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PISA AND HIGH PERFORMING EDUCATION SYSTEMS

Reflections on Preliminary Findings in the
Context of Asian Knowledge Building

Zongyi Deng

*National Institute of Education
Nanyang Technological University
Zongyi.deng@nie.edu.sg*

Gopinathan Saravanan

*Lee Kuan Yew School of Public Policy
National University of Singapore*



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Abstract

Singapore's remarkable performance in PISA has placed it among the world's high performing education systems (HPES). In the literature on HPES its 'secret formula' for education success is explained in terms of teacher quality, school leadership, system characteristics, and educational reform. This article offers an alternative explanation for the education success of Singapore, and in so doing, questions the basic assertions of the HPES literature and, in particular, the use of PISA results as the prime indicator of the educational performance of a school system. It begins with providing a historical perspective on the development of the Singapore education system and then discusses a body of empirical findings on the nature of pedagogical practice in classrooms, both of which are vital for understanding the educational performance of the Singapore's education system. The article concludes by addressing the implications of this analysis for educational policy borrowing and a proper use of PISA results.

Keywords: PISA; pedagogy; educational reform; educational purposes; Singapore; High-performing education system; Asian Education

Introduction

As 'the most successful enterprise in comparative education' (Hopmann & Brinek 2007: 9), the Programme for International Student Assessment (PISA) is having a tremendous impact on educational policy and systems around the world. Created by the Organisation for Economic Co-operation and Development (OECD), this initiative has now surpassed in influence earlier efforts such as the Trends in International Mathematics and Science Study (TIMSS) and the Progress in International Reading Literacy Study (PIRLS) by the International Association for the Evaluation of Educational Achievement (IEA). By measuring and ranking students and education systems in diverse cultures and countries, PISA has, by now, established a new mode of 'global education governance' through which international organizations like the OECD exercise a powerful influence over educational debate and policy making across the globe (Kamens 2013; H.-D. Meyer and Benavot 2013), even in countries which are nowhere near in terms of socio-economic development achieved by OECD countries. It is thus not too farfetched to claim that this exercise is a new form of academic colonialism. By identifying which education systems are best performing ones, PISA creates new "reference societies' according to which politicians and educational policy-makers are pressurised to borrow 'best' educational policies and practices to boost the educational achievement level of their countries (Kamens 2013; Sellar and Lingard 2013). By defining the 'crucial' knowledge and skills needed for the 21st century and implying what educational policies will be rewarded, it exerts a considerable influence in shaping curricular emphases, programmes, and pedagogical practices in various nations (Kamens 2014; Hopmann 2008). Beyond that, OECD is now evaluating the skills profile of workers, ranking them and seeking to influence policy beyond schooling.

This paper deals with the second kind of influence exerted by the emergence of so-called high-performing education systems (HPES)—a term used to describe

education systems that excelled in the PISA's league table in the most recent years (Lee et al. 2014). Also called 'strong performers', 'successful performers', 'top-performing systems' or 'best performing systems', HPES include Canada (Ontario), China (Hong Kong and Shanghai), Finland, Singapore, and South Korea, among others. Largely based on PISA results in 2006, 2009 and 2012, such systems are identified as 'educational stars' and models for other countries who want to improve their educational performance. There is an emerging body of literature on HPES that explains the 'secret' of PISA top-rankings in high-performing education systems and offers recommendations for improvement in other education systems.

Singapore is widely recognized as one of the high performing education systems and has become the object of envy and emulation in many countries (see Barber & Mourshed 2007; Darling-Hammond 2010; Schwab and Porter 2007). Its early success in TIMSS and PIRLS has been replicated with PISA. At the 'top of the class' on many of the international comparative measures on academic achievement, Singaporean students have surpassed many of their counterparts in traditional educational centres in North America and Europe and even Japan which was the first Asian country to modernise its education system (Luke et al. 2005; Hogan 2014a). Its extraordinary record of performance includes: first in problem solving, second in mathematics, and third in science and reading (PISA 2012); second in mathematics, fourth in science and fifth in reading (PISA 2009); first in science (both primary 4 and secondary 2 levels) and second in mathematics (primary 4 level), and third in mathematics (secondary 2 level) (TIMSS 2007); and fourth among 45 education systems (PIRLS 2006). All this has created widespread and growing international interest in Singapore's education system.

The purpose of this article is to offer an alternative explanation for the education success of Singapore, and in so doing, question the basic assertions of the HPES literature. Following a review of the HPES literature, the article provides a brief historical account of the development of the education system and then a body of empirical findings on the nature of pedagogical practice in classrooms, both of which are vital for understanding the educational performance of the Singapore system. This is followed by a critical discussion of the basic assertions of the HPES literature and, in particular, the use of PISA results as the prime indicator of the *quality* of educational performance in a school system.¹ The article concludes by addressing the implications of this analysis for educational policy borrowing.

Our attempt can be seen as being in the tradition of scholars like Hannu Simola (2005) and Anthony Welch (2011) who provide alternative explanations for PISA success as a way of debunking the 'myths' surrounding a high-performing system, and in so doing, caution against 'uninformed' policy borrowing. This is of particular significance within the current global context given the fact that in the **wake of PISA** politicians and policymakers in many Western countries are 'looking East' for educational ideas and policies that can be borrowed to boost the educational performance of their systems (Sellar and Lingard 2013). Through the case of

¹ Note that PISA has become 'the world's premier yardstick for evaluating the quality, equity and efficiency of school systems' (OECD 2012: 2). In this article we focus primarily on issues concerning the evaluating the quality of an education system.

Singapore, we demonstrate that an understanding of the history and institutional context of an Eastern system is essential to appreciating the extent to which politicians and policymakers can learn from that system, and indeed transfer/implement those ideas and policies in their own contexts. Furthermore, we assert that an over preoccupation with PISA and ranking leads to missing out on the nature and purposes of education broadly construed.

