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ORIGINAL PAPER

An ecological view of conceptualising change in the Singapore Education System

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Abstract This paper attempts to discuss how the Singapore Education System is shifting towards student-centred designs and pedagogies, yet retaining a unique Singaporean orientation. It complements the McKinsey report by analysing directives and efforts to understand trade-offs, consequences, and insights for moving forward. The paper uses an ecological view to acknowledge that education systems are complex—historical, contextual, and cultural dimensions shape Singapore's trajectory. Building on understandings of high-performing systems, Singapore's trajectory, and informed by education research, the paper distils three shifts (from a systems level of analyses) which are currently on course: (1) hybridising pedagogies; (2) levelling up the base of lower achieving students; and (3) recognising diverse talents. The paper postulates a gradual, evolutionary stance and for continuing dialogue and alignments in the change process. The paper draws implications by proposing mitigating approaches in Singapore's continuing journey of balancing high academic achievements and twenty first century, inquiry-oriented learning.

Keywords Singapore Education System · Change · Ecological view · Twenty first century learning · Centralised–decentralisation

1 Introduction

Education systems are moving from centralisation to decentralisation or vice versa. Centralised education systems in East Asia such as Hong Kong and Korea are moving towards

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decentralisation (Kim and Cho 2014; Lee and Manzon 2014). In other decentralised countries, such as the "no child left behind" policy in the United States, reforms are moving towards standardised curricular, assessments, and examinations (Jorgensen and Hoffmann 2003). Despite popular beliefs for greater autonomy and decentralisation, the Singapore Education System has preserved its centralised nature (Ng 2010, 2013). The Singapore Education System today remains centralised despite many East-Asian systems moving towards decentralisation. It has been policy makers' belief that degrees of centralisation be maintained for Singapore's nimbleness as a small city-state to react to external circumstances and challenges. Even East-Asian education systems like Hong Kong and Korea are significantly more decentralised than Singapore (Kim and Cho 2014; Lee and Manzon 2014).

There are merits to Singapore's centralised beliefs. It allows substantial economies of scale. This is partly explained by the lower education expenditure as a percentage of gross domestic product (GDP) relative to other Organisation of Economic Co-operation and Development (OECD) countries. The Singapore government's total expenditure (both recurrent and development) on Primary, Secondary, and Pre-university education in financial year 2009/2010 was Singapore dollars $4,924 million or about 2 % of Singapore's annual GDP. This compares with the typical OECD figures of 5.5 % of GDP in Nordic countries and approximately 3 % in Japan, Luxembourg, and the Slovak Republic (OECD 2010).

Almost all Singaporean students study in publicly funded schools, and practically all the school leaders and teachers in these schools (except in a small number of Independent Schools and Specialised Schools) are recruited, paid, and managed (in terms of appointment and promotion) by the Ministry of Education (MOE), Singapore. More recently, some international schools, which local students can apply for have been set up for diversity (Teh 2014).

Unique on its own merits, the Singapore Education System learns from other high-performing systems yet retains its unique characteristics. It is well known for its pragmatic orientations and for not following popular trends. While the system is less centralised than earlier decades, it remains rooted to centralised coordination and orchestration. Whether this belief is tenable for future decades remains a question to be contested. The Singapore case example may reveal tenets and nuances, which are not a 'silver bullet' for how a system should function, but rather how it attempts to evolve gradually through this change journey. It is important for Singapore to discover its own trajectory and balance of top-down (centralised) and ground-up (decentralised) initiatives.

This paper describes Singapore as a centralised–decentralisation system (Ng 2010, 2013) in a change-reform journey. This paper considers existing directives and efforts to understand trade-offs, consequences, and elicit insights as the system reforms to balance high academic achievements through teacher-centred (centralised) practices and developing twenty first century skills through inquiry-based, student-centred (decentralised) pedagogies. The paper appropriates Bronfenbrenner's (1979) framework on ecologies to understand how directives and efforts across five levels of the education system—the history and society; cross systems; whole system; school; and classroom levels—may yield ways of change to inform Singapore's change-reform journey.

The paper begins with a social and historical backdrop to highlight transformations (then and how) that the Singapore Education System has achieved to sustain performances in international benchmark tests and consequences from these transformations. Subsequently, it describes three shifts that the system embarks as it transforms towards twenty first century, student-centred pedagogies while maintaining its unique centralised–decentralisation view. The paper concludes by reflecting on the trade-offs arising from Singapore's trajectory, shifts that are initiated, and proposes mitigating approaches to facilitate its transformation.

