*p*	Lower	Upper
Class mastery GO	Mastery goals	Positive affect	.0735	.0289	2.5420	*	.0161	.1374
Class performance GO	Mastery goals	Positive affect	.0194	.0078	2.4492	*	.0045	.0419
Class performance GO	Mastery goals	Negative affect	−.0102	.0055	−1.8600	†	−.0284	−.0010
Class performance GO	Perfor-A goals	Negative affect	.0482	.0139	3.4748	**	.0202	.0841
Class mastery GO	Mastery goals	Achievement	.1308	.0390	3.3500	**	.0541	.2128
Class performance GO	Mastery goals	Achievement	.0274	.0110	2.5005	*	.0080	.0583
Class performance GO	Mastery goals	Life satisfaction	.0161	.0090	1.7931	†	.0016	.0443

Note: *GO* goal orientation, *Perfor-A* performance approach, *BC* bias corrected
[a]The confidence intervals are obtained by using bootstrapping of 1,000 samples
† $p < .08$, * $p < .05$, ** $p < .01$

Discussion

This study purpose was to validate a model with hypotheses that students' perceptions of classroom goal orientation and personal achievement goals would predict students' school success, classroom goal orientation would predict personal goals, and personal goals would mediate the relationships between classroom goal orientation and school success. We examined both the role of personal goals and classroom goal orientations in predicting subjective school success and the mediating role of personal goals played in predicting school success. Findings suggest that female students easily adopt mastery goals and perceive the classroom as mastery goal oriented than males, whereas male students are more often in pursuing performance-approach goals and more likely perceive the classroom as performance goal oriented. Although female and male students reported similar positive affect and life satisfaction, males experience quite more negative affect than females. The path patterns were invariant across gender groups, which narrate that the structural model could be considered as equivalent across genders.

Personal Goals, Classroom Goal Orientations, and Well-Being

Personal goals and classroom goal orientations were differentially correlated with well-being. Students pursuing more performance-approach goals may experience a lot of negative affect. The pursuing of mastery goals had no significant effects on well-being indices in Chinese sample as documented in former literature (Daniels et al., 2008; Kaplan & Maehr, 1999; Pekrun et al., 2006; Tuominen-Soini et al., 2008). One possible reason could be the substantial effects of classroom goal orientation on well-being. Actually, if we removed the classroom goal orientation, all of the nonsignificant paths between personal mastery goals and well-being change to be significant. Findings suggest that students' perception of classroom mastery orientation may foster well-being and decrease negative affect, but classroom performance goal orientation may increase negative affect. Generally, personal and classroom mastery orientations are promising in fostering well-being and in withstanding negative emotions, whereas performance goal orientations may be powder hoses of negative emotions.

Personal Goals, Classroom Goal Orientations, and Achievement

Students' personal goals played different roles in predicting achievement when their perceptions of classroom goal orientations demonstrated concordant effects. Consist with previous motivation studies (Daniels et al., 2009; Harackiewicz et al., 2002; Rhee et al., 2005), mastery goals have positive effects on achievement, but performance-approach goals negatively predicted achievement, which overthrew the previous findings (Barron & Harackiewicz, 2001; Church et al., 2001; Elliot & Church, 1997; Elliot

& McGregor, 1999). As previous studies mentioned (Ames & Archer, 1988; Greene et al., 2004; Murayama & Elliot, 2009), classroom mastery orientation exerts a positive influence on students' achievement. Findings also show that classroom performance orientation is instrumental to achievement, which is not consisted with some studies (Ames & Archer, 1988; Murayama & Elliot, 2009). Overall, both personal and classroom goal orientations may boost achievement except performance-approach goals.

Mediating Role of Personal Goals

Two sets of hypotheses were examined: from classroom goal orientations to personal goals and the meditating role of personal goals between classroom orientations and school success. Direct paths analyses suggest that different perception of classroom goal orientations could influence the pursuing of corresponding personal goals and decrease the adaptation of uncorresponding goals. Overall, these results were consisted with existing studies (Ames, 1992; Anderman & Midgley, 1997; Kaplan & Maehr, 1999). In addition, the hypotheses that personal goals would mediate the effects of classroom goals on well-being and achievement were partially supported. In explaining well-being, the indirect effects of both classroom mastery and performance orientations on positive affect may be increased for personal mastery goal orientation as a mediator. Consistent with Anderman's study (1999), the indirect effects of classroom performance orientation on negative affect may be increased through performance-approach goals and decreased through mastery goals. Additionally, findings suggest that mastery goals as positive mediators may increase the effects of classroom performance orientation on students' life satisfaction. For achievement, mastery goals showed significant mediation effects between both classroom orientations and achievement, which suggest that mastery goals are critical in the process of transforming classroom learning goals into individual achievement. Mastery goals are instrumental not only in increasing positive effects of classroom orientations on school success but also in defeating negative effects of classroom performance orientation on well-being.

Limitations and Future Directions

The generalizability of current study may be limited due to several reasons. Survey method limits the interpretation of causal relationships, and self-report questionnaires may be affected by social expectation (Urdan, 2004). Focus only on approach goal orientations reduces the explanation power of study findings. Nevertheless, the study contributes an integrated view in exploring the goal orientations' effects on school success and evidences the importance of environments and culture when we talk about school reform. We suggest future study to continue investigation of the joint effect of classroom and personal goal orientations on

school success. In order to detect the dynamic process, employing multiple methods to examine the relationships between goal orientations, well-being, and achievement is suggested to future inquiries.

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Chapter 15
Effects of Video Source Presentation and Cue Retrieval on Analogical Problem Solving

Mong-Song Goh, Ai-Girl Tan, and William Choy

Introduction

In everyday life, people decide their responses to new situations based on their own and others' successful, similar past experiences or analogies (e.g. how to serve customers; how to recover from disaster, Tan, 2011; Tan & Goh, 2011). Analogies facilitate the generation of new solutions in one domain by drawing on solutions from past and familiar problems from another domain (Gick & Holyoak, 1980). Analogical transfer uses stories as the source analogue to induce solution schema (Gick & Holyoak, 1983; Thompson, Gentner, & Loewenstein, 2000). Visual and kinaesthetic analogues can be effective (Beveridge & Parkins, 1987; Mayer & Anderson, 1991; Schank, 1980). The use of appropriate visual representations can facilitate cue retrieval in the problem-solving process. Video offers a rich collection of visual representations which encompass the animated, kinaesthetic and spoken language attributes. Through a combination of graphics, text, sound, motion and animation, video presents new opportunities for analogical learning and regulation of students' self-learning (Azevedo, Cromley, & Seibert, 2004; Beveridge & Parkins, 1987; Casakin & Goldschmidt, 1999).

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_15,
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Multimodality Source Representation

Studies on analogy transfer have tended to use textual problems as the source analogue to induce solution schema to solve a new problem (the target). Some studies used non-textual source analogues such as static visual analogues (Beveridge & Parkins, 1987; Mayer & Anderson, 1991; Pedone, Hummel, & Holyoak, 2001; Schank, 1980). We claim that source analogue in the textual form is insufficient to represent the essence of the surface attributes (the element similarities) and relational structure (the abstract schemas that represent the correspondences of relations between the two analogues) of everyday problems (e.g. complexity of customer service social interaction, providing relevant assistance to victims of natural disasters). In solving problems in the social domains, apart from being aware of human interactions, it is essential to master information transmitted through feelings, emotions or affect. Emotions and affect are part of social interactions. Affects in social interactions are transmitted by verbal expressions and nonverbal cues (Zajonc, 1980).

Dynamic Auditory-Visual in Source Analogue

Animated diagram or gestures change the perceptual context of the story and increase the perceptual information. Spoken presentations are not commonly used in the studies on analogical transfer. For social situation, people are able to form complex interpretation of spoken text better than written text. Spoken presentation of information may lead to better relational recall from memory than written presentation (Markman, Taylor, & Gentner, 2007). Visual representations in the form of kinaesthetic information that comprises structures associated with sensations of space and force can bring about a positive outcome for analogical reasoning (Catrambone, Craig, & Nersessian, 2006).

Hoffler and Leutner (2007) conducted a meta-analysis of 26 primary studies and provided support for dynamic and animation visualisations. In comparing the animated and static picture source analogues, they found that when the topic to be learned was explicitly manifested in the animation, the results for the animated source analogue were significantly superior to that with static pictures. They advised that animations should be designed to be sufficiently complex to convey pertinent information but simple enough to be understood.

Pedone et al. (2001) showed that animated visuals were advantageous compared to static visuals in generating more convergence and transfer. They suggested that animated visuals offer representations which were more perceptual and closer to physical reality and hence better encoding for convergence solutions. Chen (2003) showed that the use of visual pictures helped in analogical problem solving by facilitating the representation of the conceptual meaning depicted in source pictures, drawing an analogy between source pictures and the target problem and implementing the problem schema in solving the target problem. Chen, however, added that while pictorial analogues facilitated transfer, it was dependent on the learners being able

to overcome the perceptual dissimilarities which were potential obstacle in accessing the source analogues to form real-world meaning. Chen posited that other forms of analogues such as video displays could yield more fruitful outcomes in analogical transfer learning to solve real-world problems.

Video Annotation as Scaffold

Podolefsky and Finkelstein (2007) found that having combination of both abstract and concrete representations of source analogues through analogical scaffolds enabled students' understanding of physics principles. Podolefsky and Finkelstein viewed analogical scaffolding as a mechanism by which multiple analogues could be layered into the learning of abstract ideas. Videos that contain annotations can serve as a rich source of semantic content and retrieval cue which serve as scaffolds for analogical learning. Azevedo et al. (2004) asserted that media with graphics, text, video and animation presented new opportunities for learning. Mayer and Anderson (1991) posited that mere verbal representation was less effective compared to representation that comprised animation with verbal representation.

Effects of Modality of Source Analogue

Goh, Tan, and Choy (2011a, 2011b) assessed the effects of source modality on transfer outcome (measured in their studies as "testscores"), the surface mapping (measured in their studies as "surfaceresponse") and the structural mapping (measured in their studies as "reasoning"). Four experiments were conducted using different source analogue modality: textual story source analogue (Experiment 1), video source analogue (Experiment 2), video with annotation scaffolds (Experiment 3) and dual modality source analogue comprising textual story with video (Experiment 4). The results from their findings are summarised below (see Table 15.1).

For experiment 1, findings from the one-way analysis of variance (ANOVA) yielded between-groups significant differences for testscore, $F(2, 102) = 45.75$, $p = .002$, and surfaceresponse, $F(2, 102) = 19.47$, $p = .008$, but not for reasoning, $F(2, 102) = 4.84$, $p = .06$. Post hoc Scheffe tests showed that significant findings were observed between with cue and control conditions (2–3) for testscore and surface similarity score. The findings supported partially our hypothesis that the use of textual story as a source analogue with cue generated more converging solution (testscore) and surface mapping (surfacescore) in analogical transfer than did the control condition.

For experiment 2, findings from the one-way analysis of variance (ANOVA) yielded between-groups significant differences for testscore, $F(2, 102) = 18.58$, $p = .000$; reasoning, $F(2, 102) = 5.23$, $p = .038$ and surfaceresponse, $F(2, 102) = 51.77$, $p = .000$. Post hoc Scheffe tests showed that significant findings were observed

Table 15.1 Mean and standard deviation of scores for source analogue without cue, with cue and control conditions

	Without cue (1)		With cue (2)		Control (3)		(1–2)	(1–3)	(2–3)
	M	SD	M	SD	M	SD	*p*	*p*	*p*
Experiment 1									
Testscore	18.97	2.96	20.17	2.18	17.89	2.67	–	–	.002
Reasoning	2.97	1.40	3.31	1.11	2.57	1.31	–	–	–
Surface response	2.74	1.80	3.60	2.17	2.11	1.86	–	–	.008
Experiment 2									
Testscore	18.83	2.72	21.43	2.133	17.89	2.67	<.001	–	<.001
Reasoning	2.91	1.50	3.343	.803	2.57	1.31	–	–	.038
Surface response	2.97	2.13	4.513	1.933	2.11	1.86	.006	–	<.001
Experiment 3									
Testscore	20.54	1.69	21.91	1.50	17.89	2.67	.020	<.001	<.001
Reasoning	3.57	.92	3.69	.87	2.57	1.31	–	.001	<.001
Surface response	5.09	1.58	5.23	2.14	2.11	1.86	–	<.001	<.001
Experiment 4									
Testscore	20.54	1.98	21.14	1.70	17.89	2.67	–	<.001	<.001
Reasoning	3.17	1.25	3.67	.94	2.57	1.31	–	–	.001
Surface response	5.11	1.95	5.60	1.97	2.11	1.86	–	<.001	<.001

between with cue and control conditions (2–3) for testscore, reasoning and surface similarity score. Significant differences in testscore and surfaceresponse were observed between without cue and with cue conditions. The findings supported partially our hypothesis that the use of video as a source analogue with cue generated more converging solution (testscore), structural (reasoning) and surface mapping (surfacescore) in analogical transfer than did the control condition.