PISA and High-Performing Education Systems

There is an emerging body of literature on HPES comprised of reports by international organizations, consultancies and think tanks (e.g. Barber and Mourshed 2007, 2009; Barber, Chijioke, and Mourshed 2011; Jensen 2012; OECD 2010, 2012; Schleicher 2012; Steiner 2010; Tucker 2011), books or book chapters by educational scholars (e.g. Darling-Hammond 2010; Darling-Hammond and Rothman 2011; Lee et al 2014; Marsh and Lee 2014; Sahlberg 2011; Stewart 2012; C. Tan 2012; L. C. Tan and Darling-Hammond 2011; Tucker 2011), and academic articles (e.g. Harris et al 2014; Darling-Hammond 2013; Stewart 2012, 2013; C. Tan 2011). This body of literature explains the PISA top rankings of high-performing systems in terms of contributing factors—which, broadly defined, include *teacher quality*, *school leadership*, *system characteristics*, *educational reform*—and identifies the enabling 'conditions' concerning these factors in the systems.

Teacher quality

In the literature the performance of students in PISA is invariably attributed to the quality of teachers (often conflated with the quality of teaching), which is ensured and enhanced by high standards of teacher recruitment, effective programmes of teacher preparation, and opportunities for professional development in high-performing systems (Barber and Mourshed 2007; Darling-Hammond and Rothman 2011; Jensen 2012; OECD 2010, 2012; Tucker 2011). Teacher quality is ensured at the point of entry through highly selective teacher recruitment (Barber and Mourshed 2007; Darling-Hammond and Rothman 2011; OECD 2010, 2012). Teachers are recruited from the first third of each graduating cohort of their school systems (Barber and Mourshed 2007): the top 10 percent in Finland (Sahlberg 2011), the top 30 percent in Singapore (L. C. Tan and Darling-Hammond 2011) and in Hong Kong (Marsh and Lee 2014).

Teacher quality is then said to be enhanced through effective initial teacher education and continuing professional development. Upon selection, teacher candidates undergo rigorous teacher preparation programmes (Barber and Mourshed, 2007; Darling-Hammond and Rothman, 2011; OECD 2010, 2012; Jensen, 2012). Furthermore, high-performing systems are committed to continuing to enhance the quality of in-service teachers through providing them with a myriad of opportunities and resources for continuous professional development (Barber and Mourshed, 2007; Darling-Hammond and Rothman, 2011). Professional development seems to come in many forms, such as professional learning communities (see Darling-Hammond & Rothman, 2011), post-graduate studies in Finland and Singapore (see Sahlberg 2011; L. C. Tan and Darling-Hammond 2011), teacher

mentoring in Shanghai (Jenson 2012; C. Tan 2012), and lesson study in Singapore (see Lee and Lim-Ratnam 2014). Teachers are said to be 'knowledge workers' working in learning organizations, thus deserving to be treated as professionals (see OECD 2010, 2012).

School leadership

Another contributing factor to a system's high rankings in PISA is high quality school leadership developed through leadership experiences and professional development programmes (see Barber and Mourshed 2007; Darling-Hammond and Rothman 2011; Harris et al 2014; Jensen 2012; OECD 2010, 2012; Schleicher 2012; Stewart 2013; Tucker 2011). Darling-Hammond and Rothman (2011) observed that high performing countries like Finland, Canada (Ontario), and Singapore invest significantly in leadership development, in the belief that high quality school leaders can strengthen the quality of classroom teaching. All these countries have mechanisms (e.g. observations, appraisals and interviews) in place for identifying and selecting potential leaders, and strong and often innovative professional development programmes for developing the leadership capacity of potential leaders (Barber and Mourshed 2007; L. C. Tan and Darling-Hammond 2011; Jensen 2012; Sahlberg 2011). School leaders are expected to be instructional leaders, practicing distributed leadership and being able to provide teachers with guidance and support in curriculum and instruction (Darling-Hammond & Rothman 2011; also see Pervin and Campbell 2011; Stewart 2013). They are believed to be vital to school transformation, and thus expected to have leadership capacity for school improvement (Jensen 2012; Harris et al 2014).

System characteristics

Such as academic expectations, standards, accountability measures, etc.—are also considered important contributing factors. High-performing jurisdictions set high academic expectations and standards for students and monitor their performance against those expectations and standards (Barber and Mourshed 2007; OECD 2010, 2012; Tucker 2011). They employ accountability mechanisms such as school reviews, teacher evaluation and appraisal to sustain and improve teaching excellence (Marsh and Lee 2014; Steiner 2010; L. C. Tan and Darling-Hammond 2011). In addition, high-achieving systems are committed to ensuring a high degree of coherence across curriculum, instruction, assessment, and teacher preparation (OECD 2010, 2012; Tucker 2011). These systems are high equity systems as well; they believe that all students can learn and are committed to getting all students to the expectations and standards (Barber and Mourshed 2007; Jensen 2012; OECD 2010, 2012; Tucker 2011). However, it is important to note that not all high performing systems are high in equality to the same extent. In Singapore there is a 'long tail' in performance distribution; socioeconomic status (SES) seems to have a significant impact on the academic achievement of students (Kennedy 2013; Teh 2014).

Educational reform

Finally, educational reform is widely held up as an important contributing factor (Jensen 2012; Lee, Lee and Low 2014; Marsh and Lee 2014; OECD 2010, 2012; C. Tan 2011, 2012; Tucker 2011). A system's high performance in PISA is attributed to educational policies and reform initiatives that are centred on student learning (Marsh and Lee 2014), aim at 'unleashing' the power of ICT for learning (Barber and Mourshed 2009), and promote a 'thinking pedagogy' for 'deep learning' (Darling-Hammond 2013). The PISA results in Shanghai and Singapore, C. Tan (2011:164) asserts, has to do with 'governmental investment and intervention in education as evident in recent education reform' directed toward the promotion of higher order thinking, creativity, independent learning, and passion for learning.