2 The Singapore Education System: then and now

Singapore has gone through several developmental stages—the survival (1959–1978), efficiency (1979–1996), ability (1997–2011), and presently, the student-centric, values-driven (from 2012) phase. Appropriating Bronfenbrenner's (1979) framework on ecologies, this section traces the historical development, consequences, and trade-offs of Singapore's trajectory. This section provides background for the next section describing ways in which the Singapore Education System is shifting towards twenty first century, student-centred pedagogies.

2.1 Then: the survival and efficiency phases

2.1.1 A common curriculum and medium of instruction

The Singapore Education System's transformation since the late 1950s, when Singapore gained self-governing status from United Kingdom, is significant. During the 1950s and 1960s, Singapore's concern was developing an economy with skilful workers and lower unemployment. The *survival* phase (1959–1978) aimed to develop every child's basic literacy and numeracy skills through a common curriculum (Mourshed et al. 2010; Goh and Gopinathan 2008).

Another concern was nation building and social cohesion for a country with diverse races and backgrounds. Bilingualism adopted in 1966 became a fundamental aspect of the education system. Although English became the official language for utilitarian purposes and the medium of instruction in schools, students continued to learn their Mother Tongues in Chinese, Malay, and Tamil. The policy ensured that students could interact with Singaporeans of different races, be relevant to the global economy, and yet remained connected to their cultural heritage (Ministry of Education, Singapore 2009).

Despite centralised attempts to level up schools, the quality of schools remained varied and, until the early 1980s, the system continued to have different languages of instruction (English, Chinese, Malay and Tamil) (Goh 1979). Academic achievements in the end-1970s remained low. In 1978, it was reported that fewer than 40 % of each Primary 1 cohort obtained three or more GCE O-level passes, which was viewed as a threshold qualification for life-long learning (Ministry of Education, Singapore 2000).

2.1.2 Streaming students

The *efficiency* phase (1979–1996) was introduced to reduce performance variations by streaming students into academic tracks according to their aptitudes. Streaming students into different academic tracks with different curricula and syllabi only started after 1979. Before that, about 90 % of Secondary school students studied a common syllabus (Department of Statistics, Singapore 1983, 2010; Ministry of Education, Singapore 2003, 2010).

This phase proved highly effective. Teachers developed sophisticated abilities to teach to the test and efficiently levelled up students' performances. By 1993, the percentage of students obtaining three or more GCE-O-level passes had risen above 90 % (Ministry of Education, Singapore 2000). The percentage of Primary 1 cohort with five or more O-level passes (a more stringent benchmark), also rose from 65 % in 1987 to 82.1 % in 2010 (Ministry of Education, Singapore 2010).

2.1.3 Consequences and trade-offs from the survival and efficiency phases

Singapore remains mindful of its geo-political uniqueness and limited resources. The nation has long instilled a gradual transition process and the need for resource optimisation—hence the advent of the streaming system (Goh 1979). These assumptions continue to be valid today. While it is not always possible to deeply understand (from an outsider standpoint) the reasons for Singapore's centralised philosophy and national high stakes examinations as a meritocratic indicator for successful performances, the government recognises a need to slowly allow for measured diversity and decentralisation in the system.

The history of how streaming is implemented and the optimisation of resources to cater to different students cannot be ignored. Since the streaming policy in the late 1970s, MOE has repeatedly affirmed its aversion of a one-size-fits-all curriculum. Students with different academic achievements, learning needs, and disposition (whether real or perceived) are best served with a different curriculum. The provision of a small number of fixed curricula to students grouped according to their examination results is MOE's (Singapore) chosen way. This is probably to maximise efficiency and economies of scale. This approach is particularly relevant in the early 1980s when resources are limited. Policies that achieved rapid improvement are chosen, even when there may be individual losses. This pragmatic and centralised manner of levelling up students' achievements is typical of the survival and efficiency phases (Mourshed et al. 2010; Teh 2014). Consequently, teachers focus on teaching to the test. Teaching and learning emphasise teacher talk, coverage of curriculum, drill, and practice to ensure mastery of knowledge for national high stakes examinations. Teachers seem to monitor students' learning in terms of whether students know the right answer rather than focus on their conceptual understandings (Hogan 2014).

