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Educational change in Singapore and its 'tinkering' around the edges: A critical realist perspective

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Abstract This article re-examines the contents of Singapore's Thinking Schools Learning Nation (TSLN) and Teach Less Learn More (TLLM) educational initiatives, introduced and implemented to promote change and to prepare Singaporeans for a twenty-first century knowledge-based economy. Adopting a critical realist perspective that enables investigations into complex social systems, the paper highlights the concepts, change process and possible outcomes of change proposed by realist social theory. An explanatory critique responding to the question, 'What social structural changes were implemented by the TSLN and TLLM initiatives, and why?' is developed, tracing the programmes of change in TSLN and TLLM. Findings reported in 2013, by a local large-scale research project, has made claims about the ineffectiveness of the initiatives in bringing about desired changes in classroom instructional practices. The critique questions—given Singapore's recent and consistent successful performances in international benchmarking tests—whether it is only in the classroom that educational change that matters, counts. It suggests that despite making strong statements about the limited effectiveness of the TSLN and TLLM initiatives, many programs introduced and adopted by primary, secondary and post-secondary institutions, especially under TLLM, were left unexamined by the research project. The explanatory critique theorises that two kinds of changes have taken place—the reorientation of pedagogical practices in post-secondary institutions and extensions of what already exists in the primary and secondary sections. The paper concludes by highlighting some implications the explanatory critique have for research into educational change in general, and for educational change in Singapore.

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The end of the last century marked significant movements made to restructure education systems to meet the evolving demands brought on by the twenty-first century. These demands include dealing with shifts to a more information-based society driven by networked access to information communication technology; the shift from a product-based to a more knowledge-based economy; and equipping individuals with abilities and sensibilities to cope with globalization and multiculturalism. By standards of international benchmarking tests like the Programme for International Student Assessment (PISA) (OECD 2016), Trends in International Mathematics and Science Study (TIMSS) (Martin et al. 2016; Mullis et al. 2016) and Progress in International Reading Literacy Study (PIRLS) (Mullis et al. 2012), Singapore's education system has been reported to be successful in making these shifts. The system has been consistent in producing students who have shown high levels of competencies in Reading, Mathematics and Science, and who have demonstrated some abilities in applying these competencies in daily life and professional contexts—abilities which these international benchmarking evaluations propose to measure (see OECD 2016, p. 194). It is not surprising therefore, that the attainments of the system have generated interest from places and researchers curious to understand what and which educational policies and pedagogical practices (Low and Lee 2012; Connelly 2013) might explain the generally successful outcomes produced.

The policies in brief

Where policies of change are concerned, the Thinking Schools Learning Nation or TSLN (Goh 1997) and the Teach Less Learn More or TLLM (Lee 2004) initiatives, in particular, have been highlighted, by many, as policies which rolled out programmes to prepare schools to meet the demands of globalization and the twenty-first century (Ng 2008; Hogan et al. 2013). Gopinathan and Mardiana (2013) have dated this significant point earlier to 1987, in the publication of Towards Excellence in Schools (Ministry of Education or MOE 1987)—a document that identified features of effective schools in America and the United Kingdom, proposing how they may be adapted and adopted in Singapore. In implementation, it led to de-centralisation and provision of greater autonomy to schools, preparing the ground for TSLN.

TSLN and TLLM which followed, comprised programmes which focused on transitioning Singapore's educational landscape from an efficiency-driven model, which aimed to minimize educational wastage, to an ability-driven one which would prepare Singaporeans for the demands of a knowledge-based economy through recognising different talents and equipping students with essential competencies (Teo 1999; Sharpe and Gopinathan 2002).