Overall, in the HPES literature PISA results are taken as the prime indicator of the educational performance of an education system. This is despite the fact that the rationale, methodology and use of PISA have been increasingly questioned in the international literature (e.g. Dohn 2007; Hopmann 2008; Hopmann, Brinek, and Retzl 2007; Sjøberg 2007). Most HPES writers, in particular those working for international organizations, consultancies and think tanks, take a system-wide, input-output perspective to explain the causes of success in PISA, with a focus on a set of input factors supposed to contribute to the output factor—students' high scores in PISA tests. This is fairly understandable since the primary purpose of HPES literature is for 'policy borrowing' across the boundaries of jurisdictions. For this to be effective, the complexity of a system has to be reduced to a set of factors or issues that are found in every system, each of which can be dealt with by specific educational policies. Significantly, one important (input) factor is missing from the discussion. Students spend most of their lives outside of school, and what they bring with them—such as cultural background, values, motivations, aspirations, resilience, learning strategies and so forth— affect their performances in PISA and TIMSS (see Feniger and Lefstein 2014; Ho 2014; Ma, Jong and Yuan 2013; Tsai and Özturgut 2013). In addition, lacking in the discussion are those factors beyond school—parental pressures, home tuition, private tuition, etc.—that play a part in PISA success, particularly in East Asian countries (see Kim, Lavonen, and Ogawa 2009; C. Tan 2012).

Apart from the contributing factors noted above, largely lacking in the HPES literature is a careful consideration of the social, cultural and institutional contexts of a high performing system which, many scholars have argued, is crucial for understanding the educational success of a country (see Aho, Pitkanen, and Sahlberg, 2006; Kamens 2014; Simola 2005; Simola and Rinne 2011).² In addition, while teachers in a system are held as the key to student performance in PISA, the literature has focused on the quality of teachers—in terms of background, experience, knowledge, and skills pertaining to teacher recruitment, preparation and professional development—rather than the quality of teaching—in terms of what

² In some HPES literatures (e.g., OECD 2010; Tucker 2011) the history and culture of a high performing education system are briefly described to provide a background for introducing the factors that presumably contribute the top ranking in PISA. Lacking is a careful examination of how the social, cultural and institutional context has shaped the educational policies and practices pertaining to the PISA performance of a system.

teachers do in classrooms (Hogan 2014b).³ Yet, of all the school factors that could affect student academic outcomes, it is teachers' pedagogical practice or what teachers do in classrooms with students that has the most effect on the quality and level of student academic learning (Hattie 2009; also see Darling-Hammond and Youngs 2002; Kennedy 2010).

From an institutionalist perspective, students' academic outcomes need to be accounted for with reference to the social, cultural and institutional contexts in which an education system is embedded and functions (see J. Meyer 1980). As the most influential factor in student academic achievement, pedagogical practice is embedded in such contexts which support, regulate, and constrain what teachers do in classrooms (Alexander 2000, 2004; J. Meyer 1980, 2008). In the following section we provide a brief historical perspective on the development of the Singapore's education system to bring to light some social, cultural, institutional factors which we suggest better account for students' academic achievement. This also furnishes the social, cultural and institutional contexts for understanding the nature of pedagogical practice in Singaporean classrooms. Our view is that while Singapore has almost all the contributing factors identified in the HPES literature, the factors uniquely combine and intertwine with specific aspects of its society, culture, and education system.

Singapore's education: A brief historical perspective

When the merger with Malaysia failed, Singapore found itself thrust into independence in 1965. A small island with no natural resources, the country suffered from acute underdevelopment and a high unemployment rate. The impoverished island state was also socially divided along racial and religious lines, with Chinese, Malays and Indians as the three main ethnic groups, and with diverse religions such as Buddhism, Taoism, Islam, Hinduism, and Christianity, among others. Inherited from the colonial government was a complex, segmented school system comprised of Chinese, Malay, and Tamil medium schools, and a few English medium schools, with varied curricula and media of instruction. Access to school was limited, especially at the post-elementary level, and student dropout rates were very high (Gopinathan 1974; Goh and Gopinathan 2008).

The government thus had to face four major challenges—political, economic, social and educational—in developing a post-colonial education system:

- To achieve an acceptable settlement on the medium of instruction;
- To provide school graduates with the knowledge and skills needed in an industrialising economy;
- To enhance social cohesion and citizenship values; and
- To develop an education system of high quality founded on merit-based opportunities (Gopinathan and Mardiana 2013: 17).

Four important educational policies were implemented in view of these challenges. First, there was a commitment to 'equality of treatment' for all four official languages—a formula with English as the medium of instruction, and with Malay,

³ Some writers such as C. Tan (2012) and Tucker (2011) did look at practice. However, information on practice was gathered primarily through published reports, websites, and interviews with various stakeholders (e.g., policy makers, ministry officials, university professors, and classroom teachers).

English, Mandarin, and Tamil as four official languages. This is a political-linguistic settlement that has stood the test of the time. On the one hand, there is a commitment to equality with respect to the three main ethnic groups. On the other hand, there is a recognition of the necessity and value of English as an international language, mastery of which would provide social and individual advantages, and it has undoubtedly helped Singapore socio-economic modernization (Gopinathan and Mardiana 2013).

Second, the government mandated and implemented a uniform and common curriculum to replace the Chinese-based, Malay-based, and English-based curricula in the old system. This was a modern curriculum centred on the study of mathematics, science and languages, with technical subjects as a supplement. Such a curriculum was regarded as essential in producing a labour force required for the industrialization Singapore was undergoing (Gopinathan and Mardiana 2013). Third, the government introduced civics and citizenship education to help students understand the purpose and importance of nation building, cultivate their civic responsibilities, and teach them to appreciate the desirable elements of both Eastern and Western traditions (Baildon and Sim 2010; J. Tan 2010).