Although there is value in a centralised, teacher-centred approach, the Singapore Education System acknowledges the limited responsiveness and innovation that a centralised approach can afford. There is a need to give increased autonomy to schools to make decisions, adaptations, and develop their own pedagogical approaches as long as they are aligned with policy directives. Attempts are made to shift towards student-centred learning and focus on students' holistic development. This centralised–decentralisation stance has become Singapore's way of allowing decentralisation, which remains evident in the later developmental stages described. The centralised–decentralisation stance means that decision-making is made at the school level because principals and teachers know their students best. At the same time, there is increased accountability because the system needs to maintain centralised coherence and alignment to policy directives (Chua 2014; Ng 2010, 2013).

2.2 Now: the ability and student-centred, values-driven phases

From 1997–2011, Singapore went into the *ability* phase. Teachers and schools were given greater flexibility and autonomy to develop students' potential, interests, and life-long learning skills. The goal was to create a responsive education system with multiple pathways for different students (Mourshed et al. 2010; Goh and Gopinathan 2008). The system continued to maintain students' academic achievements. In 2010, about 62 % of the Secondary 4 students were in the 4-year Express Stream leading to GCE-O-level examinations, another 25 % were in the 4-year Normal Academic Stream leading to GCE-N level examinations (about 70 % would sit for the GCE-O level examinations in the 5th year), and the remaining 13 % were in the 4-year Normal Technical (NT) Stream. The NT curriculum was designed to prepare students for vocational and technical training in Institutes of Technical Education,

which most of the NT students would articulate to (Department of Statistics, Singapore 1983, 2010; Ministry of Education, Singapore 2003, 2010).

In the ability phase, the Singapore Education System evolved into one where students could cross over from one stream to another with multiple bridges and ladders to move from one trajectory to another. From a historical view, the Singapore Education System invested heavily to inject multiple pathways for different students and offered numerous opportunities to pursue excellence. There was also considerable focus on the "quality" and not the "quantity" of learning and exam preparation. Technology was integrated into classrooms to enable twenty first century, inquiry-oriented learning. Further details can be found in the literature such as Gopinathan (1985), Yip and Sim (1990) and Lee et al. (2008).

In 2011, MOE (Singapore), announced a new phase—*a student-centred, values-driven education* —where students' development focused on ethics, character development, and dispositions, such as adaptability and resilience (Heng 2011). The announcement was generally a welcome call because the public perceived the education system to be overly examination driven. This was not to imply that academic abilities had been de-emphasised, but that the MOE (Singapore) was signalling a shift towards twenty first century needs.

2.2.1 Consequences and trade-offs from the ability and student-centred, values-driven phases

Ng (2010; 2013) characterises Singapore as a centralised–decentralised education system. MOE (Singapore) maintains high quality education by centralising controls on strategic directions, curriculum content, resources, and facilities. Concurrently, MOE (Singapore) promotes decentralising tactical matters by empowering schools to accommodate diversity, be flexible, and innovative in curricular matters. As mentioned earlier, despite its relatively centralised stance, Singapore is a successful education system that consistently achieves high student performances in national and international benchmark assessments.

The Singapore Education System's historical and cultural context shapes teaching and learning practices. The instructional regime in Singapore is generally driven by grades and examinations (Hogan 2014). The system maintains that there are merits in examinations and competition. Grades provide clear standards so that teachers adapt teaching strategies and ensure students gain subject mastery. It provides a standardised way of measuring progress to the next level of education and accountability across all levels. Some amount of competition is also useful because it prepares students for the reality of working life. Yet the system recognises the need to evolve and ensure students remain relevant for the twenty first century (Heng 2013).

There are major government commitments to education research to inform policymaking, teaching, and learning practices as the Singapore Education System shifts towards student-centred, inquiry-oriented learning. In the next section, we describe three shifts that the system is currently on course to evolve and be relevant for the twenty first century.

3 Three impending shifts in the Singapore education system

Moving forward, a competitive education system considers global trends in student-centred, inquiry-oriented learning while aligning with its local context (Lee et al. 2013). This ecological perspective is supported by proponents, such as Bronfenbrenner (1979), Hogan (2014), Reigeluth and Karnopp (2013), and Toh et al. (2014). These scholars advocate alignments

across all levels in a system's change-reform journey. The levels considered are the history and society, cross systems, whole system, school, and classroom levels.

East-Asian values are implicit in Singapore's local context. A good education is an innate desire for families. Asian students tend to have tuition because parents fear their children cannot excel in examinations (Bray 2006; Bray and Kwok 2003). Asian students' behaviours and attitudes of learning are also different (Mok 2006; Mok et al. 2008). These East-Asian values cannot be underestimated because it shapes the shifts Singapore initiates to becoming a twenty first century education system.