For experiment 3, findings from the one-way analysis of variance (ANOVA) yielded between-groups significant differences for testscore, $F(2, 102) = 36.09$, $p = .000$; reasoning, $F(2, 102) = 11.90$, $p = .000$ and surfaceresponse, $F(2, 102) = 30.79$, $p = .000$. Post hoc Scheffe tests showed that significant findings were observed between without cue and control conditions (1–3) and with cue and control conditions (2–3) for testscore, reasoning and surface similarity scores. Significant differences in testscore were observed between without cue and with cue conditions. The findings supported partially our hypothesis that the use of video with annotation scaffolds as a source analogue under without and with cue conditions generated more converging solution (testscore), structural (reasoning) and surface mapping (surfaceresponse) in analogical transfer than did the control condition.

For experiment 4, findings from the one-way analysis of variance (ANOVA) yielded between-groups significant differences for testscore, $F(2, 102) = 22.70$, $p = .000$;

Table 15.2 Findings of MANOVA

Source	Dependent variable	Type III sum of squares	df	Mean square	*F*	Sig.
Corrected model	Testscore	500.63	8	62.57	12.68	<.001
	Reasoning	39.49	8	4.93	3.75	<.001
	Surfaceresponse	455.13	8	56.89	14.83	<.001
Intercept	Testscore	109,698.91	1	109,698.91	22,238.79	<.001
	Reasoning	2,771.54	1	2,771.54	2106.08	<.001
	Surfaceresponse	4,121.76	1	4121.76	1,075.06	<.001
Source	Testscore	114.48	3	38.16	7.73	<.001
	Reasoning	12.02	3	4.01	3.04	.029
	Surfaceresponse	239.62	3	79.87	20.83	<.001
Cue	Testscore	145.72	1	145.72	29.54	<.001
	Reasoning	8.22	1	8.22	6.25	.013
	Surfaceresponse	40.12	1	40.12	10.46	.001
Source * cue	Testscore	36.98	3	12.32	2.49	.060
	Reasoning	1.40	3	.46	.35	.786
	Surfaceresponse	18.87	3	6.29	1.64	.180
Error	Testscore	1,509.42	306	4.93		
	Reasoning	402.68	306	1.31		
	Surfaceresponse	1,173.20	306	3.83		
Total	Testscore	130,018.00	315			
	Reasoning	3,758.00	315			
	Surfaceresponse	6,944.00	315			
Corrected total	Testscore	2,010.06	314			
	Reasoning	442.17	314			
	Surfaceresponse	1,628.33	314			

reasoning, $F(2, 102) = 7.47$, $p = .003$ and surfaceresponse, $F(2, 102) = 33.53$, $p = .000$. Post hoc Scheffe tests showed that significant findings were observed between without cue and control conditions (1–3) for testscore and surfaceresponse and with cue and control conditions (2–3) for testscore, reasoning and surface similarity scores. There was no significant difference observed in testscore, surface and reasoning between the groups under without and with cue conditions. The findings supported partially our hypothesis that the use of video combined with story as a source analogue with cue generated more converging solution (testscore), structural (reasoning) and surface mapping (surfacescore) in analogical transfer than did the control condition.

Source Representation of Emotions in With Cue and Without Cue Conditions

Findings from multivariate analysis of variance (MANOVA) are summarised in Table 15.2. It was observed from the Wilks' lambda *F*-values 11.47 ($p. < .001$) and 17.20 ($p < .001$) that the combined testscores, reasoning and surfaceresponse

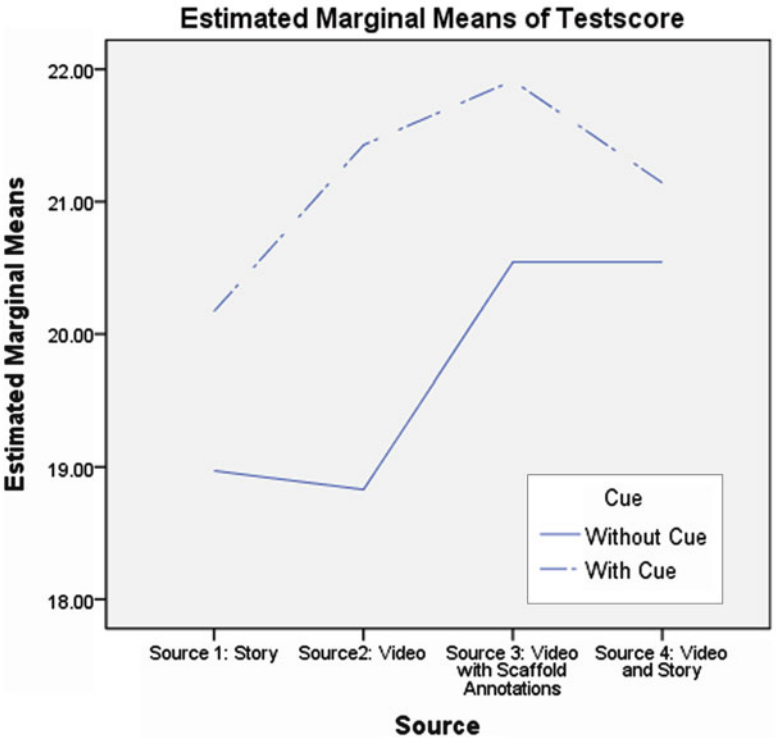

Fig. 15.1 Interaction plot for effects of source on testscore in cue and without cue conditions

successfully distinguish between the source groups and the cue groups, respectively.

Testscore Performance

Source modalities had a significant effect on testscores $F(3, 306) = 16.11$, $p < .001$, and cue conditions had significant effect on testscores $F(1,306) = 35.39$, $p < .00$. For condition with cue, source video with scaffold annotation had the most effect on testscore. This was followed by source video, video and story and story (Fig. 15.1). For condition without cue, the source comprising video with scaffold annotations and source comprising video and story shared the same effect on testscore. Both source comprising story and source comprising video showed lower effect on testscore. Overall, under without cue condition, source comprising video with scaffold annotations and source comprising a combination of video and story both exhibited higher testscore outcomes than source comprising story and source

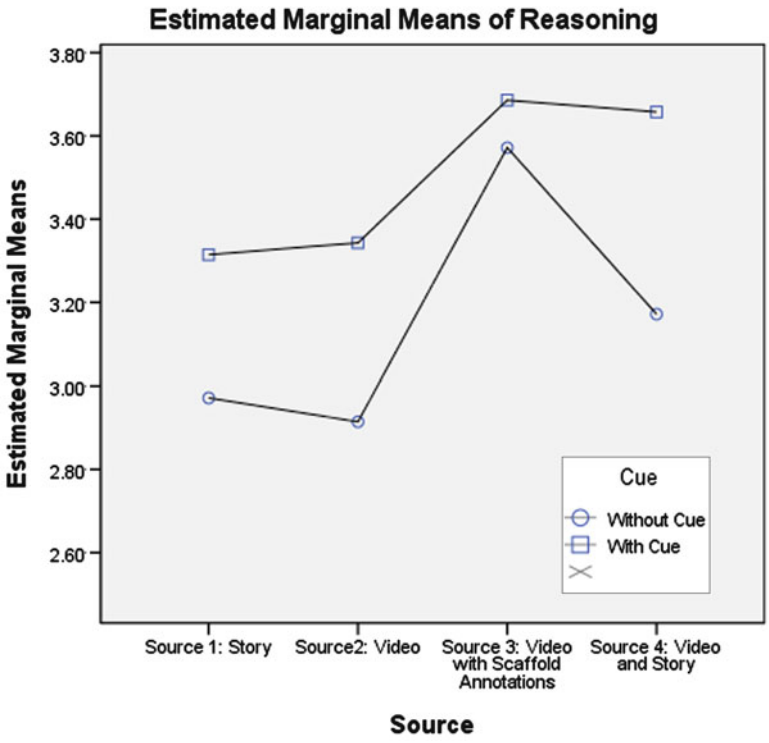

Fig. 15.2 Interaction plot for effects of source on reasoning in cue and without cue conditions

comprising video. Under without cue condition, source comprising video with scaffold annotations and source comprising a combination of video and story exhibited higher testscore outcomes than source story under cue condition.

Reasoning

Modality of source analogue has a significant effect on reasoning score ($F(3, 306) = 5.67$, $p < .00$). Cue conditions have a significant effect on reasoning score ($F(1, 306) = 9.93$, $p < .00$). Under condition of without cue, source comprising video with scaffold annotations had the greatest effects on reasoning scores (Fig. 15.2). This was followed by video with story. Both source with story and source comprising video shared about the same lower effect on reasoning scores. Under the with cue condition, source comprising video with scaffold annotations and source comprising video with story both had a higher effect on reasoning scores than the other source types. As in without cue condition, both source with

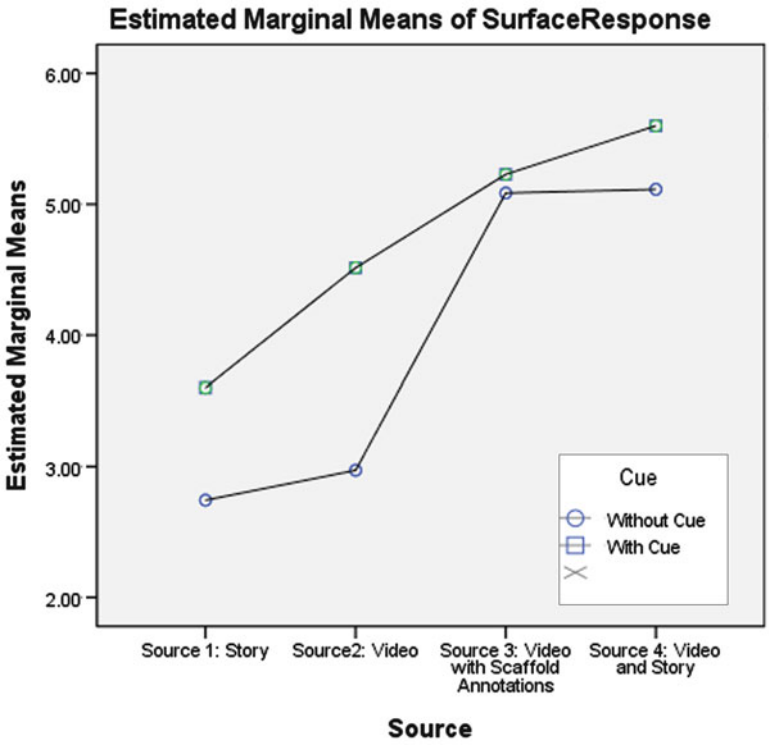

Fig. 15.3 Interaction plot for effects of source on surfaceresponse in cue and without cue conditions

story and source comprising video shared about the same lower effect on reasoning scores under with cue condition.

Surface Similarity

Source types had a significant effect on surfaceresponse scores ($F(3, 306) = 25.83$, $p < .00$). Cue conditions have a significant effect on surfaceresponse ($F(1, 306) = 25.64$, $p < .00$) (see Fig. 15.3). Under condition with cue, source comprising video and story has the greatest effect on surfaceresponse, followed by source comprising video with scaffold annotations, source comprising video and source comprising story. Under condition of without cue, both source comprising video and story and source comprising video with scaffold annotations had the same stronger effects on surfaceresponse compared to sources comprising video and source comprising story.

Discussion

Effect of Cue and Video Presentation

Surface features recall is an important trigger to access the problem schema to solve the new problem. Under cue condition, the source analogue on dialogue prose was significantly better than the control experiment in testscores, surfaceresponse and reasoning (see Table 15.1). The introduction of cues enabled the retrieval of surface attributes as evident by the significant difference in surface response scores which represented the retrieval of the surface features of the source. The surface features triggered recall of the schema as evident from the higher and significant reasoning score in the experiment. The cue aided in triggering the recall of the story analogy encoded in memory. The recall leads to access of surface feature and mapping of solution schema to the new problem.

There was no significant difference in testscore, surfaceresponse and reasoning scores between the control experiment and the experimental group using video or auditory visual source analogue without cue injection (Table 15.1). In contrast, when cue was injected, testscore, surfaceresponse and reasoning scores were all significantly different compared to the control. Without the cue, the surface features of the auditory visual source were not accessed to trigger recall of the schema to use to solve the new problem. The external representations in the video did not translate into internal representation. The higher cognitive load of the information in the video source analogue affected the generation of surface and structural similarities.

The use of cue imposed a goal-relevant focus on the subjects. As a result, the search became more goal-oriented then incidental. The explanation for the observed phenomena can be traced to the dual code theory (Clark & Paivio, 1991; Paivio, 1991). The auditory component of the video source analogue was encoded verbally, and the visual component was encoded nonverbally. These two storages would require to be interconnected before they could support each other in recall and recognition (Mayer, 2003; Sternberg, Radeborg, & Hedman, 1995). Under the without cue condition, it could be explained that the interconnection was not activated, and hence, there was no recall of the source analogue. When cue was introduced, it served to prime the interconnection between the verbal and nonverbal storage bringing about recall and mapping. The resultant outcome was significantly better than the case of text-based source.

Scaffolding of Auditory Visual Source Analogue

With scaffoldings, auditory video materials could be designed to provide support to learners on a targeted basis, which would be unavailable if the students had learned on their own without the scaffolds. The scaffoldings provided learners with a level of elaboration which enabled them to control and regulate their comprehension. This finding is

consistent with the postulation by Podolefsky and Finkelstein (2007) that external representation plays a key role in learner's use of analogies in problem solving. Auditory visual source that is blended with the scaffolds leads to significant abstraction of productive schema. From our study there were significant differences in testscore, surfaceresponse and reasoning scores between video sources with scaffolding under without cue condition and also under with cue condition compared to the control (Table 15.1).