Fourth, the government made a firm commitment to meritocracy. Throughout the 1960s and 1970s, rewards for effort and performance were well evident. Academic grades were held as primary measures of the students' ability and effort, irrespective of their social and economic backgrounds.⁴ Prestigious scholarships went to high achievers. Possessing good academic credentials was seen as the most important factor for their career prospects and their future social and economic status. Also rapid economic growth which rewarded credentials and substantial social mobility reinforced meritocracy and helped create a high aspirational society (Kong and Yeoh 2003).

All these policies had a lasting impact on the system thereafter. As universal free primary education was achieved in the late 1970s, the government had succeeded in the first step in the first phase of transforming and modernising the education system.

However, such a radical attempt to transform and modernize the system was fraught with difficulties and problems. After the implementation of the bilingual policy and the common curriculum for about 20 years, evidence surfaced of high attrition, semi-literate school graduates, and the bilingual policy falling short of its aims. According to the diagnosis in the Report on the Ministry of Education (Goh's report), ability differentials, not unreasonable curriculum standards and expectations, were the cause of the problems (Goh 1979). As a result, the New Education System (NES) was implemented in 1980, with the creation of a two-tier curriculum and a three-track system at the primary school level. It tracked primary school students into three streams, *Normal Bilingual*, *Extended Bilingual*, and *Monolingual*, based on the results

⁴ In fact, belief in meritocracy rather than a system based on race, connections or wealth was one reason Singapore left Malaysia.

of the end of Primary 3 examination.⁵ Three similar streams, *Special*, *Express*, and *Normal*, were also established at the secondary school level.⁶

As a result, the structure of a Singapore model of bilingual education based on English-knowing bilingualism and differentiated tracks were put in place; these policies have had an enduring impact on the education system.

Furthermore, curriculum standardization was achieved through the establishment of the Curriculum Development Institute of Singapore (CDIS) in 1980 which was responsible for developing syllabi, instructional guides, and textbooks for all schools in Singapore. The Institute for Technological Education (ITE), preceded by the Vocational and Industrial Training Board (VITB), was established in 1992 as a post-secondary education institution to provide technical vocational training for school graduates who had successfully completed ten years of education. Several polytechnics were established, tasked with the mission of training middle-level professionals to support the economic development of Singapore. A national education system eventually took shape, supplanting the segmented system inherited from the colonial period (Gopinathan and Mardiana 2013; Lee et al 2008).

In short, Singapore's present education system is the product of a distinctive set of historical, social, and institutional circumstances, and of strategic central planning and implementation of educational policies by the government in response to unique political, economic, and social challenges. Education has been vital to the transformation of a multi-ethnic, divided, and impoverished island to a modern industrial nation with political stability and economic prosperity over one generation. Education has functioned as a means for social cohesion, a platform for nation building, and a vehicle for economic development (Gopinathan & Mardiana 2013).

The brief historical perspective also brings to light two basic features of the education system that help explain Singapore's high rankings in PISA. First, the national curriculum stresses the development of students' competences in mathematics, science, and languages—the three subjects tested in PISA. Second, a commitment to academic rigour and standards, underpinned by the principle of meritocracy and enforced by a system of national high-stakes examinations (PSLE, 'O' and 'A' levels), has lifted the floor under the quality of teaching and learning for all student groups throughout the school years. This is a system that ensures effort on the part of students and teachers and a system-wise emphasis on academic performance. As OECD's PISA director Andreas Schleicher (2011) observed during his visit to Singapore,

The academic standards set by Singapore's Primary School Leaving Examination and O- and A-levels are as high as anywhere in the world, and

⁵ In *Normal Bilingual* stream, students take English and one mother tongue, and take Primary School Leaving Examination (PSLE) at the end of Primary 6. In *Extended Bilingual* stream, students also take English and one mother tongue but sit for PSLE at the end of primary 8. In *Monolingual* stream, Students focus on learning English and basic numeracy; they are prepared for vocational training. (Gopinathan and Mardiana 2013; Y. P. Tan et al. 2008)

⁶In *Special* stream, students learn English and Chinese at the first language level, and take 'O' level exams at the end of secondary 4. In *Express* stream, students learn English at the 1st language level and mother tongue at the 2nd language level, and take 'O' level exams at the end of secondary 4. In *Normal* stream, students take a reduced curriculum and sit for GCE 'N' level exams at the end of secondary 4. (Gopinathan and Mardiana 2013; Y. P. Tan et al. 2008)

that is also what you see from their results in PISA. Students, teachers and principals all work very hard towards important gateways. Rigour, coherence and focus are the watchwords [our emphasis]. Serious attention to curriculum development has produced strong programmes in maths, science, technical education and languages and ensured that teachers are well-trained to teach them.

It is important to note that despite various reforms and reviews at both the primary and secondary school levels in the past three decades, the PSLE and the 'O' and 'A' levels remain purveyors of a nation-wide obsession with excelling in examinations. This is understandable for as Cheah (1998: 196) explained, 'examination results are seen as the way into the top streams and the top schools in the country, and to that end, parents, students, and teachers are all drawn into the competition'. Indeed, such is the pressure to excel that parents spent a billion Singapore dollars on enrichment and private tuition classes (see Chow 2012; Toh 2012). The high-stakes examination system, together with the national prescribed curriculum, also steers classroom practice toward a kind that is traditional and didactic in nature, directed toward the transmission of curriculum content and examination performance, with whole class teaching as the dominant teaching mode (see Chew et al 1997; Kaur and Yap 1997); thus well up to the beginning of the new century, a performative pedagogy centred on success in high stakes examinations prevailed, in spite of high quality teachers, educational reforms, etc.