Based on insights of high-performing systems, Singapore's trajectory, and education research (Lee et al. 2013), we postulate three shifts that may transform Singapore towards student-centred pedagogies. We attempt to tease out, in the subsequent paragraphs, tenets for each shift at various levels of the education ecology.

3.1 Hybridising pedagogies

It is important to acknowledge *at the cross systems level* that Singapore's achievements are unique because of its multi-cultural, multilingual composition. Singapore is similar to top performing East-Asian systems, such as Korea, Hong Kong, Japan, Shanghai, and Taiwan where dominant philosophies embedded *in the history and society level* stress academic achievements as the key criteria for university admissions (Zeng 1996). These systems typically default to mechanisms such as private tuition and other forms of content driven instruction so students do well academically (Bray 2006; Dawson 2010). While centralised structures can be argued to better regulate 'market driven' forces because parents and their children may not always be the best judge of education goals, an over instantiation of such practices may cause twenty first century literacies to be undermined.

East-Asian pedagogies also differ philosophically from Western ones in that discipline and diligence, including that of rote learning, seems reasonable. While large class sizes seem undesirable to Western education, deeper analysis and observations show that Asian teachers value students' thinking, participation, and creativity but their definitions of student-centred experiences differ from the West (Mok 2006).

Set against this backdrop, the envisaged pedagogy and curriculum for Singapore's classrooms is probably a hybridisation of Western and Asian pedagogies. As Singapore advances, we envisage a more balanced approach *at the system and school levels* recognising that parts of the curriculum can remain teacher-centric while others move towards student-centred designs.

Even though most East-Asian systems have become decentralised, the Singapore Education System maintains aspects of centralisation. This centralised trait recognises that not all topics need to be taught in an inquiry fashion. Teacher-centred approaches are relevant in some parts of the curriculum. Such a perspective is attuned to an East-Asian society and the centralised–decentralisation stance that Singapore adopts. The drill-and-practice pedagogies disliked typically by Western and constructivist perspectives have a role in this education system. The issue becomes one of when to employ such methods and the extent of its use (Hogan 2014).

MOE (Singapore) has initiated numerous policies, *at the system level*, to transform classroom practices. Generic observations suggest that it is not easy to translate student-centred policies into practices (Silver 2011). Complementary policies are needed to develop teachers' capacities and an action-learning process to enact more student-centred and hybrid pedagogies. Teachers need to be given opportunities to participate in dialogues, embodied

Table 1 Tenets for hybridising pedagogies

Tenets for hybridising pedagogies
Centralised, teacher-centred pedagogies are needed to regulate educational goals and 'market forces', such as private tuitions
Hybridise pedagogies where teacher-centred pedagogies are used to teach foundational/disciplinary knowledge and student-centred pedagogies are used for pedagogical interactions in classrooms
Develop teacher capacity through action learning, embodied experiences, and reflective dialogue
Create policies, structures, and processes to encourage hybrid pedagogies that enable student-centredness, deep learning, and pedagogical innovations

experiences of change in classroom practice, and build trust with school leadership to enable experimentations. These are key dimensions that need foregrounding.

A systemic approach is needed to develop teachers' capacity in ways that differ from traditional professional development towards actual enactments interspersed with reflective dialogue. This may heighten the quality of teachers with the professional knowledge to encourage student-led interactions which are key in transforming practices, sustaining pedagogical innovations, and enabling deep learning (Baeten et al. 2010; Owston 2007). There are also explicit recognitions amongst the teaching fraternity that while we want to be more student-centric in classrooms, there are also tried and tested disciplinary knowledge that can be learned by heart. This particularly applies to foundational knowledge, such as the multiplication table. A systematic process is underway to find the balance in curriculum, pedagogy, and develop a teacher's toolkit to use different strategies based on students' needs and learning goals (Fang and Lee 2010).

Table 1 summarises tenets that are ongoing to hybridise teacher-centred and student-centred pedagogies. These attempts can be perceived as Singapore's way of balancing centralisation–decentralisation dialectics. This is because teacher-centred and student-centred pedagogies may be viewed as centralised and decentralised ways of teaching, respectively. Singapore is maintaining its centralised–decentralisation stance by creating policies and processes that develop teacher capacity and encourage hybrid pedagogies. Teachers are given the autonomy to mix pedagogies according to students' needs and learning goals.