TSLN (Goh 1997) targeted five areas of development—upgrading institutional infrastructure to foster the use of ICT in education (Heng 2013) and to support the

Information Technology Masterplans (MOE 1997a) which to date, have gone through 4 phases (1997–2002, 2003–2008, 2009–2014, 2015 and beyond); a review of the existing curriculum and assessment systems, and the professionalization of teaching through initial and continual teacher training. Additionally, there was greater investment and involvement from the Ministry in supporting providers of pre-school and post-secondary education. Measures were also introduced to raise Singapore's profile as an education hub by attracting foreign talent and forging collaborative relationships with foreign institutes of higher learning (Teo 1999).

TLLM progressing from TSLN, which concentrated on making macro-level changes, added to system complexity by focusing on diversifying. In policy terms, TLLM aimed to 'positively encourage a diversity of talents—in intellectual fields, in the arts and sports, and in community endeavor' (Shanmugaratnam 2004, point 13). In enactment the stance remained consistent with that announced for TSLN, which worked to sustain the core of a system, while permitting customization to nurture individual students' aptitudes and abilities wherever possible (Teo in Budget-MOE 1999). In 2004, in his inaugural speech as Prime Minister Lee (2004) stated,

> I think we should cut down on some of this syllabus. It would mean less pressure on the kids, a bit less rote learning, more space for them to explore and discover their talents and also more space for the teachers to think, to reflect, to find ways to bring out the best in their students and to deliver quality results. We've got to teach less to our students so that they will learn more. Grades are important—don't forget to pass your exams—but grades are not the only thing in life and there are other things in life which we want to learn in school. (Lee 2004, point 112)

This often quoted segment of Lee's speech was, in part, an attempt to reduce the pre-dominant focus on examinations and academic attainment, and foster diversity while sustaining the system's core. Acknowledging parental concern in language learning, Lee continued,

> … what MOE is going to do is a modular approach, have different modules for different students. Everybody will do the core module, that's standard. If you are a weak student, we will give you additional foundation modules, bridging, reinforcement … If you have skills, if you want to go further, we should let you do it … any student who has that language skill, let him do it, have enrichment modules, advanced modules, he can learn more. (Lee 2004, point 121)

What focus, and which concept, of change?

The brief overview of policy aims indicates that a range of programmes would contribute to make up both the initiatives. While the nuances of the programmes and how they proposed to work together is elaborated in the latter parts of this article, local research in Singapore, emphasizing pedagogy and practice, have tended to be

organized around the view that research should presumably be focused 'to examine how effective the reform initiatives have been at the point they matter most, the classroom' (Gopinathan and Mardiana 2013, p. 27). This orientation contrasts with those proposed by a number of educational change scholars. Anderson (2010) for example explains that outcomes produced, by policy initiatives promoting educational change, by and large pertain to the degree of adoption of the introduced programmes and practices rather than the effects of these adoptions on students in the classroom or the efficient functioning of institutions. Others have acknowledged that systemic educational change is often easier said than done (Fink and Stoll 2005) and that examination of change involves investigating a process, taking place over time rather than isolated events (Anderson 2010). While Lee's (2004) speech envisioned change in terms of retaining but modifying familiar core practices and supplementing or extending these with a modular approach, a more radical conception of educational change was assumed by a local large-scale educational research project.

How educational change was measured and reported

The project called Core 2 was officially proposed in 2009. It set out to measure, map and model the logic of teaching and learning in a representative sample of primary 5 (Grade 5) and secondary 3 (Grade 9) Mathematics and English Language classrooms to ascertain the extent to which classroom pedagogy had transformed since the introduction of TLLM in 2004. Core 2 relied on the findings from earlier, related studies carried out in Core 1, and used those findings as baseline data (Hogan et al. 2009a, b, c, d). Both core 1 and 2 projects were MOE-funded, with the projects' design and focus being determined by researchers with the approval from MOE, Singapore.