Implications for Teaching

Suitable source analogues and appropriate source modality can be used to enable better access to the emotional and relational components of social situation (see Table 15.2, Figs. 15.1, 15.2, 15.3). Questions for teachers to consider when designing lessons for analogical learning include the following: What is the structure of the particular knowledge that is intended for imparting? How can a different domain be taught to students for transfer to a new domain? How can students use their observational skills to learn analogical transfer skills? Students may not see the connection between the academic lessons and authentic practical application, between classroom knowledge and real-world problem solving. Teachers should consider how analogical transfer can be included in their curriculum in such a way as to make connections of their teaching between domains.

When used with auditory visuals and textual scaffolds, students can learn through visual materials and activate perceptual representation of the converging solutions for social situation with more emotion components in the transactions. Perceptual information such as the video combined with the scaffold annotations increases the likelihood of encoding the source more effectively and improves analogical reasoning. With the different modality combinations (i.e. textual story, video, video with scaffolds, video combined with textual story), teachers can adapt the modality depending on the nature of the problem. Problems that are social situation based with more emotion context may choose to use video-based source modality due to the findings that such analogues are more effective in problem-solving performance.

The modality of the source has been shown in our study to have varying effects on transfer. How can instructional processes promote significant analogical transfer and effective learning? As transfer is commonly not spontaneous, instructional material has to be adapted and designed to make enhance transfer. Through use of appropriate source analogue modality, teachers can impart analogical transfer skills by helping students to better recall and retrieve the source information. Besides explicitly demonstrating concepts in particular domain, teachers should provide students with information and schema for them to transfer in a variety of new contexts and then to require students that they find applications themselves. It should not be expected that students can transfer spontaneously. For video-based source to serve as effective source analogues in teaching of social situation problem-solving skills, our study has shown that support structures are needed to facilitate processes of abstracting surface and relational attributes. Scaffolds of the video-based analogue highlight the general

principles behind particular skills or knowledge and better stimulate students to attempt such generalisation themselves. Through scaffolding of the video, the identification of such surface or structural similarities will induce transfer.

Conclusion

Video-based source analogues improve analogical learning of social situation problem. Video-based source analogue, coupled with blending of textual annotation, alerts learner to observe the attributes and relations present in the source and produces higher level of mappings and hence transfer outcome. Cueing learners to the source video further help in the process of transfer by enabling memory recall to similarities in the source which can be mapped to target problem. In teaching social interaction skills, analogical comparison of source video analogues bootstraps learning not just with the schema but also the subtleties and undertones of emotions. The textual and auditory visual analogues mutually act as scaffolds that provide problem-solving support directed at the learners.

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Part V
Challenges Ahead

Chapter 16
Perspectives on Gifted Education in the Third Millennium

Kurt A. Heller

Current Conceptions of Giftedness and Their Impact on Gifted Development and Education

Giftedness models published in the last two decades are characterized, almost without exception, by multidimensional and/or typological ability constructs (for an overview cf. Sternberg & Davidson, 2005, or more recently Subotnik, Olszewski-Kubilius, & Worrell, 2011). Two such examples are presented below: the Munich Model of Giftedness (MMG) and the Munich Dynamic Ability-Achievement Model (MDAAM).

The Munich Model of Giftedness (MMG)

In the MMG, Heller and Hany (1986) and Heller (1992/2001) conceptualized giftedness or talent as a multifactorized ability construct within a network of noncognitive personality (motivations, learning emotions, control expectations, self-concepts, etc.) and social moderators as well as performance-related (criterion) variables. Diagnosis and intervention examine the difference among predictor, criterion, and moderator variables. The MMG in Fig. 16.1 served as a reference model for the Munich High Ability Test Battery (MHBT) (see cf. Heller & Perleth, 2007, 2008/2010). The validity of the MMG has been confirmed in German studies of the development and promotion of gifted children and adolescents and in cross-national and cross-cultural investigations (for an overview see Heller, 2010; Heller, Perleth, & Lim, 2005; Ziegler & Perleth, 2011).

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_16,
© Springer Science+Business Media Singapore 2013

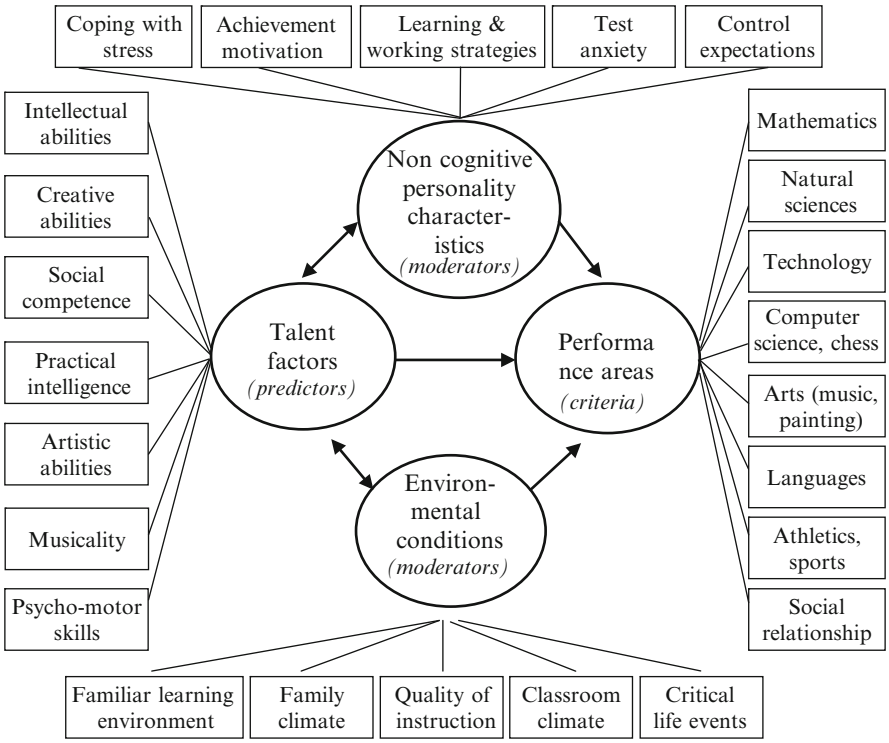

Fig. 16.1 The Munich Model of Giftedness (MMG) (Heller, 1991, 1992/2001; Heller & Hany, 1986; Heller, Perleth, & Lim, 2005)

Legend:

Talent factors (predictors)
Intelligence (language, mathematical, technical abilities, etc.)
Creativity (language, mathematical, technical, artistic, etc.)
Social competence
Musicality
Artistic abilities
Psycho-motor skills
Practical intelligence

(Noncognitive) personality characteristics (moderators)
Achievement motivation
Hope for success vs. fear of failure
Control expectations
Thirst for knowledge
Ability to deal well with stress (coping with stress)
Self-concept (general, scholastic, of talent, etc.)

Environmental conditions (moderators)
Home environmental stimulation ("creative"environment)
Educational style
Parental educational level
Demands on performance made at home
Social reactions to success and failure
Number of siblings and sibling position
Family climate
Quality of instruction
School climate
Critical life events
Differentiated learning and instruction

Performance areas (criteria)
Mathematics, computer science, etc.
Natural sciences
Technology, handicraft, trade, etc.
Languages
Music, arts (musical-artistic area)
Social activities, leadership, etc.
Athletics/sports

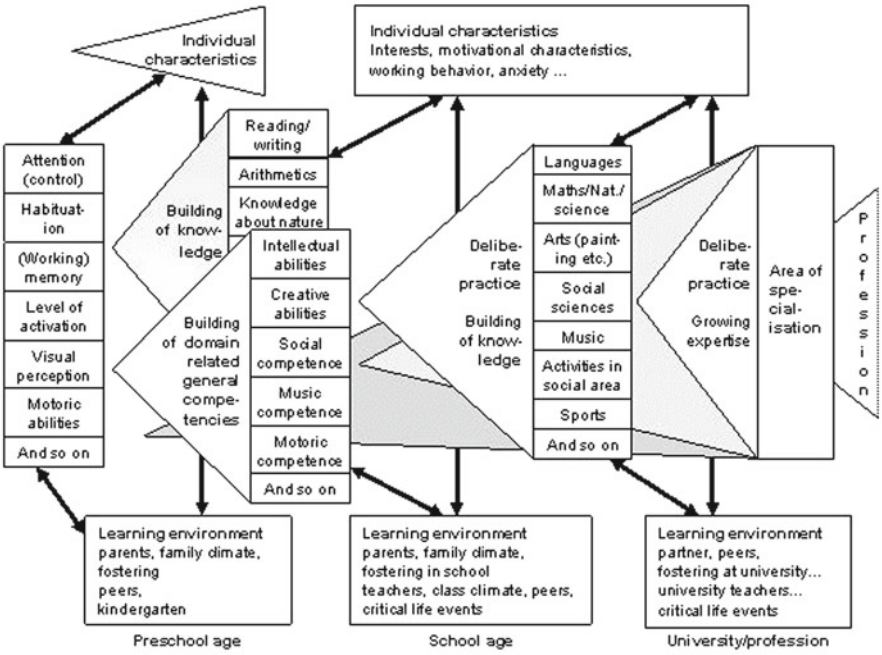

Fig. 16.2 The Munich Dynamic Ability-Achievement Model (MDAAM) (Perleth, 2001, p. 367)

The Munich Dynamic Ability-Achievement Model

In an attempt to forge a bridge between the psychometrically based research into giftedness and the process-oriented expertise research, Perleth (2001) extended the MMG to the Munich Dynamic Ability Achievement Model (MDAAM, see Fig. 16.2). An increase degree of expertise influences active learning processes, which in turn influence expansions of knowledge and the acquisition of domain-specific competencies. This implies that noncognitive personality characteristics such as interest and task commitment or achievement motivation are to be accorded increased significance regarding talent potential. Does the time spent in active learning responsible for achievement excellence in a domain? This is a question that is related to the Ericsson's construct of "deliberate practice" (cf. Ericsson, Charness, Feltovich, & Hoffman, 2006). There is yet a convincing proof that adolescents or young adults are capable of reaching the degree of expertise of the gifted in randomly chosen domains – in fact independent of individual talent prerequisites. The formulation of threshold hypotheses (cf. Bloom, 1985; Schneider, 1993, 2002) is an attempt to rescue research findings accumulated with the expertise paradigm. These hypotheses do not relinquish any of the significance of the cognitive learning and achievement potential for the development of expertise with a high standard (excellence) confirmed in giftedness research.

The MDAAM distinguishes between three stages of achievement or expertise development. These are related to the main phases of preschool, school, and vocational training, which can be roughly compared with Plomin's (1994) classification into "passive" (preschool age), "reactive" (primary school age), and "active" (adolescence/adulthood) genotype-environment relations. Certain learning processes belong to each of these stages. They serve the building up of competencies and are symbolized by the gray triangles. These triangles open to the right are indicating growth in abilities, knowledge, or competencies. The left corner of the triangles indicates when the respective learning process begins (the different tones of gray are just to make the figures clearer).

Strengths of the Models

A compelling supplementary suggestion currently offered by Campbell and Kyriakides (2011) compares the MDAAM triangles with the 10 years or 10,000 h rule of the expertise research paradigm. The authors believe "there are triangles that can be considered for novices as they work to become experts. Smaller triangles exist for the beginner (early career triangle)…" The authors are convinced that there are more (at least ten) triangles necessary to explain the process of becoming an expert, and they "suggest that the developers of MDAAM add a 10,000 h triangle at the base of their model … in order to make the connection with the Ericsson studies… Whereas the beginning expert starts with a 1,000 h triangle, then the future champion begins a more sophisticated 1,000 h triangle as he continues to learn his sport/craft. For the world-class performer, this process goes on year after year until ten triangles are completed (10,000 h). But even here the champion performer must continue to practice maintaining this high level of skill" (Campbell & Kyriakides, 2011, pp. 290–297). The authors examined the applicability of MMG and MDAAM using various data of their (academic) Olympiad studies as well as contributions of other researchers in the field. They conclude "that the three learning environments suggested in the MDAAM (preschool age, school age, university/profession) will be applicable to a range of further applications in a number of field. Similarly, as more researchers begin to use the MDAAM, we believe that the non-cognitive moderators implicated by the MMG, especially the psychological constructs, will find applicability. For both sets of moderators, the developers of the MMG and MDAAM have invited future researchers to add new constructs to the developmental process. This invitation should result in many more applications" (Campbell & Kyriakides, 2011, p. 298).

Findings from STEM

Other recent studies confirmed the predictive validity of MMG and MDAAM in the field of STEM (Heller, von Bistram, & Collier, 2010; Ziegler, 2011) as well as in the

cross-cultural context (Cho, Lin, & Hwand, 2011). The findings from a series of relevant studies "demonstrate that the MDAAM can serve as a valid frame of reference to examine the predictive relationships among factors involved in the development of math and science expertise. The studies were conducted in Korea at the national level and in Taiwan at a local level with cohorts from several grade levels, resulting in four different studies on the predictive relationships of personal and environmental factors on talent development" (Cho et al., 2011, p. 269).