3.2 Levelling up the base of (lower achieving) students

A par excellent education system maximises all students to their highest potential. This may be difficult to achieve due to Singapore's limited resources. Emphasis is now placed on academically lower achieving students to capitalise on their strengths, talents, and draw linkages back to the academics. From a historical lens, there are practical reasons for why Singapore initiated a streaming model. The streaming model may have, consequently, led to insufficient attention on academically slower students or those who do not fit the various streams. MOE (Singapore) has recently organised efforts to address this gap (Ministry of Education, Singapore 2013b). It acknowledges the importance of levelling up lower achieving students and enables greater resource savings in the longer term.

Comparing with other systems *at the cross system level,* Singapore needs to improve the baseline literacy of the lowest percentile students (for example, Kaur 2010; Lee 2010). There are implicit assumptions in our practices. We seem to assume that traditional classroom practices and structures are suitable for all students. However, the saturated curriculum and pedagogies teachers use to prepare students for examinations may be daunting for aca-

demically slower achievers (Bottge 2001). Teachers seem to assume that inquiry-based and other process-oriented pedagogies work better for high ability students. Teachers need to know that academically lower achieving students have learning orientations that are biased towards action and performance. Often, inquiry-based, action-oriented, and out of class activities seem to work better for them (Wang et al. 2014).

Insights from researchers (for example, Kapur 2008; Bielaczyc 2006) suggest that changing learning contexts and approaches *at the classroom level* enable better learning experiences for lower achieving students. These changes include (1) different student-led interactions; (2) altering the learning, instructional, and disciplinary tasks to be more open-ended and authentic; (3) making the learning process more experiential and collaborative; and (4) equipping classrooms with more resources, such as technology. These changes enable classroom practices to change from procedural transmitting of knowledge to approaches that attune to students' learning styles and interests. Teachers facilitate learning by exploring with phenomena and presenting concepts in multiple representations. Learning becomes inquiry-based and learner-centric. Research studies in Singapore schools also suggest that when classroom practices are more interactive, previously disengaged students show significant improvements in their motivation and engagement (for example, "Breathing a Second Life into Geography Teaching", 2011; "Learning Physics by Inquiry", 2011; "Networking in the Classroom", 2011; "Productive Failure in Math," 2011; "When Kids' Ideas Come First," 2011).

Supporting structures are also essential to spread practices and develop teachers' skills for lower achieving students. One possibility is to reduce class sizes for lower achieving students at *the system level* and equipping them with more proficient teachers who can analyse their learning needs and styles. The structural affordances of high student to teacher ratio in efficiency-driven classrooms seem to limit the flexibility and kinds of pedagogies teachers enact (Crawford 2002). Research *at the school level* suggests that tailoring instruction to learners' needs and yet sustaining the performances of other students is a complex issue (for example, Lim et al. 2011). Teachers need to be empowered with the capacity and flexibility to adapt instruction according to learning needs and profiles (Hung et al. 2014).

In this manner, the Singapore Education System at *the whole system level* provides directives and structures to level up lower achieving students, such as reducing class sizes and developing teacher capacity. Schools and teachers are given autonomy to seed innovations, changes, and adapt pedagogies *at the classroom level* as long as they align themselves to the system's intended goals. While there is emphasis on inquiry-based and student-centred pedagogies, schools and teachers may need to hybridise pedagogies with teacher-centred approaches to deliver foundational knowledge and maintain academic performances. This, to a certain extent, illustrates how centralised–decentralisation may manifest as Singapore works towards levelling up lower achieving students while continuing with teacher-centred approaches to maintain academic performances. Table 2 summarises the key tenets relating to levelling up the base of (lower achieving) students.

3.3 Recognise diverse talents

Paper and pencil examinations serve a purpose at the system level to provide a standardised way of measuring students' mastery of knowledge and determining progress to the next level of education. There are increasing concerns that an over emphasis on examinations may be unfavourable for students who are less academically inclined or those who may take longer time to develop academic competencies. There are also concerns at the society level that an over emphasis on examinations may result in an attitude of superiority and lead to less desire

Table 2 Tenets for levelling up the base of (lower achieving) students

Tenets for levelling the base of (lower achieving) students
Encourage teachers to move towards inquiry, action-oriented, and out of class activities
Enable better learning experiences by changing learning contexts and approaches that attune to learners' interests
Reduce class size and equip lower achieving students with more proficient teachers so teachers have the flexibility to enact innovative pedagogies
Empower teachers with flexibility and capacity to adapt pedagogies for different learning orientations and profiles

for life-long learning. A par excellence education system should try to nurture diverse talents and habits of reading, writing, criticality, and good citizenry throughout life (Tan 2006).