Since the late 1980s the Ministry has attempted to alter the pervasive traditional and didactic practice through educational reform which also represents the government's educational response to the challenges of globalization. It began with a recognition that broader educational outcomes were necessary if school leavers were to be ready for a knowledge economy and an attempt to diversify educational provision and create flexibility through the establishment of multiple pathways such as state-funded independent schools and later various categories of specialist schools with specialized curricular missions in the 2000s (see Sharpe and Gopinathan 1996). The paradigmatic, landmark response came in 1997, signalled by then Prime Minister Goh's (1997) 'Thinking Schools, Learning Nation' (TSLN) speech—which addressed the conditions of nationhood and globalization and laid out a more student-centric, active learning paradigm, with the aim of producing autonomous and independent learners with capacity to think, innovate, and learn continuously. Under the TSLN's framework, a plethora of reform initiatives has been rolled out in schools and classrooms. Some of the major initiatives are:

- *The 'thinking school' concept (1997):* an initiative that aims at the development of critical and creative thinking through introducing thinking skills to the curriculum (see Deng 2001).
- *IT-Masterplan (1998-2002; 2003-2008; 2009-2004):* initiatives that seek to establish an ICT-infrastructure and increase tools and resources for the exploitation of the power of ICT for teaching and learning in classrooms, schools and beyond, with the intention to equip students with the competencies and dispositions to succeed in a knowledge economy (Deng and Gopinathan 2005)

- *National Education* (1998): an initiative that aims at developing national cohesion through sensitizing younger Singaporeans to the national needs, concerns and possibilities in an emergent global economy, and developing in them a sense of belonging and emotional rootedness to Singapore (see Sim 2013).
- *Content reduction* (1998): a curriculum policy that mandates a **content reduction** across all school subjects ranging from 10 – 30 % in order to create more curricular space for pedagogical innovations and the development of critical and creative thinking and other desirable attributes (see Deng and Gopinathan 1999).
- *Project work* (2000): an initiative that aims to provide students with an integrated learning experience that encourages students to break away from the compartmentalisation of the different school subjects and to explore the inter-relationships and inter-connectedness of subject-specific knowledge (see Ho et al. 2004).
- *Innovation and Enterprise* (2004): an initiative that aims at cultivating in students intellectual curiosity, innovative thinking, self-reliance, persistence, resilience, a team-work spirit, and social commitment (Ng 2008).
- *Teach Less Learn More* (TLLM) (2005): an initiative that envisions students as 'engaged learners' actively in the process of learning for life rather than for examination, and calls on teachers to rethink the 'why', 'what', and 'how' of education (see Teo et al. 2013).

This sample of initiatives represents the government's unrelenting push for pedagogical change, with the intention to move away from traditional practice—centred on the transmission of knowledge and examination performance—and to strive toward the TSLN vision of pedagogy characterized by: (1) more opportunities for constructing knowledge, problem solving, higher-order thinking, and innovation; (2) more meaningful use of ICT for teaching and learning—in terms of transforming classroom practice, expanding access to quality learning, and enhancing collaboration among teachers, students and communities; and (3) more time on interdisciplinary learning. If Singapore is indeed to be seen as a model for others, the test will be to see how well these reforms have worked.

The impact of reform initiatives on traditional pedagogical practice

What has been the impact of reform initiatives on conventional classroom practice? What is the present nature of pedagogy in Singapore's classrooms? These two questions have been systematically and empirically investigated by David Hogan and associates at Centre for Research in Pedagogy and Practice (CRPP) within the National Institute of Education (NIE)—a research centre that, established in 2003 and funded by the Ministry of Education, aims at providing a comprehensive empirical, interpretative, quantitative and qualitative picture of the Singapore school system (see Luke et al. 2005). Between 2004 and 2005 researchers conducted detailed classroom observations of 920 primary 5 and secondary 3 lessons in mathematics and English from a nationally representative sample of 56 schools. In 2010 they conducted similar detailed classroom observation of 625 primary 5 and secondary 3 lessons in mathematics and English from a nationally representative sample of 31 schools. In addition, they conducted a survey of a nationally

representative stratified sample of 62 primary and secondary schools in which 16895 students and 2100 teachers reported instructional practices in mathematics and English at the primary 5 and secondary 3 levels. By collecting massive classroom data at two time points, researchers were able to not only investigate the overall impact of TSLN's initiatives on traditional pedagogical practice, but also ascertain whether significant change has occurred in classroom practice over the past six years (2004-2010) after the implementation of certain initiatives like TLLM. The findings have been reported notably in Hogan (2009), Hogan et al. (2013), Hogan (2014a), and Hogan (2014b). Below we answer the two questions based on the findings of Hogan and associates as well as the findings generated by other researchers at NIE (e.g. Kaur 2011; Kramer-Dahl 2008; Lee 2008, 2013; Silver et al. 2013; Vaish 2008).

Notwithstanding multiple reform initiatives to encourage the TSLN's pedagogical vision, pedagogical practice in Singapore's classrooms has remained largely traditional, directed toward curriculum content delivery and examination performance. There is very little evidence of sustained teaching for high-order thinking, meaningful use of ICT, students' constructing knowledge, and interdisciplinary learning (Hogan 2009; Hogan et al. 2013; also see Deng, Gopinathan, and Lee 2013). This conclusion is consistent with the findings generated by NIE's researchers on classroom practice in science (Lee 2008, 2013) and language (e.g., Kramer-Dahl 2008; Silver et al. 2013). For example, the enactment of reform initiatives in language classrooms, according to Silver et al. (2013: 163-164), is 'somehow superficial', with 'little evidence of policy initiation or curriculum innovation'. Lessons 'were well-planned and well managed, but rarely encouraged passionate pursuit of knowledge, higher-order thinking or open-ended interaction'. We want to clarify that this does not mean that there are no curricular innovations in schools. Over the last ten years, as a result of the TSLN-TLLM reform, there has been a surge of curricular and pedagogical innovations—such as school-based curriculum development (SBCD) and school-based curriculum innovation (SCI)—carried out in a large number of schools (see Leong et al. 2010; Teo et al. 2013). However, in their actual implementation, the authority tends to devolve to the school level but not to individual teachers (cf. MOE 2008; O. S. Tan et al. 2007). As such, these innovations do not seem to have a significant impact on pedagogical practice in classrooms, except the emergence of what Hogan's terms a 'hybrid pedagogy' which we will be explained shortly. It also remains to be seen how sustainable these innovations will be.