"It can be concluded that the MDAAM is useful in describing the talent development mechanism of Korean and Taiwanese students who share a common Confucian heritage culture (Biggs, 1996), which values education, expects high achievement, shows a stronger attribution of achievement to the effort than to ability, and demonstrates the ideal of a scholar teacher. It will be necessary to determine whether the MDAAM would be similarly useful in explaining the talent development of Hispanic and African American students who may differ culturally in terms of their educational values, expectations, attributions of achievement, and their ideal of teachers, resulting in different interactions between environmental and personal characteristics" (Cho et al., 2011, pp. 278–279). For further cross-cultural perspectives, see Hernández De Hahn (2002), Heller (2010), Shi (2011), Tan (2011b), and Tang (2011), among others.

Promoting Giftedness and Talent

A reasonable attempt to promote gifted children and adolescents must be oriented on the individual developmental and learning needs, insofar as one understands promotion as a function of a comprehensive achievement and personality development. Also gifted education must be based on a valid giftedness model, e.g., Gardner's theory of multiple intelligences (MI), the MMG, or MDAAM. For an example of MI-based classroom special education, cf. Armstrong (1994). Applications of MMG- and MDAAM-based gifted intervention strategies are presented in Heller (2010).

In addition to the individual cognitive potentials and the noncognitive (e.g., motivational) prerequisites of excellence, synthetic approaches attempt to more accurately incorporate social and/or situational context conditions into their definition of gifted education, especially in the systemic theoretical frame, which focuses on the *interactions* between the cognitive and noncognitive personality factors on the one hand and the social learning conditions on the other hand. Central terms here are effective or creative learning environments (in family, school, university, and work). This is, however, not limited to addressing such topics as opportunities for experimentation, recreational resources, available reference facilities, as well as material and instructional resources, but rather primarily directed toward experts in their role as creative role models. According to relevant investigations, effective teachers at school and university are characterized by particularly positive attitudes regarding highly gifted students. A significant didactic goal here is the independence

experienced by the students with respect to learning, thinking, and creative problem-solving. Self-directed, discovery learning is often praised in the literature published on gifted education; for an overview, see Colangelo and Davis (2002) and Heller, Mönks, Sternberg, and Subotnik (2002).

As Neber (1999) pointed out, *discovery learning* has been realized in three basic forms: (*a*) through example, in order to learn terminology and rules (especially in the STEM area); (*b*) through experimentation, primarily to acquire knowledge of rules in science instruction, whereby the danger of attaining faulty knowledge in the process of uncontrolled knowledge acquisition outside of the teacher's sphere of influence must be considered; and (*c*) through conflict resolution.

According to Zimmerman (1989), the learning processes employed in self-directed learning contain meta-cognitive, motivational, and behavioral aspects. Self-instruction results in an intensification of the more or less autonomous organization and control of learning, stronger experiences of self-effectiveness, and an increase in learning goal motivation according to Dweck (1986) – also see Dresel (2011) or Subotnik, Edmiston, Lee, Almarode, and Tai (2011) – as well as more energy directed toward the selection and structuring of social and physical learning environments. In such an atmosphere the gifted are better able to attempt to optimize, regarding to the needs, their knowledge acquisition processes. These tendencies also find support in theories raised in the field of behavioral genetics, e.g., by Scarr (1997) or Thompson and Plomin (2002).

Gifted Education as an Interaction Process

Interactions between individual behavior variables and learning or working environments conducive to social development have not only been confirmed for gifted children (cf. Freeman, 2002) but also for talented adolescents and (young) adults, especially in the field of STEM (e.g., Campbell, Tirri, Ruohotie, & Walberg, 2004; Heller, 1999; Heller & Lengfelder, 2006; Heller, Rindermann, & Reimann, 2010; Heller & Viek, 2000; Heller et al., 2010; Neber & Heller, 2002; Rindermann, 2011; for greater detail see Heller, 2010, pp. 405–565).

Using the method of retrospective surveys, Zuckerman (1992) made biographical analyses of North American Nobel Prize recipients for physics, chemistry, and biology in the period between 1901 and 1980. She was able to isolate the following characteristics: The laureates descend overwhelmingly (but not exclusively) from the upper social classes and profited from both the occupational and academic experiences of their fathers and (more recently) also from their mothers. This finding concerning family socioeconomic status has been often confirmed in the newer literature too, as cited above. Corresponding positive socialization influences on the development of giftedness and achievement excellence appear to be more strongly influenced by process components than by the analogous family or scholastic structure variables.

The second conspicuous career characteristic among the laureates investigated is immediately relevant for promoting talents in the tertiary area. More than half of the Nobel Prize winners were awarded their doctoral degrees at one of five universities. Regardless of whether this is interpreted as a result of recruiting efforts made by these universities and/or a self-selection effect of the candidates themselves, this finding is an indication of the enormous importance of an intensive exchange of knowledge and experience between older, seasoned experts and younger semi-experts and rising talents. This interpretation is punctuated by the further finding that 45% of the laureates had worked with previous prizewinners. Such encounters are subject to two assumptions: the competence of the older scholars (here the laureates) to recognize and promote exceptional talents ("truffle hounds") and a correspondingly pronounced sense of perception among the younger scientists. On the basis of her biographical analyses, Zuckerman could prove that through this association, a sense for scientific thinking and proper research standards could be formed. Contrary to expectations, direct contact with the Nobel Prize winners had no influence on the point in time when the rising scientists were awarded their prizes, rather solely on the point in time when the award-winning research was conducted.

Furthermore, the younger prize winners laid particular emphasis on the value of confrontation with outstanding colleagues in the same age range during their university studies; this social comparison process allowed them to develop a standard of quality. We were able to replicate this finding within the framework of the above mentioned study on the German Student Academy through a retrospective inquiry among former attendees (Neber & Heller, 2002) as well as for a comprehensive program evaluation of university promotional committees operating in ten German associations ("Förderwerke") of higher education which provide scholarships to the top 1% gifted and talented university students (Heller & Viek, 2000). The association between highly talented adolescents or young adults with the same aged peers equipped with a corresponding level of talent, interests, and task commitment appears to be of extraordinary significance for the collective personality development, in particular for the development of a realistic self-concept of ability. Similar results reported from Subotnik and Steiner (1993) and Subotnik and Arnold (1993, 2000), among others.

Creativity, Key Qualifications, and Scholastic Learning as Conditions of Gifted Education

An excellent knowledge basis is a, albeit essential, frequently insufficient condition for the establishment of expertise in the sense of the creative mastery of demanding, complex problems. In retrospective studies, creative learning and working environments have been demonstrated to provide extremely conducive conditions for achievement excellence at school, university, and professional life; for greater detail

about the role of creativity in gifted education, see Heller et al. (2002, pp. 81–267), Heller (2007), Tan (2007, 2011a), and Hany and Heller (2010), among others.

In the current debate over the value of so-called key qualifications for achievement excellence, frequently raised demands come up short when the attention for domain-specific knowledge foundations and proficiencies in the sense of available subroutines recedes into the background. The concept "self-directed discovery in learning" was named above as perhaps the most recently suggested postulate by educators of the gifted. This means that individual problem-solving competencies together with domain-specific knowledge should be mediated or supported by autonomous learning (cf. Betts & Kercher, 1999) and thus support creative achievements.

The relevance of formal (scholastic) learning processes as a prerequisite for professional success or rather achievements meaningful to everyday life are, of course, a controversial topic discussed in the literature. Gardner (1991) noticed in his critique of classroom instruction, documented in numerous examples, that the intuitive knowledge manifested in subjective everyday theories and the knowledge taught in school – systematic or formal (objective theory) knowledge – often exist parallel to and independently of one another and frequently conflict with each other. Whether the solution to this problem is to be found solely in doing without the teaching of formal knowledge or as an alternative by trusting one's creativity potential is doubtful. Controlled empirical research gives more support to the supposition that cognitive or intellectual learning abilities and a corresponding formal teaching of knowledge are frequently necessary, but in many areas not sufficient condition for extraordinary academic and professional achievements. The Munich Longitudinal Study of Giftedness (Heller & Hany, 1986; Heller, Hany, Perleth, & Sierwald, 2010) was able to reconfirm that those students who were both highly intelligent and highly creative obtained the best grades in most school subjects. The highly intelligent students with average or good – but not very good – creativity test scores were better only in math and physics. Hence, a combination of intellectual and creative abilities or rather convergent and divergent cognitive thinking processes as well as domain-specific knowledge and key qualifications like discovery learning strategies, meta-cognitive competencies, media, and social competencies offers the best conditions for individual achievement excellence. This is true with regard to the outcome of other investigations, e.g., several program evaluation studies in the field (Heller, 2002, 2009; Heller et al., 2010; Heller, von Bistram, & Collier, 2010).

Gender Issues of Gifted Education

When the participation rates of gifted education programs of men and women in the STEM area are compared, significantly lower participation rates are usually found – in all countries. This is all the more remarkable when considered that (a) there has not yet been convincing proof of women's lower ability in math and sciences and (b) most countries provide equal educational opportunities for both men and women; for greater detail, see Heller and Ziegler (1996, 2010). With respect to virulently

high degrees of – undesirable – gender differences specific to giftedness or talent in the STEM area and the reduction thereof, it appears as though approaches taken in the field of cognitive psychology are more effective than organizational alteration (e.g., mono- vs. coeducation). At any rate, we have been able to assemble a large body of evidence to support this proposition in the last 15 years; for an overview, see Heller (2010, pp. 217–342).

In our intervention program "attributional retraining" (ART), task-related informational feedbacks, which are instructionally integrated and directed by the teachers toward those (female) students with detrimental cognitions, which interfere with action (e.g., a pattern of causal attribution which is detrimental to achievement motivation and/or impairs the ability self-concept) are more conducive to increases in performance when compared to organizational alterations or curricular modifications. Furthermore, in addition to achievement behavior, it appears as though the – for the most part unconscious – attitudes held by parents, teachers, and peers and the expectancy behaviors of students with respect to mono- vs. coeducational instructions in math, physics, and chemistry have yet to be considered regarding possible effects on actual (later) achievement success.

An important link between individual ability potential and motivational preconditions for achievement excellence is, according to the option of prominent researchers in the field, the individual ability self-concept. This is particularly evident among highly gifted girls and women – more frequently than among highly gifted boys and men – in the form of weaker levels of self-confidence and diminished goal pursuance. Subotnik and Arnold (1994) view gender as a universally significant variable with respect to individual career patterns; see also Stoeger (2007), Fiebig (2011), and Freeman (2011).

Recent studies on gender-specific giftedness development have almost always confirmed the superiority of female scholastic achievement – e.g., in the form of better school marks – up to the end of secondary school education. However, this balance tips dramatically with the passage into the tertiary phase of education. Gifted and talented women in general are less likely than gifted and talented men to take advantage of their entitlement to a university education and are less inclined (despite their talents for STEM) to opt for college majors or careers in the STEM area. It appears as though the key to success in the promotion of talent lies in the area of motivation and self-concept. Hence, the ART focuses on these components. The effectiveness of the ART has been confirmed in dozens of experimental and quasi-experimental (field) studies; see Heller (2010, pp. 217–342).

Gifted Education: Social and Individual Responsibility

A talent promotion oriented on individual prerequisites and developmental needs should not let social responsibility fall by the wayside. This is valid from two points of view. In the first place, social responsibility should be exercised by all members of society including the highly gifted children and adolescents. In the second place,

giftedness is itself subject to a particular form of individual responsibility to human kind in general. From an educational psychological point of view, the role of nurturance of the gifted is primarily individual development support. This implies at least the following: (a) "giftedness" as a multifactor concept, (b) personality development as an interactive process between the individual and his/her social environment, and (c) nurturance of the gifted as a function of optimizing individual (personality) and social developmental aspects. This is tangential to the social and educational policy of equal opportunity.

Independently of whether giftedness is considered psychometrically as a predisposition toward outstanding achievements in various areas or cognitively as more or less domain-specific expertise, new theories favor multidimensional conceptions of giftedness (cf. Sternberg & Davidson, 2005; Subotnik, Edmiston, Lee, Almaradode, & Tai, 2011). Identification as an integral part of gifted education (cf. Heller, 2004; Heller & Perleth, 2007, 2008) as well as nurturance strategies thus calls for differentiated approaches, which are not represented by one-sided IQ-fixings cutoff models. The practice of identification measures frequently limps behind the state of the art recognitions from research on the gifted.

Giftedness first manifests itself as a relatively nonspecific individual achievement potential whose development interacts with the social learning environment from the very beginning. This indicates interaction with educational and socialization variables. This interaction process should be viewed as a mutual influencing of children's behaviors and parental upbringing practices. The hereditary background is then crucial in the development of giftedness mostly for the individual selection and employment of the learning opportunities presented by the social environment (cf. Scarr, 1997; Thompson & Plomin, 2002). Early indicators of giftedness even suggest that during the first few months and years, particular activities develop which are expressed in curiosity and exploratory behaviors. These can be interpreted as influencing the socialization agents. Attempts to provoke socialization conditions adequate for giftedness and thus to actively influence the learning environment to satisfy basic cognitive and social-emotional needs are apparently characteristic of the behavior of highly gifted or extremely talented children. A vital educational task for parents and teachers or other relevant socialization agents stem from this. The demand for early identification and nurturance of gifted children and adolescents is thus founded on the responsibility for providing appropriate learning environments. The individual's right to equal education opportunities thus stands face to face with the social responsibility for offering an adequate spectrum of specific educational measures and programs to the target gifted group.