There are recent efforts by MOE (Singapore) to move beyond academic achievements and recognise other talents. MOE (Singapore) has created Specialised Schools for students' diverse talents such as the Arts school and also schools that address students with unique academic difficulties, such as Northlight and Crest Secondary School (Tan and Ponnusamy 2014; Teh 2014). For mainstream schools, there are increased efforts to develop teachers' expertise of providing expanded learning opportunities so students develop cognitive competences and experience more holistic forms of learning. Moving ahead, there may be a need to expand student assessments to other qualitative dimensions and alternate forms of recognition such as in the Arts, with structures to emplace talents through competitions and other alternative assessments.

In a way, the centralised–decentralisation stance is maintained because MOE (Singapore) controls the kinds of Specialised Schools introduced into the system. Specialised Schools may be seen as initiatives that promote decentralisation because these schools promote learning opportunities that go beyond cognitive competences to recognise diverse talents, develop holistic forms of learning and life-long learning skills. There are also potential opportunities for student-centred (decentralised) pedagogies used in Specialised Schools to be transferred and adopted in mainstream schools.

Efforts are on going to enable holistic development and life-long learning, but these initiatives have also faced dilemmas and concerns. One dilemma relates to the current Specialised Schools model because the entry criteria are still dependent on the Primary 6 national high stakes examinations, although a significant consideration would be talent based. Another area of concern is that lessons learned from Specialised Schools may not be easily transferrable to mainstream schools for which more students would benefit from the instructional strategies used. This is because the resources and structures afforded in Specialised Schools differ from mainstream schools. An overview of tenets for recognising diverse talents is shown in Table 3.

4 Discussion

It is useful to continuously question our education system's assumptions to ensure it remains relevant for the twenty first century. Our education system has evolved from streaming as a common way of measuring academic progression to multiple pathways and Specialised Schools for different students and talents. Singapore maintains its centralised–decentralised stance by balancing teacher-centred pedagogies with twenty first century learning approaches.

Table 3 Tenets for recognising diverse talents

Tenets for recognising diverse talents
Specialised schools cater for diverse talents and learning opportunities beyond cognitive competencies to more holistic forms of learning
Nurture diverse talents and life-long learning instead of over emphasising examinations
Go beyond quantitative and cognitive assessments toward alternate assessments that focus on qualitative, non-academic dimensions
Address dilemmas of using national high stakes exams as entry criteria and the transferability of instructional strategies used in specialised schools to benefit more students in mainstream schools

This enables Singapore to uphold academic achievements through teacher-centred (centralised) pedagogies and yet give schools and teachers the space to enact student-centred, inquiry-oriented (decentralised) pedagogies.

Proponents have also characterised the Singapore education context as a blend between centralisation and decentralisation (Tan and Ng 2007; Ng 2010, 2013). Balancing the centralisation–decentralisation dialectic requires careful monitoring and continuing dialogue between policy, pedagogy, and curriculum. Evolving the Singapore Education System needs to be considered not only at the school-district level but also the system at large. There needs to be alignments at all levels from how the society understands the purpose of education to the roles of policymakers, schools, teachers, parents, and students. Evolutions cannot be sustained unless the education needs of the system and society are met (Reigeluth and Karnopp 2013). For Singapore, it is important that societal mind-sets are in tandem with policy changes. This means seeing education as a life-long journey not a destination, allowing different students to learn according to their pace, interests and styles, and developing students with empathy and a shared sense of responsibility for the Singaporean community (Heng 2013).

Most systems, including that of Korea, Taiwan, Japan, Hong Kong,and Macau, have done away with national high stakes examinations. Hence, they are progressively more decentralised than Singapore (Lee et al. 2013). Singapore has bucked the trend, and remained centralised with increasing degrees of school autonomy in terms of resource management and experimentations in pedagogies (Ng 2010, 2013). Singapore has maintained that removing national high stakes examinations provides short-term relief and may cause education standards to drop in the long term. Examinations are useful for setting clear standards and accountability to ensure students are well prepared for the global workforce (Heng 2013).