The limited impact on pedagogical practice has to do with teachers' traditional beliefs about knowledge, teaching and learning, a holdover from an effective industrial model of schooling. In Singapore, teachers conventionally tend to view knowledge as a body of proven, ready-made facts or factual information contained in the national curriculum, expressed in textbooks upon which students are tested during examinations. Accordingly, they are inclined to view teaching in terms of passing on or imparting knowledge in the curriculum, and learning in terms of acquiring, memorizing, and practicing this knowledge (Deng and Gopinathan 1999; Hogan et al. 2013; also see Chai, Khine, and Teo 2006). Such beliefs shape

classroom practice toward the transmission, examination-oriented mode, despite reform initiatives calling for a new kind of pedagogical practice. Furthermore, these beliefs are strengthened by the existence of 'a very tight coupling between the high stakes summative assessment system and classroom instruction' (Hogan and Gopinathan 2007: 370). The assessment system, fundamentally unchanged, exercises a firm grip over classroom practice. Also, an implementation strategy that is sensitive to system wide and individual school needs and can support substantial and sustainable pedagogical transformation and improvement is largely lacking (Hogan 2014a). Most TSNL's recent initiatives like the establishment the Academy of Singapore Teachers (AST) and subject chapters like English Language Institute of Singapore (ELIS) have still to demonstrate a significant shift toward the TSNL's vision of pedagogy.

Furthermore, the empirical findings reveal a distinct kind of pedagogy in classrooms. Also dubbed as 'instructional regime' or 'pedagogical regime' (Hogan 2014a; Hogan et al. 2013), this pedagogy has three distinctive features:

- Classroom teaching is largely driven by content coverage and preparing students for semester-end and high stakes examinations, with the primary focus on the transmission of knowledge and skills contained in the national curriculum (represented by teaching and examination syllabi) (Hogan 2014a; Hogan et al. 2013; Silver et al. 2013; Vaish 2008).
- Accordingly, classroom teachers tend, to a large degree, to rely on whole class forms of lesson organisation, with whole class lectures and question-and-answer sequences (IRE) as the dominant methods. They also depend heavily on textbooks and instructional materials and provide students with a significant amount of worksheets and homework, with a special focus on their mastery of specific procedures and problem solving skills, particularly in mathematics and science (Hogan 2009; Hogan et al. 2013; also see Deng, Gopinathan and Lee 2013; Kaur 2011; Lee et al. 2000).
- When teachers do make limited use of constructivist pedagogical methods such as checking prior knowledge, monitoring understanding, and providing formative feedback, they largely do so for the purpose of getting students to know the correct answers rather than developing their conceptual understanding and higher-order thinking. Classroom talks, largely dominated by teachers and used mostly for checking content mastery, does not lead to extended conversation and critical thinking on the part of the students (Hogan et al. 2013; Hogan 2014; Vaish 2008; also see Jacobson et al. 2010).

What emerges from research on Singapore pedagogy thus is a 'hybrid pedagogy' (Hogan et al. 2013) with 'a strong focus on direct instruction and traditional pedagogical practices and a much weaker focus on constructivist learning principles' (Deng, Gopinathan and Lee 2013: 268). This pedagogy serves to explain in part Singaporean students' success in PISA and TIMSS despite differences in the focus of these two assessments (Deng, Gopinathan and Lee 2013). Based on

multivariate analysis of CRPP data, Hogan (2014b) concludes that performative pedagogical practices like traditional and direct instruction—directed toward content mastery and examination preparation—are especially predictive of student academic achievement. This purpose-fit pedagogy ‘is highly-effective, helping to generate outstanding results in international assessments’ such as PISA and TIMSS’ (Hogan 2014a).

Critics might contend that such a pedagogy would contribute to students' performance in content-based tests like TIMSS, PSLE, ‘O’ and ‘A’ levels, and yet would not have much to contribute to their performance in PISA tests which assess students' ability to apply content in real-world contexts—rather than their mastery and reproduction of content. However, the OECD's claim about PISA's measuring real-life competencies has been challenged by several researchers. Through an analysis of PISA's items, Sjøberg (2007) argues that PISA contains only paper-and-pencil items which are basically “decontextualized” and “non-controversial,” incapable of assessing the skills and competencies required for dealing with contextualized, uncertain, and contentious problems. Therefore, PISA does not live up to its promise of testing “real-life skills and competencies in authentic contexts” (203). Likewise, Dohn (2007) contends that while PISA tests for the application of knowledge to real world problems, this application is framed by the test taking situation, and exam-oriented pedagogical approaches can prepare students to perform well in these situations. In addition, Bulle (2011: 505) argues that what PISA tests actually measure are *academic potential* or ‘competencies related to solving academic types of problems which...are not predefined by academic knowledge’. Taking these arguments into account, it is not a surprise that Singapore pedagogy can produce high results in PISA tests.