Personal Qualification and Program Evaluation as an Integral Part of Gifted Education

Last but not least, the quality of gifted education depends on the qualification of gifted teachers, counselors, and other professional persons in the field. Although many gifted programs do already exist, there is – worldwide – a strong demand for

scientifically evaluated gifted measures and programs in the field. According to this statement, the National (US) Mathematics Advisory Panel concluded in the final report (March 2008): "Especially missing are evaluations of academically rigorous enrichment programs." For positive examples of academically evaluated – enrichment and acceleration – gifted programs, see Heller (2010, pp. 403–507). Furthermore, a series of cross-cultural studies on giftedness and talent including program evaluation aspects will be found in Heller (2010, pp. 509–565) as well as in Ziegler and Perleth (2011, pp. 47–59, 268–329).

Although basic training programs for personnel working in the field of gifted education do already exist in the United States and a few other nations, in-service training programs are the dominant form of support in other parts of the world as well as in Europe, e.g., the ECHA in-service program for gifted specialists (cf. Mönks, Heller, & Passow, 2002, p. 857). Academic special gifted qualification programs for scientific research personnel (at university level) are rather scarce. Exemplary to such postgraduate programs is the international (2-year) master's study program "Psychology of Excellence in Business and Education" at the University of Munich (LMU), established in 1997 (Heller, 2000, p. 8; Mönks et al., 2002, p. 857 f.). All courses offered in this master's study program are in English. The program already has attracted over 600 students from more than 40 different countries; see a selected description of the program flyer below.

The Program

The curriculum focuses on the mental, social, and institutional conditions of giftedness as developing expertise and excellent performance, particularly in schools and the work place. For this purpose, personal, social, and organizational conditions for promoting excellence are taken into account as well as pedagogical, didactical, sociological, and philosophical aspects linked to excellence. The program conveys fundamental skills and knowledge from educational and organizational psychology with a clear focus on excellence. 120 credits can be earned by attending classes in six different modules, written and oral exams, a master thesis, and one internship.

As part of a dynamic world, the program has established many strategic alliances with prestigious organizations through master thesis, internship, and cooperative research projects. Excellence is not only the name of the M.S. program but also the main task and aim; for greater detail, see the web page: http://www.psy.lmu.de/excellence.

Study Focus

The *major* of the program is Identification and Promotion of Excellence, the *first minor* is Educational Sciences, and as *second minor*: Sociology, Philosophy, or Science Education. Classes such as Excellence and Related Concepts (expertise,

creativity, ability), Emotional and Motivational Aspects of Excellence, Advanced Statistics, Research Design and Evaluation, Assessment of Giftedness and Talent Search, Programs for Promoting Excellence and Giftedness, Effective Leadership in Organizations, Organizational Development, Quality Management, Learning Environment and Educational Technology, Corporate Ethics, and Sociology of Economics are some of the courses offered with different modules.

Internships

The Excellence program strongly aspires to bring theoretical knowledge into practice. It offers a broad internship database and directs contact to different organizations, schools, and research institutes. So far internships have been conducted in several different fields and organizations such as Roland Berger, BMW, Siemens, GERI, and many more. Students have benefited themselves and impacted different countries in North and South America, Africa, Asia, Australia, and Europe through our partnerships and strategic alliances.

Master Thesis

The master thesis should be written within 6 months. It counts for 20 credits and should be empirical. Contacts and topics are available to develop research with various organizations, institutions, and schools in and outside Germany.

To my knowledge, the M.S. study program Excellence at LMU was unique in the field – worldwide – with respect to the curricular comprehensiveness and the academic standard (see Heller, 2001, p. 56 f., 2002, pp. 75 ff., 2011, pp. XIII–XIV; Mönks et al. 2002, p. 857 f.; Heller, Reimann, & Senfter, 2005, pp. 80 ff., among others).

Future Perspectives

Reflections on where we must go in gifted education over the next decades should primarily focus on the advances made in theoretical and empirical research with increased levels of quality. “Most significant are the increasing tendencies toward interdisciplinary communication in research and practice, cross-cultural research and sharing of conceptions and practices and the continued tendency to perceive giftedness from the developmental perspective. There is evidence of solving interdependence of research and practice, and we continue to press for greater understanding and awareness of giftedness by highly trained researchers” (Mönks et al., 2002, p. 857).

Through the examples set by expertise research and cognitive psychology, it becomes clear that interdisciplinary approaches to the study of giftedness and talent

mediate in tandem with new theoretical points of view developed in related fields of giftedness research and realizations that are readily convertible into practice. Furthermore, cross-cultural studies in gifted education (e.g., Cho, Moon, & Park, 1996; Hernández De Hahn, 2002; Tan, 2011b) offer the possibility to revise older theories and to gain a broader understanding for special needs, thereby enriching our understanding of the identification – as an indispensable element of gifted education – and nurturing measures concerning giftedness and talent. Finally, gifted education policy should focus on underrepresented populations and so-called at-risk groups, e.g., gifted females in the area of STEM. This should affect not only gifted individuals' educational opportunities but also national prosperity in the future – worldwide.

Increasing globalization demands international perspectives. When we are able to understand the chances being offered here, I am sure that gifted education will not only help to secure our economic living conditions in the third millennium. It will also provide a salient contribution to the establishment of peace among nations and cultures.

Acknowledgements The content of this chapter was read at the ABB-Symposium "Gifted education international" (chaired by Ai-Girl Tan) at the University of Erfurt (Germany) on September 30, 2011, in conjunction of Kurt A. Heller's 80th birthday celebration.

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Chapter 17
Transitional Gaps and Resilience in Japan

Makio Taira

School Transition: A Universal Phenomenon

The Japanese students go through 6 years of primary school education (age 6–12years old), 3 years of secondary school education (age 13–15 years old), and 3 years of high school education (age 16–18 years old). The first 9 years primary and secondary education are compulsory. In year 2007, between primary six and secondary one, the Ministry of Education (MOE) of Japan reported an increase in the number of school violence (including violence toward teachers, 600%), bullies (250%), and nonattendance (300%) The same year, nearly all secondary school graduates (97.9%) enrolled into high schools. The MOE of Japan and numerous local boards of education introduced three major approaches to reduce transitional gaps: (1) setting up liaison meeting between primary school teachers and secondary school teachers to discuss difficult students, (2) introducing interactive activities between primary school students and secondary school students to foster smooth transit, and (3) creating 9-year-through-training program to reduce the students left behind. The first and second approaches were preferred among teachers and the educational administrative officers. The third approach was not common and employed to special school districts. It was seen to be an experimental project and difficult to administer in neighborhood schools (Muto, 2007). The first approach (setting liaison meeting) and second approach (introducing interactive activities) were not effective to solve the transitional gap between primary school and secondary school (Muto, 2007). Indeed, the secondary school students experienced a curriculum gap, which inducted high stress to students who could not adapt their learning style to suit the expectations in the secondary school settings.

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_17
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The similar approaches were recommended in the United States of America (USA, e.g., Wormeli, 2010, e.g., inviting elementary and middle school teachers to switch jobs for a day).

For example, Midgley and her colleagues reported data that was similar to nonattendance behavior (Urdan, Midgley, & Anderman, 1998). Urdan et al. (1998) examined avoidance behaviors (such as withdrawal of effort to school work) of secondary school students in the USA. They concluded that avoidance could occur when students feared of trying hard and failing as an indicator of low ability which threatened their self-esteem. Some students had been purposely did not try hard in school so that if they did not do well, they could have attributed it to lack of effort instead of lack of ability. Students engaged in avoiding the demonstration of inability. Their anxiety could lead to nonattendance, bullying, and school violence. Urdan et al. (1998) reported strong correlations of avoidance behaviors to self-handicapping, avoidance of help-seeking, avoidance of novelty, and cheating behaviors. In the United Kingdom (UK), similar problems were reported that primary students, secondary students, parents, and teachers were ascertained to a fear of bullying. Bullying was the major concern for all groups during the transition process in the UK (Zeedyk, Gallacher, Henderson, Hope, Husband, & Lindsay, 2003). School transitional gaps reported by the above countries (Japan, USA, and UK) seem to be the cause for nonattendance, bullying, and school violence.

Risk Factors and Transitional Gaps

Curriculum

Poor educational performance likely causes the emergence of negative behavior (such as nonattendance, bullies, school violence). The lack of continuity in curriculum and teaching leads to unwholesomeness among the secondary 1-year students. Cizek and Burg (2005) suggested a checklist of intervention strategies for American educators (pp. 119–120): providing direct instruction and practice in metacognitive skills, having a balanced curriculum/content coverage with opportunities for reflection, and reviewing student work for deeper understanding. The recommendations were meant to prevent students from having test anxieties. Good metacognition would enhance students' academic resilience. Benese (2006) used a questionnaire to study behavior of Japanese cram school students' behavior from primary four to secondary three. The percentage of students who did not know how to study and who did not know the meaning of learning increased from primary four (33%, 27.3%) to secondary three (76%, 58.1%).

Jindal-Snape and Miller (2008) pointed out three risk factors in school transition: the individual (internal factor), the family (external factor), and the external environment (external factor). Individual risk factors such as poor academic performance could lead to low self-esteem and risk of nonattendance.

Teacher Factors

The stakeholders, both parents and teachers, have to pay great attention to the "curriculum gap" between primary and secondary schools. The "curriculum gap" stems from pedagogical differences between primary and secondary teachers (Sano, 2006). Primary teachers teach every subject (nine subjects at most). The homeroom teacher system is employed in Japan. Homeroom teachers usually are in charge of their classes and handle multiple subjects, moral education, special activities, and guidance. Their assessment tools are ready-made tests. Each test is administrated at the end of each unit (each textbook is organized by several units).

Secondary school teachers are responsible for single subjects (subject teacher system). Their assessment tools/methods are not ready-made. They have to prepare examination by themselves. The test is administrated periodically such as midterm, end-of-term, and end-of-year examinations. The format of the examination varies from true-false format questions to essay writings. Examinations are becoming important for secondary school students. Nearly all students in Japan enter high schools by taking high school entrance examinations. Secondary students' learning goals become examination-oriented (Sano, 2006).

Assessment

In primary school days, the tests are administrated at the end of each unit so that the quantity that students have to prepare for the test is little. For secondary students, the tests are administrated periodically. They take many tests in a day. The quantity which secondary school students must prepare for the test gets larger than that of the primary school's tests. Students have to change their learning styles to secondary school's rugged environments, especially for test-taking behavior in Japan (Yajima, 2006). Some students increase their self-esteems and gain resilience during this transition. The author would like to know the differences between students who fail to adjust themselves to secondary school settings and students who successfully adjust.

Hypothesis of this Research

The study hypothesized that students have to acquire strategies to cope with the huge amount of knowledge (especially for the examinations) in secondary school, otherwise the students fail to gain "academic resilience" and feel transitional gaps that lead to serious unwholesomeness and could bring nonattendance or bullies (Urdan et al., 1998; Zeedyk, et al., 2003). The study examined the type of students who would suffer from the environmental transition and the type of students who would gain from the school transition.

First, acquisition of good metacognitive judgment/ability is important because that controls judgments on (a) degree of understanding, (b) task difficulties, (c)

setting of learning/achievement goals (mastery-oriented vs. performance-oriented Midgley, Kaplan, & Middleton, 2001), and (d) selecting proper learning strategies to achieve the goal. Students need to acquire various learning strategies from simple naïve strategy (e.g., memory-oriented learning strategies) to higher-order learning strategies (e.g., elaboration-oriented learning strategies or organization-oriented learning strategies: cf. Appendix). Secondary school students need to learn how to use of these strategies and how to accommodate the most suitable strategy based on their metacognitive judgment (e.g., task difficulty and purpose of learning).

Method

A school diagnosis chart inventory was developed to detect problems in school and to improve school transition gaps (Taira, 2008, 2009a, 2010). For the past two decades, studies have been conducted to study the relationship between learning and study strategies and academic achievement. No conclusive definition for the concept of study or learning strategy exists (Yip, 2009). The general view of learning strategies would be "any thoughts, behaviors, beliefs or emotions that facilitate the acquisition, understanding or later transfer of new knowledge and skills" (Weinstein, Husman, & Dierking, 2000, p. 727).

The distinction between deep and surface approaches to learning is seen among many inventories (Entwistle & McCune, 2004). Deep learning is associated with an intention to understand. Surface learning is accompanied by an intention to simply reproduce. Weinstein and her colleagues' work (Weinstein, 1982; Weinstein & Meyer, 1994; Weinstein, Schulte, & Palmer, 1987) linked inventory development to a program of training in study skills. Their Learning and Study Strategies Inventory (LASSI) combined a wide range of study strategies in training schemes, supplemented by developing ideas about learning processes. They distinguished rehearsal, elaboration, and organizational learning strategies. In this study, the author employed three different learning strategies: (1) memory-oriented learning strategies (MOLS), (2) elaboration-oriented learning strategies (EOLS), and (3) organization-oriented learning strategies (OOLS). MOLS refers to learning strategies mainly based on rehearsal and superficial one. EOLS refers to subject content-oriented learning strategies for understanding each unit. For example, student who was good at EOLS would mark such a sentence higher: "I try to understand topics not only by memorizing but also by inferring the meaning." OOLS refers to learning strategy to connect each unit structurally. For example, student who was good at OOLS would mark such a sentence higher: "I try to create a new conceptual category in which different topics could be grouped." The study hypothesized that the last two strategies (i.e., EOLS and OOLS) were categorized as the higher-order learning strategies and the first strategy (i.e., MOLS) was categorized as naive and unsophisticated strategy that stemmed from experience of lower grade of primary school (cf. Appendix).