There is scope in our education system to move beyond academics and create holistic curriculum that recognises other talents (including academics, the arts, sports, and music). However, an area of concern relates to whether parents and society would accept other measures of academic and non-academic competencies. Many studies have demonstrated that there are productive links between academic achievement, emotional well being, and social acceptance (Nisbett 2011). Instead of relying solely on past traditions of quantifiable education outcomes, Singapore may draw motivation from an alternative, holistic curriculum, and one that is not divided according to the traditional disciplines but focuses on care for one's self, for others, and for our environment and ideals (Noddings 1992). MOE's (Singapore) recent progression towards student-centric, values-driven education (Heng 2011) is probably an indication that it is intentional in this direction. However, its demands may be challenged by pragmatics and economic considerations beyond the ideals. These issues are currently nascent. It would require societal and cultural shifts for the general population to appreciate

the deeper purposes of education, and for momentum to take off as our education system journeys to a student-centred, values-driven paradigm.

Indeed, the pragmatic and efficiency-driven stance adopted in our system's earlier years has brought trade-offs, such as over emphasising academic achievements albeit limited passion for life-long learning and holistic development. Although Singapore has grown into a successful system, its unique cultural orientations and institutional arrangements seem to drive teacher-centred (centralised) pedagogies. Given the quality of leadership and willingness of policymakers, Singapore will continue its transformation on its own terms (Hogan 2014).

The previous section describes shifts that try to transform Singapore towards a student-centred, values-driven paradigm. These shifts try to maintain Singapore's centralised–decentralisation stance by balancing academic performances and twenty first century learning orientations. In the subsequent paragraphs, we build on understandings of high-performing systems, reflect on these shifts *at the whole system level*, and postulate that the centralised trade-offs from Singapore's historical development may require mitigating to further enable its transformation for the twenty first century. The mitigating approaches illustrate possible ways for Singapore to maintain its centralised–decentralisation stance by providing guidelines and flexibility for schools to balance teacher-centred pedagogies with twenty first century learning orientations

4.1 Opportunities for innovations and lateral collaborations between schools

In Singapore, the decision to preserve teacher-centred pedagogies is an intentional mandate. Although other high-performing systems emphasise accountability built on trust and professionalism (Sahlberg 2007, 2012), in view of Singapore's limited resources, the system has continued to emphasise accountability based on hard evidences of learning goals and school performances in both the academics and twenty first century learning. The consequences of centralisation may be witnessed in the limited lateral collaborations between schools.

The literature suggests the importance of school leadership in reforming high-performing systems by providing instructional, change, and administrative leadership (Barber and Mourshed 2009; Hallinger 2005; Leithwood et al. 2008; Marks and Printy 2003; Mourshed et al. 2010). Less works document the role of system leaders and policy makers in making hard decisions such as those characterised by a centralised system. In Singapore, attempts are made where a gradual, phased approach is taken to enable some schools to be early adopters in particular innovations vis-à-vis others. These innovations try to balance teacher-centred approaches and twenty first century learning orientations with the intents of *hybridising pedagogies* and introducing student-centred, inquiry-oriented approaches.

With the removal of competitive school ranking criteria and the introduction of policies, such as "Every School a Good School" (Ministry of Education, Singapore 2013a), a new path may be set for more across school collaborations. Traditionally, schools account upwards to MOE (Singapore) and through the cluster system. Going forward, with the seeding of innovations in every school, *cross lateral fertilisations may enable lateral networks* to be productive and optimisation of resources may occur from the ground. Our on-going studies of school-based innovations suggest that such networks can be further improved (Toh et al. 2014).

In attempts to create more opportunities for innovations, Singapore schools are gradually building links and partnerships between schools and communities so teachers and students may learn authentically beyond the formal classroom (Hung et al. 2012). On-going investigations explore how links enable the integration of main curricular with co-curricular or informal activities to support inquiry-based learning and collaborations. Links between schools and

communities and bridges between main curricular and co-curricular may be possible levers to cultivate innovative practices. This is aligned with *shifts to hybridise pedagogy and balance teacher-centred pedagogies with twenty first century, inquiry-oriented approaches.* These partnerships enable resource pooling to create opportunities for innovations and relive centralised resources in lieu of decentralised networks for aggregating expertise.

4.2 Nurturing every child

High-performing systems ensure that every student receives quality education regardless of their abilities and the standard of every student is raised (McKinsey and Company 2007). The goal is to reduce gaps between high and low achieving students (Aho et al. 2006; Valijarvi 2003). Overemphasising quantifiable learning outcomes in Singapore means that students who have not mastered exam practices are typically considered lower performing or lower achievers. The Singapore Education System attempts to bridge this gap in mainstream schools and creates Specialised Schools for students who excel in other talents, with academics still emphasised. This is in line with *shifts to level up lower achieving students and recognise diverse talents.*

Within the mainstream schools, curriculum adaptations catering to those who might learn with different styles and orientations are reconsidered (Teh 2014). In recent years, MOE has poured large amounts of funding to the Institute of Technical Education (ITE) to ensure that students who move to the vocational tracks, usually characterised by students who do not do well in the Primary 6 national high stakes examinations, have strong educational basis. Likewise, the profile of Polytechnics in Singapore has heightened to an extent that many students who excel in academics also opt to gain entry (Davie 2013).