From an institutionalist perspective, this pedagogy is a function of the institutional arrangement and socio-cultural milieu of schooling in Singapore. It is regulated and shaped by a largely centralized education system, with a national curriculum that prescribes what to teach and (to some extent) how to teach. It is powerfully driven by high stakes examinations which stream students into various school types and curriculum tracks based on their examination performances (Gopinathan and Mardiana 2013; Lee et al. 2008; also see Hogan et al. 2013). Significantly, examination performance is highly valued in Singapore's prestigious schools which are home to the academic elite. A long running gifted programme beginning in Primary 4 reinforces the value of academic ability and performance. The integrated programme (IP) allows high academic ability students to skip the ‘O’ levels. All this sends strong societal signals to which families and students respond (see Gopinathan and Mardiana 2013). As noted earlier, this pedagogy is also supported by an excessive reliance on private tuition centred on the mastery of specific content procedures in the curriculum and the improvement of examination performance (cf. Chow 2012; Toh 2012). Furthermore, this pedagogy, together with its institutional arrangement, is supported by a range of cultural and ideological orientations—such as exam-based meritocracy, economic efficiency, and social cohesion noted earlier—that ‘underwrites, sanctions and reproduces the instructional regime’ (Hogan 2014a). It is further underpinned by a highly instrumentalist view of

education (that views education merely in terms of social, economic, and vocational goods) shared among parents, students, teachers and policy makers, together with traditional beliefs and assumptions about knowledge, teaching and learning which include, knowledge as 'factual' and 'procedural', teaching as telling, and learning as listening, and assessment as summative (Hogan 2014a).

Discussion

As revealed in the discussion, Singapore's success in PISA has to do with a particular kind of pedagogy and the unique cultural and institutional arrangements that regulate, support and constrain this pedagogy. This, however, does not mean that other social and cultural factors do not have an impact on the achievement in PISA tests. Explaining the education success of an Asian country like Singapore is by no mean easy; there are many potential contributing factors—Confucian cultural orientation, students' motivation, resilience, time spent on homework, modes of learning, out-of-school tuition, among others—to the PISA success in an East Asian country (see Bulle 2011; Jerrim 2014; Tsia and Ozturgut 2013). The point we want to stress in this article is that the pedagogy, and its surrounding cultural and institutional contexts, are too important to be overlooked in explaining Singapore's top rankings in PISA.

The body of HPES literature, then, is far from adequate or satisfactory in explaining the success of high-performing countries. High standards in teacher recruitment, effective programmes of teacher preparation, opportunities for professional development, and school leadership are certainly important and contribute to the 'quality' of teachers, but they cannot determine what teachers do in classrooms. While system characteristics—such as high academic standards, expectations, accountability mechanisms, and so forth—could promote the academic performance of students, they are embedded in and work hand in hand with other cultural and institutional aspects of an education system—including the curriculum system, the examination system, the instructional system, conventional beliefs and expectations on schooling, among others. So, borrowing the standards of teacher recruitment, programmes of teacher preparation, approaches to professional development, and so forth from a high-performing system will not necessarily lead to the improvement of another country's performance in PISA tests, nor will emulating or imitating the system characteristics of a high-performing system. The unique cultural and institutional arrangements of a high-performing system place a powerful constraint on what can be borrowed from the system.

Also, questionable is the assertion that the PISA success of a high-performing country has to do with its government's implementation of educational reforms aimed at transforming classroom pedagogy into a more student centric, learning-focused, and ICT-enhanced kind (see Darling-Hammond 2013; Marsh and Lee 2014; Barber and Mourshed 2009; C. Tan 2011). At the policy and rhetorical level, Singapore fits well the description of a high performing system in the HPES literature—'unleashing' the power of ICT for learning (Barber and Mourshed 2009) and promoting a 'thinking pedagogy' for 'deep learning' (Darling-Hammond 2013). However, as already noted, at the classroom level, meaningful use of ICT, teaching for deep understanding, and

opportunities for critical and creative thinking are very limited and uncommon (Hogan 2009; Hogan et al. 2013; Vaish 2008). The finding on the inability of reform to alter classroom practice is, in fact, consistent with what is found in the international literature about implementing educational reforms aimed at changing classroom practice (e.g., Cohen and Ball 1990; Cuban 1984; Fullan 2008; Tyack and Cuban 1995). Cuban's (1984: 34) analogy for how most educational reforms affect teaching practice is that they are like storms on the ocean: 'The surface is agitated and turbulent, while the ocean floor is calm and serene (if a bit murky). Policy churns dramatically, creating the appearance of major changes ... while deep below the surface, life goes on largely uninterrupted'. Then, to link a high-performing system's top rankings in PISA to its pedagogical reform is to ignore the complexities of changing classroom practice. It entails the fallacy of equating reform discourse at the policy level with the reality of schools and classrooms.

This, however, is not to mean that sustainable and systemic educational reforms do not contribute to the education success of a high-performing country. As shown in the preceding discussion, educational achievement in Singapore has a lot to do with its effective educational reforms and policies (1950s-1980s) to build and sustain a high quality system as springing from the need to compensate for lack of natural resource by building superior human capital.⁷ Our point is that transforming classroom pedagogy would not be possible without sustainable and systemic reforms that tackle various aspects of the education system, including teachers' pedagogical beliefs and assumptions, the national curriculum, high-stakes examinations, and cultural and ideological orientations toward education, among others.

In the light of the nature of the kind of pedagogy and its underpinning cultural and institutional arrangements, Singapore's superior performance in PISA 'no longer appears to be a miracle'—borrowing the words of Simola (2005). Like teachers in Finland, teachers in Singapore still can teach in 'the traditional way' because of their traditional beliefs about the nature of knowledge, teaching and learning, and because of social, cultural and institutional milieus that reinforce and support such pedagogical beliefs and practice. However, whereas in Finland where teachers' traditional beliefs and practice 'are supported by social trust and their professional status' (Simola 2005: 465-466), in Singapore teachers' traditional pedagogical beliefs and practice are supported, regulated and constrained by a prescribed national curriculum, high-stakes examinations, and an exam-based meritocracy ideology. The Singapore's 'secret' of top-rankings, therefore, can be seen as the contingency of traditional pedagogical practice within the context of a centralized education system, with a standardized national curriculum and educational standards enforced by high-stakes examinations and supported by an exam-based meritocracy ideology. Singapore's high rankings in PISA can be accounted for in part in terms of the 'Asian education model' found in high-performing countries and cities such as South Korea, Japan, Hong Kong, and Taiwan. Like Singapore, all these countries and cities privilege