Participants

The participants were 119 secondary school students. All participants were freshmen, male = 60, female = 59, and age = 12–13 years old. They were to answer the same questionnaire twice in a year; the timing was in accordance with the beginning and the end of the school year. The school year begins in April and ends in March in Japan. The same questionnaire was distributed to participants in May 2008 and January 2009. To analyze the differences between May and January, the participants were asked to write down their student numbers.

Design of Questionnaire (School Diagnosis Chart)

The questionnaire (in Japanese) was distributed to a local secondary school in Sendai City (May 2008 and January 2009). The participants were first grade students (12–13 years old). The students took on average 10–20 min to complete the questionnaire that consisted of 62 items. They rated the items on a 5-point Likert scale, from no to yes (Appendix). Participants answered single digit from 1 to 5 (no was 1 and yes was 5). The participants answered each item. They recorded their IDs in the marked answer sheet. The participants were notified a brief schedule of the research. They answered the questionnaire twice in a year, in May 2008 and in January 2009. The questionnaire consisted of ten scales. The author wished to learn about the participants' learning strategies. He decided to focus on two subjects: mathematics and science. The following are sample items:

1. Group-oriented activities: "Classroom activities are going well."
2. Relationship with friends: "My friend admits my goodness."
3. Relationship with teachers: "My teacher accepts me warmly."
4. Help-seeking behaviors related to learning subject matter: "I ask my friend what I could not understand."
5. Social class: "I talk with my family about what I have learned at school."
6. Motivational factor: "Learning math is interesting."
7. Metacognitive judgment (for math and science): "When math class is difficult, I try to figure out the reason."
8. Memory-oriented learning strategy (for math and science): "Repetition is an important part in math learning."
9. Elaboration-oriented learning strategy (for math and science): "I try to understand topics not only by memorizing but also by inferring the meaning."
10. Organization-oriented learning strategy (for math and science): "I try to create a new conceptual category in which different topics could be grouped."

Table 17.1 Average differences between May and January (cf. Appendix)

Scale	Cronbach's α	January	Difference (SD)	Uptrend	Same	Downtrend
Group-oriented	.79	3.87	−.19 (.80)	35	30	54
Friend	.93	3.41	−.17 (.89)	33	26	60
Teacher	.87	3.13	−.3 (.87)	28	32	59
Ask: friend		4.16	−.19 (1.12)	22	61	36
Ask: family		3.96	−.15 (1.15)	24	57	36
Ask: teachers		3.04	−.41 (1.34)	21	51	47
Help-seeking	.50	3.72	−.25 (.75)	30	27	62
Social class	.66	3.35	−.3 (.70)	30	17	72
Math: motivation	.90	2.87	−.36 (.91)	36	13	70
Science: motivation	.90	3.05	−.27 (.77)	34	11	74
Math: metacognition	.83	3.15	−.4 (.96)	24	16	79
Science: metacognition	.81	3.14	−.17 (.96)	37	21	61
Math: MOLS	.51	3.27	−.13 (.86)	42	21	56
Science: MOLS	.56	3.55	−.05 (.79)	49	19	51
Math: EOLS	.79	3.59	−.21 (.92)	32	23	64
Science: EOLS	.76	3.57	−.2 (.92)	36	23	60
Math: OOSL	.68	3.19	−.29 (.92)	29	26	64
Science: OOSL	.74	3.27	−.13 (.95)	35	28	56

Note: Help-seeking was the average of scale of help-seeking activity to friends, parents, and teachers. *MOLS* memory-oriented learning strategy, *EOLS* elaboration-oriented learning strategy, *OOSL* organization-oriented learning strategy. Each number in the uptrend, the same, and the downtrend referred to the number of participants (cf. Table 17.2)

Results

The value of each scale and its Cronbach's alpha value are outlined in Table 17.1. As hypothesized, metacognitive ability would play an important role in adapting to the secondary school environment especially for maintaining "academic resilience." The author divided the participants into three groups: the downtrend group, the same group, and the uptrend group. These groups were categorized according to their each metacognitive ability (math and science) change from May 2008 to January 2009 (Japanese school year begins at April and ends at March). The downtrend group was the participants who marked their metacognitive ability higher in May compared to January; the same group was the participants who marked their metacognitive ability the same in May and January; the uptrend group was the participants who marked their metacognitive ability lower in May compared to January.

Initial Metacognitive Ability

As hypothesized, metacognitive ability would play an important role in adapting to the secondary school environment especially for maintaining "academic resilience." The author divided the participants into three groups: the downtrend group, the

Table 17.2 Number of each metacognitive ability

	Downtrend	Same	Uptrend	(Math)
Uptrend	4	2	18	24
Same	5	6	5	16
Downtrend	52	13	14	79
(Science)	61	21	37	119

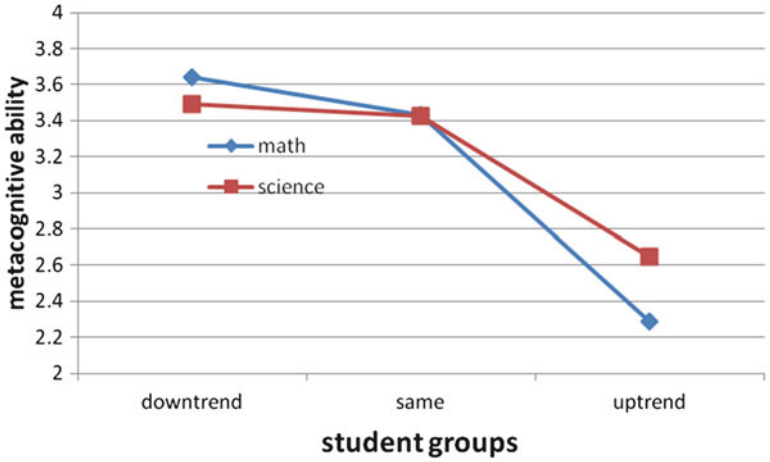

Fig. 17.1 Initial metacognitive ability of each student group (May) (Refer to Table 17.1 for number of each student group)

same group, and the uptrend group. These participants groups were categorized by their each metacognitive ability (math and science) change from May to January (Japanese school year begins at April and ends at March). The downtrend group was the participants who marked their metacognitive ability higher in May compared to January; the same group was the participants who marked their metacognitive ability the same in May and January; the uptrend group was the participants who marked their metacognitive ability lower in May compared to January (Table 17.2).
There was a statistical significance ($\chi(2) = 28.56$, $p < .001$) for the results of each group. Table 17.1 suggested that the metacognitive ability of most of students declined from May to January in each academic subject; however, some students improved their metacognitive ability. As stated, these groups would gain most from the transition and would elevate their motivation to study academic subjects.

Figure 17.1 shows the initial metacognitive ability in math and science of the participants in May. The ANOVA for math was $F(2, 52) = 7.68$, MSE = .85, $p < .001$; according to Tukey HSD test, the downtrend and the same were statistically higher than the uptrend. The ANOVA for science was $F(2, 53) = 4.03$, MSE=. .67, $p < .001$; according to Tukey HSD test, the downtrend and the same were statistically higher than the uptrend. Namely, the downtrend group was seemed to be overconfident in

their metacognitive judgments compared to the uptrend group. In other words, they did not properly judge their weak points at the start of the school year.

However, the important thing was that the participants who were evaluated for their metacognitive abilities as the lowest among three groups improved to moderate metacognitive ability in the end. They became efficient students in terms of metacognitive judgments in January (the end of school year). The author conducted two mixed design ANOVA (between subjects factor, change of metacognitive abilities; within-subject factor, the timing, May and January) for both subjects (math and science). The result of math was statistically significant interaction between each factor, $F(2, 53) = 9.03$, MSE = .104, $p < .001$. The Tukey HSD test showed statistically significant difference in the metacognitive ability of the uptrend and the downtrend group in January (MS = .809, DF = 142.52). This effect showed that the uptrend students (math) had overtaken the downtrend students in January. In the same inclination, the result of science showed also statistically significant interaction between each factor, $F(2, 52) = 7.69$, MSE = .101, $p < .001$. Again, the Tukey HSD test showed in science a statistically significant difference in metacognitive ability between the uptrend group and the downtrend group in January (MS = .71577, DF = 142.24). This effect also showed that the uptrend students had overtaken the downtrend students in January in the subject of science.

Shifting the Motivation to Learn

Gaining resilience of learning motivation plays an important role to prevent nonattendance or bullying. For example, dropping out from school due to declining academic achievement can be a risk factor, and "academic resilience" has a fatal role in the US school (Catterall, 1998). As hypothesized, sound metacognitive ability could be important. Therefore, the author conducted two mixed design ANOVA about change of motivation to study for the participants. The inter-subject factor was the change of metacognitive abilities (downtrend, same, uptrend), and the intra-subject factor was the timing (May and January) for both subjects (math, science).

The results of ANOVA were statistically significant in both subjects: In Math: $F(2,113) = 5.496$, $p < .01$, MSE = 0.388 (Fig. 17.2); and in Science: $F(2,113) = 12.541$, $p < .01$, MSE = 0.252 (see Fig. 17.3). The Tukey HSD test for Math showed statistically significant difference in the meta-cognitive ability of the downtrend group between May and January, MS = .971, DF = 169.60. Namely, the motivation of the downtrend group in Math significantly declined in freshman. In science (Fig. 17.3), $F(2,113) = 12.541$, $p < .01$, MSE = 0.252. The Tukey HSD test for science also showed statistically significant difference in metacognitive ability of the downtrend group between May and January, MS = .936, DF = 150.49. The number of downtrend group in both math and science was 52 of 119 participants (Table 17.2). Therefore, it could be said that a great majority of students were at risk of being vulnerable.

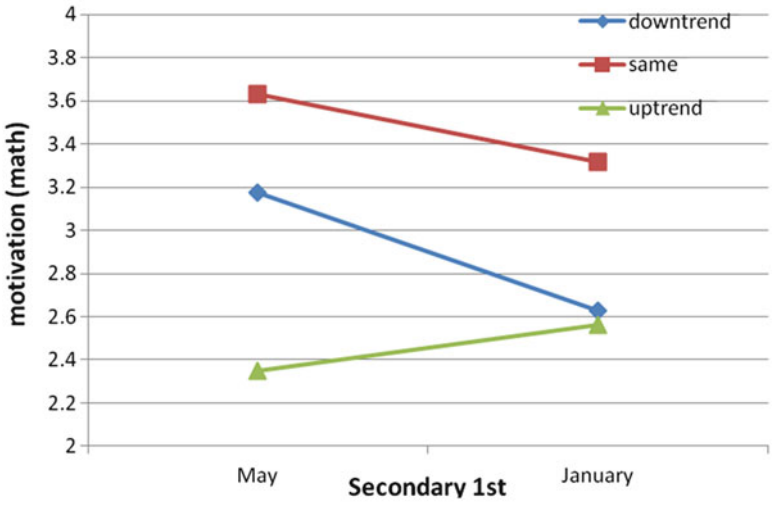

Fig. 17.2 Changes of motivation to learn math at secondary first (May to January)

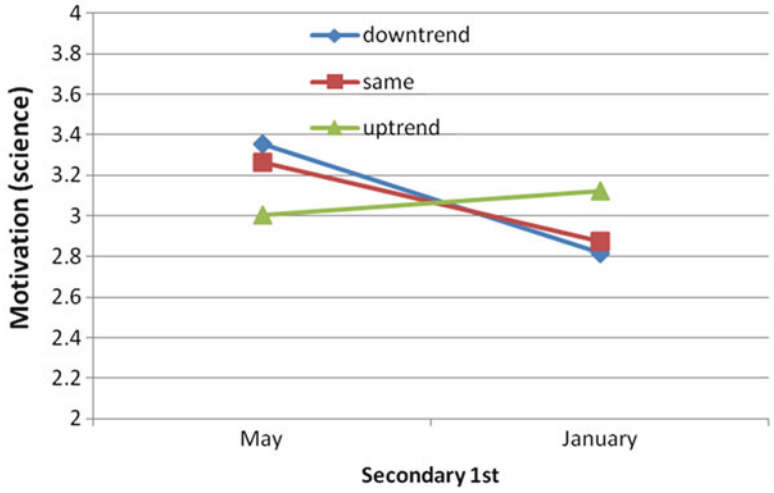

Fig. 17.3 Changes of motivation to learn science at secondary first (May to January)

Determining Factors of Motivation

As stated, serious unwholesomeness, namely, lack of motivation to study, leads to transitional gaps (Anderman, Maehr, & Midgley, 1999). The author conducted two multi-linear regression analyses to study the impact of each scale on learning moti-

Table 17.3 Multiple linear regression analysis. The determining factor of motivation (changes from May to January for math and science)

Scales	Math	Science
Group-oriented	* .25	−.04
Friend	.01	.02
Teacher	−.01	−.01
Ask: friend	* −.16	.10
Ask: family	−.10	−.10
Ask: teachers	−.07	.09
Extracurricular activity	−.06	−.01
Family support	−.09	−.08
Metacognition	* .25	* .38
MOLS	.07	.001
EOLS	* .21	.15
OOLS	* .22	* .19

Note: *MOLS* memory-oriented learning strategy, *EOLS* elaboration-oriented learning strategy, *OOSL* organization-oriented learning strategy
*Statistically significant at 5% level

vation (math and science). Table 17.3 shows the results of the analysis. Each value is a standardized partial regression coefficient: math, $F(12,106)=5.78$ $p<.001$, standard partial regression coefficient = .327; science, $F(12,106)=4.51$ $p<.001$, standard partial regression coefficient = .263.