There are advantages in our system's centralised–decentralisation stance. It is nimble and responsive to policy changes. Current PISA findings show that the 'long tail' is shortening (OECD 2012) probably because Singapore has quickly set policies, facilitated by centralised controls, to address the 'long tail' in performance distributions (although this tail is not relatively long by international standards).

4.3 Develop teacher capacity

It is well known by now that the performance of an education system cannot supersede its teachers (Darling-Hammond and Rothman 2011). Quality teachers ensure policies and pedagogies are enacted with the right intentions and outcomes (Barber and Mourshed 2009; McKinsey and Company 2007; Sahlberg 2007, 2012; Valijarvi 2003). In Singapore's case, teacher capacity building is needed to facilitate shifts related *to hybridising pedagogies, levelling lower achieving students, and recognising diverse talents*. Even though there is a process to heighten the quality of teachers, a deliberate policy may be needed for this transition to occur. The Singapore Education System has developed policies to enable professional learning communities (PLCs) to take root in schools, and a centralised pool of master teachers to reach out to subject-discipline teachers across the nation. PLCs are key platforms for building teachers' capacities by sharing practices, solving issues, and reflecting experiences with peers (Dimmock 2010). Research data suggests that teachers in PLCs are engaged in deep reflective dialogue about their practice and professionalism (Lee and Lee 2013).

Trade-offs are inevitable depending on how resources are prioritised and allocated to achieve different goals. There are assumptions and trade-offs underlying the Singapore Education System. Singapore is widely recognised as a well-designed and efficient system due to good planning and centralised policies. In Singapore, schools emphasise learning in for-

Table 4 Trade-offs in the Singapore Education System and mitigating approaches for the future

Trade-offs	Mitigating approaches	Shifts
Centralised mandates to preserve teacher-centred pedagogies and emphasise accountability based on hard evidences of learning goals and school performances	Seed innovations and establish across school lateral collaborations	Hybridise pedagogies by mixing teacher-centred pedagogies with student-centred, inquiry-based approaches
Centralised stance to school accountability led to competition and limited across school collaborations	Gradual, phased approach to enable some schools to be early adopters in education innovations	
	Links between schools and communities coupled with bridges between main curricular and co-curricular activities may be possible levers to cultivate innovative practices	
Over emphasising quantifiable learning outcomes means that students who have not mastered exam practices are typically considered lower performing or lower achievers	Create specialised schools to attend to students with diverse talents	Leveling up the base of lower achieving students
	Curriculum adaptations in mainstream schools cater to different learning styles and orientations	Going beyond academic performances and recognising diverse talents
	Create ITE and Polytechnics to recognise diverse talents and enable multiple pathways	
Singapore's limited resources mean that there is a need to look at effective and efficient ways of developing quality teachers	Centralised pool of master teachers to reach out to subject-discipline teachers in schools	Teacher capacity building is needed to enable these shifts:
	PLCs as platforms for teachers to build capacities by sharing practices, solving issues, and reflecting experiences with peers	Hybridise pedagogies
		Level up lower achieving students
		Recognise and develop diverse talents

mal contexts because outcomes are quantifiable (Mourshed et al. 2010; Goh and Gopinathan 2008). Table 4 summarises the above discussion by mapping trade-offs from Singapore's trajectory to the mitigating approaches and shifts that may facilitate Singapore's journey to the student-centred, values-driven paradigm.

5 Conclusion

Singapore today no longer faces the same resource constraints, which limited its policy options in the 1970s and 1980s. The twenty first century demands that students are well prepared for uncertainties in a globalised economy. For Singapore, it believes that hybridis-

ing pedagogy, levelling up lower achieving students, and recognising diverse talents is the way to go. Singapore aims to give very student the best opportunities, learning pedagogies, and contexts that are tailored to their needs. It is hoped that with continuous investment in education research and a gradual evolutionary stance, Singapore can progressively build structures, processes, and involve stakeholders to become a par excellence education system. Singapore's students should not just excel in international benchmark examinations. They should also be well grounded and prepared for future challenges.

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