⁷ A similar point has been made about educational policies and reforms in Finland. 'Finland's remarkable performance today', Aho, Pitkanen and Sahlberg (2006: 1) argue, 'springs directly from education policies and reforms set in motion four decades ago'.

economic growth to strengthen state legitimacy, and therefore, education is central to state building (Gopinathan 1997; Morris and Sweeting 1995; Woo-Cummings 1999). They all have an extensive state control of education, with a national curriculum which places high emphasis on students' academic performance in science, mathematics and languages rather than general competencies (Baker and Stevenson 1991; Bulle 2011; Waldow, Takayama, Sung 2014). Furthermore, these countries and cities all have a meritocratic national examination system that is tied to the gradual selection of students for admission into high school and into college or university based upon their academic performance on high-stakes examinations; national examinations are employed to determine students' educational opportunities and (therefore) future career and life chances (Bulle 2011; Kamens 2014).

Such an Asian education model contributes to Asian students' high rankings in PISA in three respects. First, PISA happens to test skills and content in precisely the three curriculum areas—mathematics, science and reading—stressed in the centralized modern curriculum. Second, national high-stakes examination, by virtue of its considerable institutional authority, steers classroom practice toward the transmission of knowledge and examination performance which, as noted above, in part contributes to high PISA results. Third, since examinations are the primary determinant of educational and economic careers, teachers are more inclined to teach to examinations, and students are motivated to learn material that will be tested and take such examinations seriously (Kamens 2014; Sjøberg 2007; Zhao 2014).

Let us clarify that to characterize the Asian education model in terms of a state control of education, a standardized curriculum, and a meritocratic national examination system is not to endow the perception that schools in Asia encourage memorization and rote learning but stifle independent thinking and creativity—a prevailing stereotypical image of Asian education in Western literature (e.g. Chun 2003; Hanushek 2002; Lam 2008; Lim 2010; Stevenson 1991). There is a body of literature testifying that high quality teaching and learning (characterized by purposeful activities, high enthusiasm and enjoyment in both teachers and students, and a high level of challenge to student thinking) indeed exist in Asian classrooms (e.g. Chan and Rao 2010; Takayama 2011; Watkins and Biggs 2001). Asian school systems like Japan and Korean are capable of nurturing students' conceptual understanding, independent thinking and creativity (Park 2011).

Lastly, we want to point out that the use of PISA results as the chief yardstick for measuring the quality of the educational performance of a system is very problematic; it entails a narrowing of the purpose or function of education, thus reducing the educational significance of the system. The primary goal of education underpinning PISA is *economic*—developing skills and competencies for the economy in the 21st century. Indeed, it has led to what has been called the 'economisation of education policy' (Stellar and Lingard 2013). But, as indicated in the brief history of educational development in Singapore, apart from economic development, schools have served the goals of social cohesion, citizenship education, nation building—goals that are at least as important as the economic one. Likewise, according to Biesta (2009), in addition to the *qualification* function (the acquisition of knowledge, skills and attitudes required for jobs) which is the focus of PISA, education serves the

socialization function (the development of values and norms necessary for becoming members of existing social and cultural orders) and subjectification function (person-making, the becoming of an unique individual, the cultivation of autonomy, independent thinking, and creativity), both of which are largely ignored by PISA. In the words of David Labaree (2014), the use of PISA results as the prime indicator of the educational performance of an education system thus entails 'shrinking the aims of education'.

Concluding remarks

In this paper, we provide an alternative explanation of the education success of the Singapore system, and in so doing, question the basic assertions of the HPES literature. We argue that the social, cultural, and institutional contexts of schools in Singapore, and the kind of pedagogy regulated, supported and constrained in such contexts, are crucial in understanding why Singaporean students perform so well in PISA tests. This, we think, is true of other Asian education systems as well though detailed attention to context specifics would reveal differences as well as similarities. Therefore, it is questionable that one can pick and choose educational policies from a system without being concerned about the larger social, cultural and instructional contexts of which they are a part. In other words, policy borrowing requires an understanding of the social, cultural and institutional contexts of the borrowed system, and of the practice or inner-work of schooling informed by evidence and research. This is in line with Bob Lingard's (2010: 132) argument that effective policy borrowing must be accompanied by policy learning involving a 'careful consideration of national and local histories, cultures and so on' and taking 'account of research on the effects of the policy that will be borrowed in the source system'.

We need to clarify that our critical discussion on the use of PISA's results as the primary yardstick for the educational performance of an education system does not imply a complete repudiation of PISA. PISA at least 'is a very innovative comparative study on the uneven distribution of a particular kind of knowledge and abilities among young people in different countries' (Hopman and Brinek 2007: 13). However, there are many issues and problems concerning PISA, its rationale, methodology, uses and misuses, etc. (See Hopmann, Brinek, and Retzl 2007; H.-D. Meyer and Benavot 2013; Pereyra, Kotthoff, and Cohen 2011). In particular, our paper shows that the exclusive, one-dimensional focus of PISA on the economic function of schooling prohibits an accurate, realistic representation of what constitutes the educational performance or achievement of a school system. Therefore, one should not take PISA results for granted, but be aware of the issues and problems inherent in PISA as well as what PISA results can and cannot tell us about an education system.

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Biographic note

Zongyi Deng is an associate professor at National Institute of Education, Nanyang Technological University. His interest areas include curriculum making, curriculum content or subject matter, didactics (or *Didaktik*), educational policy and Chinese education. He has published in *The Sage Handbook of Curriculum and Instruction*, *Curriculum Inquiry*, *Journal of Curriculum Studies*, *Pedagogy, Culture & Society* and other journals.

S. Gopinathan is an adjunct professor at the Lee Kuan Yew School of Public Policy, National University of Singapore. He has written and lectured extensively on education reform, language in education issues and teacher education. His papers and edited volumes are key references for students of education in Singapore and comparative education internationally.

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