The analysis of math suggested that although group-oriented factor, metacognitive ability, EOLS, and OOLS contributed positively to the motivation to study math, help-seeking behavior for friends was negatively affected. The reason that help-seeking behavior for friends suppressed motivation was not clear, but other described factors: For example, EOLS and OOLS playing an important role to enhance motivation would be meaningful to practitioners.

As hypothesized, metacognition and use of higher-order learning strategies had an important role in enhancing both motivations to learn (math and science). To validate these evidences, the author conducted another ANOVA for math about the use of EOLS (Fig. 17.4).

This mixed design ANOVA for math consisted of two factors: (1) inter-subjects factor (change of metacognitive abilities) and (2) intra-subject factor (timing, May and January). The result suggested statistically significant interaction, $F(2,113)=5.496$, $p<.01$, MSE = 0.388. Tukey HSD test for math showed statistically significant differences in motivation in May between the downtrend group and the uptrend group, as well as statistically significant difference in the downtrend group between May and January, MS = .767, DF = 189.00. The declining use of EOSL depicted in Fig. 17.4 was coincident that the downtrend group's motivation to learn math had declined between May and January, as depicted in Fig. 17.2. As hypothesized, full use of higher-order learning strategies contributed gain of "academic resilience" to prevent losing motivation to study, otherwise students failed to maintain self-esteem in Japanese secondary school.

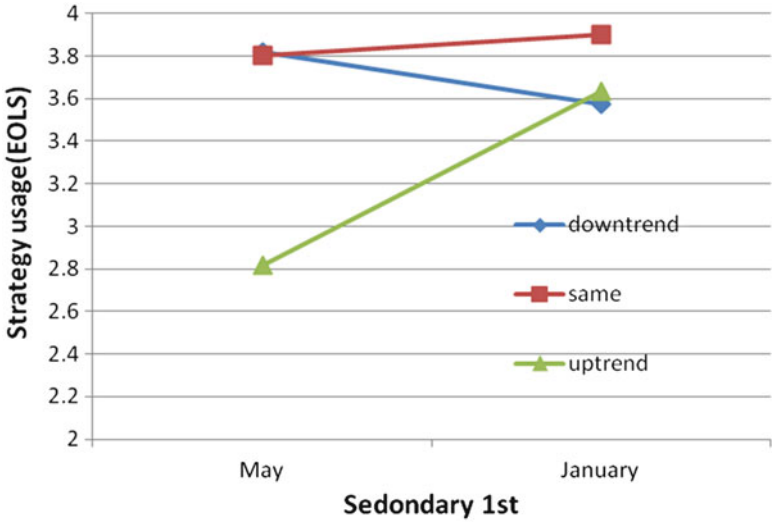

Fig. 17.4 Change of EOLS usage in math: secondary 1 (May to January)

General Discussion

The results suggest that the uptrend group had started the academic year with lower metacognitive ability but had ended their first year with an adequate ability to tackle each subject (Fig. 17.1). The downtrend group had started their academic year with higher metacognitive ability and had ended their first year of secondary school with the lowest ability to tackle each subject. It is not certain whether this change sustains in upper grade. The change did coincide with motivation and the use of higher-order learning strategies (Figs. 17.2, 17.3, and 17.4). It cannot be said that the downslide of motivation directly leads to nonattendance and bullying. However, if students can keep their learning motivation high, the possibility of not attending school may decrease. If teachers were able to have students think their way of learning in each subject or set their learning goal by themselves and their weak points, the students may not become nonattendant and kept themselves away from bullying.

It is important to raise learning motivation to keep students away from behavioral problems. Putting too much emphasis on learning motivation in psychological study to modify the issues such as school transition gap could be a risky venture. This is because, as Ichikawa (2008) and Taira (2009b) stated, teachers in a challenging school where transitional gap was apparent tended to attribute the issue of gaps to the motivational factors. They preferred to conclude some chains of cause and effect as a reason for the issues. (e.g., the students have a lack of motivation; they

do not study). In such challenging schools, teachers expect students to push hard to do extracurricular activities or tighten up on relationships of friends to raise motivation to learn.

It is much easier and quicker method to improving learning contents to interesting ones than to raising students' motivation (Nishibayashi, 1994). As discussed earlier, creating a 9-year-through-training program to reduce the risk of students becoming left behind is desirable to solve the issues of transitional gap. Therefore, we should consider the quality of learning such as higher-order learning strategies and the methodology to learn these strategies by students.

Motivation to climb up the ladder of the education system varies according to countries. For example, in Singapore, a strong streaming system is used in the early stage of education: Primary School Leaving Examination (PSLE) can serve as a traditional tracking system in Singapore. Japanese primary and secondary schools do not have any tracking system and no high-stake testing excepting the entrance examination to high school. Taira and Leong (in printing) reported that PSLE contributed to cultivating Singaporean students' metacognitive ability. The assessment and streaming system played an important role in deciding the type of adaptive learning. The developmental changes in learning motivation and learning strategies could be molded by social demands. Midgley and her colleagues suggested that ethnicity and racial differences could determine learning goals such as master-oriented learning goals or performance-oriented learning goals. In a class of performance-oriented learning goals, some students generally avoid learning to prevent revealing their inabilities. If teachers try to teach for master-oriented learning goals, the students unlikely show any transitional gap. Assessment policies likely define learning strategies and coping strategies for the school demands (e.g., high-stakes testing). Intercultural studies are needed to support the results of this chapter.

Appendix (Questionnaire)

School Diagnosis Chart

Group-oriented activities

1. Classroom activities are going well.
2. My feelings are understood in the classroom.
3. The class activities are interesting.

Relationship with friends

4.. My friend may worry when I am absent from school without notice.
5. My friend admits my goodness.
6. My friend understands me when I make a mistake.

Relationship with teachers

7. Teachers understand me when I make a mistake.
8. My teacher likes me.
9. My teacher accepts me warmly.

Help-seeking behaviors related to learning subject matter

10. I ask my friend when I could not understand something.
11. I ask my family when I could not understand something.
12. I ask teachers when I could not understand something.

Social class

13. After returning home from school and on my days off, I often play outside.
14. I talk with my family about what I have learned at school.
15. I read scientific articles and watch science TV programs.
16. I read newspapers and watch the TV news.
17. I use books or dictionaries when I study.

Attitude (motivation) toward math

18. Math is one of my favorite subjects.
19.. I can get good marks in math.
20. I can understand math classes.
21. Learning math is interesting.
22. I would like to tackle harder math problems.
23. I want to continue learning math even after becoming an adult.

Learning styles (metacognitive ability): math

24. When math class is difficult, I try to figure out the reason.
25. I know how to overcome my weak sides in math.
26. I can set up learning goal in math.

Learning strategy (memory-oriented): math

27. In math classes, rote learning is important.
28. Repetition is important part in math learning.
29. I try to copy down everything that was written on the blackboard by teacher.

Learning strategy (elaboration-oriented): math

30. I try to organize my notebook to understand meaningfully what I learned in math classes.
31. When I learn a new idea in math, I try to make concrete image of it.
32. I try to understand topics not only by memorizing but also by inferring the meaning.

Learning strategy (organization-oriented): math

33. When I organize my math notes, I try to integrate the material.
34. I try to create a new conceptual category in which different topics could be grouped.
35. I try to connect what I learn in math classes to daily life.

Attitude (motivation) toward science

36. Science is one of my favorite subjects.
37. I can get a good mark in science.
38. I can understand science classes.
39. Learning science is interesting.
40. I would like to tackle harder science problems.
41. I want to continue learning science even after becoming an adult.

Learning styles (metacognitive ability): science

42. When science class is difficult, I try to figure out the reason.
43. I know how to overcome my weak points in science.
44. I can set up a learning goal in science.

Learning strategy (memory-oriented): science

45. In science classes, rote learning is important.
46. Repetition is an important part in science learning.
47. I try to copy down everything that was written on the blackboard by teacher.

Learning strategy (elaboration-oriented): science

48. I try to organize my notebook to understand meaningfully what I learned in science classes.
49. When I learn new idea in science, I try to make concrete image of that.
50. I try to understand topics not only by memorizing but also by inferring the meaning.

Learning strategy (organization-oriented): science

51. When I organize my science notes, I try to integrate the material.
52. I try to create a new conceptual category in which different topics could be grouped.
53. I try to connect what I learn in science classes to daily life.

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Chapter 18
Epilogue: Toward an Integrative Understanding of Creativity, Talent, and Excellence

Ai-Girl Tan

Introduction

In this chapter of epilogue, we shall reflect upon the intent of a book on creativity, talent, and excellence. Do the contents of the book chapters represent the contemporary understanding of creativity, talent, and excellence? Does it represent a new direction of knowledge innovation in the fields of creativity, talent, and excellence?

Leading researchers in psychology of creativity (Beth Hennessey) and in talent development and excellence (Jiannong Shi) write two forewords with a converging view that emphasizes intercultural exchanges and systemic approaches to conceptualization and the study of creativity. This book collects 18 chapters contributed by colleagues of the fields of psychology and education specialized in the constructs of creativity, talent, and excellence. In the first part, authors present broadening views of conceptions of creativity in the mainstream, gifted, and organization settings (Chaps. 1, 2, 3, 4, and 5). Eleven chapters report empirical studies conducted in schools, higher educational institutions, and organizations. Three chapters are devoted to practices such as strategies to facilitate divergent thinking, future directions of gifted education, and constraints faced in creativity studies in giftedness. The main contents of this chapter are related to the constructs creativity (*ten* chapters), talent (*two* chapters), and excellence (*six* chapters). The target audience of the chapters includes students in the mainstream educational institutes (school, vocational college, and university), gifted students, and working adults. Table 18.1 summarizes the main categories of the book chapters.

This book has a broad content coverage and target audience. Some chapters reflect upon new conceptions of creativity by broadening its conceptions (e.g., self-regulation, Chap. 2), synthesizing main processes of creativity (e.g., Chap. 4), and refining frameworks of creativity for teaching and learning (e.g., for the use of

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A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7_18,
© Springer Science+Business Media Singapore 2013

Table 18.1 Main themes, target audience, and nature of the chapters

Chapter	Main theme and target audience			Nature of the chapter		
	Creativity	Talent	Excellence	Theory	Research	Practice
1	Mainstream			Yes		
2	Gifted			Yes		
3	Mainstream			Yes		
4	Mainstream					Yes
5	Mainstream				Yes	
6	Mainstream				Yes	
7			Mainstream		Yes	
8	Mainstream				Yes	
9	Mainstream				Yes	
10	Organization			Yes		
11			Organization		Yes	
12			Organization		Yes	
13		Gifted			Yes	
14			Mainstream		Yes	
15			Mainstream		Yes	
16		Gifted				Yes
17			Mainstream		Yes	

classroom, Chap. 1, and problem-based learning, Chap. 5). Some chapters on organizational excellence and educational excellence address socially critical issues such as goal setting at work (Chap. 14) or in learning (Chap. 12), developing strategies to manage social emotions (Chap. 15), regulating curricular and learning difficulties (Chap. 17), and designing enrichment programs for the gifted students (Chap. 14) and team diversity (Chap. 11). The construct of creativity self-efficacy was developed with reference to components of creative processes and domain-relevant processes (Amabile, 1983) and self-efficacy theory (Bandura, 1986) (Chap. 8). The construct of entrepreneur creativity (Chap. 10) was developed. The relationship between creativity and personal epistemology (Chap. 9) was established.

Closing Gaps

Have the contents of the book chapters tried to provide some insights into incomplete views of creativity observed in the literature of psychology and education? To a certain extent, the answer is positive.

Gap 1: The Role of Unperceived Part of an Action

The exclusion of unperceived part human behavior such as intuition resulted in an incomplete understanding of creativity, talent development, and excellence in learning and interaction. Studies reported in Chaps. 5 and 6 provide evidence that

children are able to represent creatively. Children participated in activities that encourage them to evaluate creativeness (Chap. 5) and that allow them to engage in artistic creativity (Chap. 6). None of the book chapter addresses directly the role of intuition in creativity.

Creativity in Development

Some new understanding of creativity from psychology of development can be useful in nurturing creativity and talent. It is imperative to remove any dichotomous understanding of human psyche and reality, intuition and consciousness, being and doing, as well as cognition and emotion. It is important to acknowledge human psyche as a reality, the role of unperceived part of human behavior, as well as complementary relations of intuition and consciousness, being and doing, cognition and emotion, internal representation and external representation (see Ponomarev, 2008). It is also indispensable to ensure the presence of regulation for the emergence of culture (see Vygotsky, 1933). Stoeger (Chap. 2) highlights the role of self-regulation in developing creativity in learning. Similarly, Oei (Chap. 8) articulates the importance of self-regulation in school transition and in creativity. The unconscious is a decisive part of a creative act (Ponomarev, 2008). It is difficult to observe the presence of the unconscious such as intuition as it produces a local result unconnected with the whole system of a person's idea (Ushakov, 2007). Recognition memory is essential as it has a larger capacity than reproductive memory (see also Hakkarainen, 2008). Creative thinking emerges when objects interact and burst directly into our mind. Intuition consists in the direct givenness to us of unobserved properties of objects, of properties that arise from the interactions of objects among themselves (Ushakov, 2007, p. 40). Intuition is non-goal directed. It supplies individual elements and consideration out of which consciousness builds a coherent and meaningful system (Ushakov, 2007, p. 75).

Consciousness or the internal plan of action or the ability to act in the head is an invariant of the content of accumulated experience. It is an ability to execute transformation of mental models (Ushakov, 2007, p. 50) or an ability in full sense of the world (Ponomarev, 2008, p. 50). A plan refers to an interconnection of parts, an intention, a scheme or a design, a sketch, a schema, a diagram, or a field or ground on which some action takes place (Ponomarev, 2008, p. 44). An internal plan can only be executed in relation to an external plan. Logic contains coherent, structured knowledge that enables the subject to find answers to set questions in a volitional and goal-directed manner and in accordance with ready-made schemas (Ushakov, 2007, p. 25). Children experience five stages in the development of internal plan of action: background (unable to act on their head), reproduction (only ready-made solutions are reproduced), manipulation (solving problems by manipulating representations of objects), transposition (manipulating representations with objects, path exists when problems are solved twice and above), and regimentation (constructing a plan or program for a system of actions and controlling own actions). The five stages of development above were observed in experiments (Ponomarev, 2008).

Gifted children achieve higher than their peers of the same age or older age groups not in chronogenic (Piagetian tasks, age difference, Piaget, 1985) but in personogenic (Raven's test, individual difference) problems (Ushakov, 2007). In their own ways, Pizzingrilli and Molteni (Chap. 5) attempted to examine development of creativity across age groups. Oie (Chap. 7) and Taira (Chap.17) investigated factors that influenced learning difficulties of elementary and secondary school students. They were interested in self-regulation and resilience of Japanese students. Heller (Chap. 13) shared his experience to provide enrichment programs for talented students over a period of time. None of the studies deliberately combined the use of chronogenic and personogenic problems.

Gap 2: Human Creativity for a Good Life

Second, the exclusion of purposes of human creativity for a good life resulted in meaningless creative talent programs. Chapters 7, 11, 12, 13, 14, 15, and 17 report empirical studies on nurturing creativity, developing talent, and promoting excellence in schools and organizations. The authors of the chapters aspire to clarify relationships between creativity and other variables and to provide evidence to support the role of positive intervention in good learning. In what way is creativity part of life? We refer to Lev Vygotsky's (1926, 1933, 2004) sociogenetic view of creativity for some insight. To Vygotsky, high mental functions emerge in sociocultural activities. Psychology is social. Creativity and experience interact to give life and to generate meanings in life. Culture and cognition meet within a person's zone of proximal development. Some chapters examined social psychological factors that influence learning and development of children, adolescents, and young adults in the context of a school or sociocultural system. Some chapters also investigated social psychological factors that influence creativity and excellent performance of adults in the context of an organizational system. The chapters have not explicitly studied the role systemic factors in creativity and talent development and holistic excellence. The findings did not contradict the systemic approaches to creativity.

An Iterative Relation Between Imagination and Reality

According to Vygotsky (2004), in everyday life, there have been numerous creative behavior, products, and activities that have yet to be recognized as eminent but that have contributed to our lives. All individuals are creative and able to imagine. Our brain is plastic. It has two main functions: reproduction of past impressions and experiences and creation of new images or actions. The former is related to memory and the latter combinatorial or creative activity. Imagination and creativity are used interchangeably. To Vygotsky (2004), creativity is about reworking on our and social experiences (including narrations of other people) and realities (including emotional reality). Imagination is based on realities. Real experiences give rise to creativity.

Creativity begins in childhood. All children, adolescents, and adults are able to create. Children display their creativeness early and in play. Play is an activity that a child creates in development to meet his/her unmet needs in everyday life (Vygotsky, 1933). To Vygotsky (2004), creativity or imagination is associated with realities, and emotional reality is part of imagination. Play is experiential, and it is important in children's development. In play, children take the roles they observe in adults' worlds. They act in various roles and construct the world of experiences that they have yet to fulfill in everyday life. Creativity is thus developmental, transcendental (Frankl, 1984), and transformational (Rogers, 1961). Creative imagination enables children to work and rework on their existing experiences they gather themselves and/or through other people and adults in their communities (Vygotsky, 2004). In play, children learn to represent problems, generate ideas, evaluate options, etc. Children experience emotions which are induced positively. Their cognitive repertoires are broadened. They likely build personal and sociocultural resources to be resilient and creative (Fredrickson, 1998). Children likely experience flow (Csikszentmihalyi, 1996). In sum, recall allows us to experience successes of the past. Imagination enables us to experience successes of the present and hope for the future.

Children's creativity is likely less rich than that of adults. Life experience of a child is likely less rich than the life experience of an adult. Furthermore, children need time to develop linguistic and literary creativity. Play is not departed from reality. Imagination is not a fantasy that is not related to real experiences. Emotion plays an important role in creativity. Emotions exist in all imaginations. The development of a child's creative potential involves fostering emotional expression of the child's individuality. A creative act is a manifestation of one's own individuality (Iakovlena, 2003). Vygotsky (2004) suggests that imagination is based on experience. Real life or social experiences of other people are sources of creativity. This includes narrations of other people. In story writing, the writer combines stories or narrations and experiences various forms of emotions (e.g., joy, sadness, despair, excitement). To Vygotsky (1926), giftedness is about special dispositions to a certain type of activity.

Multiple Forms of Creativity

Creative processes include dissociation or distortion (change) of the existing experiences or realities, exaggeration or minimization of the experiences, unification or combination of various experiences and realities, as well as transformation to a new reality. Vygotsky (2004) alerts us of our phases of imagination such as creativity in childhood, adolescence, and adulthood, as well as linguistic creativity, literary creativity, and numerical imagination. He cites the Eastern philosophy is rich in numerical imagination (e.g., the description of thousands of universals in Buddhist scripts or experiencing unlimited space in meditation). Our curiosity in numeral imagination is evidently observed in astrophysics. Scientists construct experimental studies to verify theoretical understanding of planet formation. They spent hours to analyze and interpret numerical representations of free falls of dust particles. Our imagination leads us to invent products that we desire to possess such as telephone,

aircraft, art and craft, theory and policy, and so on. Invention needs spontaneous resurrection of images. Needs and desires do not lead to any creation.

Vygotsky (2004) introduces two forms of creativity which differentiated during adolescence: plastic (external, objective) imagination which is based on external impressions (from without) and emotional (internal, subjective) imagination, which is based on elements taken from within. Adolescents may retreat to dreaminess or may lose interest in literacy creativity as they develop critical attitudes to their own work. Reasoning and imagination coincide. To Vygotsky (1926), artistic creation comes with aesthetic appreciation. Music stimulates and affects the person. In any form of creativity, the child transforms reality toward his(her) emotional needs. Talent is a goal of education. Education must guide the high level of human talent and must develop and preserve it. A child possesses the drive to do good. In game and play, children develop social relationships in a context of free education and in the presence of the innateness of moral sensibility. Human beings master and transform inner psychological processes with the help of tools (e.g., sign, symbols, and texts). Learning is about creating meanings in texts (e.g., narratives) (Bruner, 1996). Vygotsky's theory of creativity concerns personal sense and process of knowledge (Lindqvist, 2003). A creative pedagogy of play involves interdisciplinary collaboration such as drama, literature, music, and dance. The child creates the playworlds together with the adult. The playworlds combine the actor(s)' (child and/or the author) emotional experiences and aesthetic relations to realities (Nilsson, 2010). Children shall undertake various forms of play (e.g., director, image, and literature) when appropriate to facilitate development in play (Kravtsov & Kravtsova, 2010).

Gap 3: Toward Synthesis in Theory and Collaboration in Research

Third, the exclusion of cross-disciplinary collaboration for improving life resulted in superficial or general views of creativity and creativity projects that do not address critical social issues. Do our book chapters attempt to provide some pointers to the three questions? Some chapters attempt to address critical social issues such as the need to self-regulate (Chap. 7), losses and gains during school transitions (Chap. 17), transfer of skills to deal with socio-emotional problems (Chap. 15), and organizational teams and innovation (Chap. 11).

Systems Theories and Cross-Disciplinary Approaches

Creativity can be understood with reference to systems approaches (Csikszentmihalyi, 1996). The notion of system is as old as European philosophy (Von-Bertalanffy, 1972, p. 407). Creativity is *developmental and interactive* between the person and his(her) environments, as well as *interdependence* and *dialogical* between the people and their cultures. Our existing knowledge of creativity informs us that all people have the potential to be creative in regulating their life. Children, adolescents, and

adults are able to regulate their life through effective strategies. Developmental sciences are cross-disciplinary (Bronfenbrenner, 1979). Cross-disciplinary collaboration is essential for knowledge integration (Aagaard-Hansen, 2007). Talent management and development goes beyond nurturing giftedness or high ability. Talent is inclusive. Talent show or talent search does not refer to a specific group of people with special characteristics but includes all people who are motivated to express differently and to articulate using multiple ways such as music, art, sport, and others. Creativity, giftedness, talent, or high ability cannot be developed in isolation but within supportive systems at home, in schools, organizations, and within communities of practice and interest. Theories of development of giftedness, talent, or high ability have to be ecologically relevant and systemic. A person is a system and forms part of the sociocultural systems. New theories of talent have to include components of abilities within systems. Researchers and educators shall reflect upon the integrative conceptualization of talent, creativity, and excellence. Instead of proposing separate models of theories for each of the construct, integrative understanding of creativity, talent, and excellence is recommended. To do this, researchers have to move away from developing a single ability but nurturing holistic development or a whole person's development.

Excellence for All

VanTassel-Baska (1997) advocates excellence as a standard for all education. To her, excellence is "the process of working toward an ideal standard and attainment of a consistently high standard of performance in a socially valued endeavor" (p. 9). As such, there are many parties involved in promoting excellence: parents, teachers, schools, policymakers, students, and communities. As a unit of excellence, they engage in rigor subject-matter teaching, vigorous learning, advanced placement, setting standard that goes beyond technical mastery, managing performance, providing resources for learning, and cultivating the habits of mind and attitudes toward hard work and diligence, as well as striving for the best, passion, or love of learning.

An excellence program shall have sufficient resources that support each of its components. The leaders of the programs shall forecast and obtain ample budge to run their programs. At different phases, evaluation shall be done to ensure the quality of the program. Efficient management of the program is a key to success. Instructional strategies shall vary to meet the needs of the learners and shall be appropriate to enhance learning, creativity, and motivation. There shall be sufficient program options which are interdependent. The relationships between program components shall be clearly defined and well integrated.

VanTassel-Baska (2005) proposes eight nonnegotiables or essential components for an excellence program or service. Some components are related to improving the *structure* (e.g., grouping the talented) of learning. Other components are for providing suitable *support* for learning (e.g., differentiated curricula, resources, and instructions to the talented). In addition, VanTassel-Baska and colleagues suggest the use of nontraditional ways such as performance-based assessment and dynamic assessment (VanTassel-Baska,

Feng, & de Brux, 2007) to identify the gifted minority. The use of different performances is essential across ethnic groups (White, Asian, and African Americans). For instance, *Project Athena* is a program designed for students with poverty, differentiated instruction to develop advanced literacy – writing, listening, communicating, reasoning, conceptual understanding, and others (VanTassel-Baska & Stambaugh, 2006).

Conclusion

There are at least three desirable outcomes of all the scientific studies and academic discourses related to human creativity and excellence: the individual's optimal functioning, systemic stability that supports human activities and optimal functioning, and peace, harmony, and balance in personal, interpersonal, community, sociocultural, ecological, and worlds. Would the existing understanding and knowledge of creativity, talent, and excellence able to help us to attain these outcomes?

Children and adolescents of the twenty-first century are challenged to be positive, resilient, ethical, creative, critical, and genuine. The face-changing worlds of knowledge, technology, communication, and ecology can be unpredictable and complex. Collectively, new knowledge, strategies, devices, tools, policies, and technologies are created rapidly to meet our needs, desires, and will to overcome constraints (psychological, physical, geographical, sociocultural, and ecological) in life. Innovations, inventions, and creativities in all aspects of life (at home, in schools, and in organizations) are meant for us to live safely, peacefully, and with care. An integrative understanding of creativity, talent, and excellence is timely as we shall reflect upon having comprehensive views of human development and interaction for ethical, good, and meaningful life. Theories of creativity, talent, and excellence shall represent accurately ontology and epistemology of human behavior. We shall to be aware that knowledge is passed down to the next generations so that our wisdom are shared and distributed. Our next generations are prepared to face the challenging worlds. Knowledge is created for goodness, peace, and ecological balance. Devices and tools are invented to ensure that we function well in the society. Communication and transport technologies are invented for interconnectedness among human communities beyond geographical boundaries. Does our understanding of our nature and worlds meet challenges of the increasingly fast-paced and complex worlds? We shall continue reflecting upon ways to answer this question, which certainly are not straightforward but hopefully are creative.

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Name Index

A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7,

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Subject Index

A.-G. Tan (ed.), *Creativity, Talent and Excellence*, DOI 10.1007/978-981-4021-93-7,

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