Core 1 was reported to have played a very significant role in shaping policy and practice, in tracking, evaluating, and advising about the effectiveness of educational restructuring efforts in Singapore schooling prior to TLLM (Luke et al. 2005b, p. 11; Gopinathan and Hung 2010, p. 180). The findings from Core 1 (Luke et al. 2003, 2005a, b; Luke and Hogan 2006) however, are not included in this explanatory critique because the official project proposal was submitted in 2003. Its initial intended scope could not have included investigations into the TLLM initiative, which was announced a year later, in 2004. While the eventual intended scope of Core 1 may have shifted, the author is not aware of any official document, which highlights this change. Additionally, a content analysis of research documents related to either the core 1 or 2 projects has highlighted that a large majority did not mention TSLN and TLLM when reporting their research (De Souza 2014a, pp. 232–233).

Core 2, which followed, was proposed several years after the TLLM initiative was introduced and running in 2009 (Lee 2004; Shanmugaratnam 2004). As it was a MOE-funded project that aimed to inform policy and practice, its findings and claims about the TSLN and TLLM initiatives were made the focus of this study.

The design of Core 2 located measures of effectiveness, not at the extent to which TSLN and TLLM programmes were adopted by schools, but in terms of the observable pedagogical changes the initiatives achieved or failed to achieve in the school classroom. It specified what change ought to look like by using theoretical models rather than focusing on the specific content of the TSLN and TLLM programmes (cf. Anderson 2010). Reporting on data collected 'to analyse the pedagogical organization of four theoretically specified 'models' of instructional strategy—traditional instruction, direct instruction, teaching for understanding, and co-regulated learning strategies in secondary 3 Mathematics and English' (Hogan et al. 2013, p. 57), the project concluded that TSLN and TLLM constituted, 'Tinkering around the edges—a little more feedback and formative assessment here, a little bit more teaching for understanding there, a little more Professional Development (PD) everywhere—[and] is unlikely to achieve the outcomes the system desires' (Hogan et al. 2013, p. 60). Drawing on findings from classroom observations and surveys conducted, in part, to measure the effectiveness of the TSLN and TLLM initiatives, the study concluded,

> …we also think that the national high stakes assessment system has resulted in a pedagogy that is intractably didactic rather than dialogical, compromised the epistemic quality and the transparency or 'visibility'… of learning processes during lessons, restricted the opportunities of students to engage in knowledge building work in class, and constrained the ability of the system to successfully introduce substantial and sustainable pedagogical improvements despite a strong policy commitment to doing so as reflected in the two key policy documents of the past 15 years—Thinking schools, learning nation (TSLN 1997) and Teach less, learn more (TLLM 2004). (Hogan et al. 2013, p. 60)

Presumably expecting the kind of educational change that required, 'a substantial reorientation of practice or the way practice is organised' (James 2010, p. 47), the research project detected what the researchers believed to be a misalignment between policy statements and observed classroom practices, reporting the presence of

> … a very considerable tension, if not outright contradiction, between the… twenty-first century learning objectives of recent policy statements (especially Teach less, learn more) and the continuing commitment of the government to its national high stakes assessment regime… these findings raise important questions about whether the current pedagogical model… needs substantial modification of its basic design principles if the system is to have any real hope of achieving the policy priorities set out in TSLN and TLLM. (Hogan et al. 2013, p. 60)

There is an essential point to make and several assumptions worth highlighting that are evident in the above stated findings. Noteworthy, the comments that follow in no way intend to dismiss the research or the insights it has provided about what went on, pedagogically, in the observed secondary 3 English Language (EL) and Mathematics classes in Singapore, at that time. Rather, it wishes to delimit the

strong and over-generalised claims the paper proceeded to make, based on very limited findings from the study, about TSLN and TLLM and what they indicate about Singapore's educational system, undergoing change, as a whole.

The claims about TSLN and TLLM were problematic for several reasons. Firstly, the study interpreted that the initiatives aimed for teachers to make the kind of change that would replace, rather than supplement or extend (see Lee 2004, points 112 and 121), their preferred pedagogical style with more dialogical interactions. It was proposed that the latter would allow students to engage in knowledge building work thereby, ostensibly, improving the epistemic quality of their learning. Secondly, the research design located and reduced most of the change efforts which might affect students' overall learning experiences, and which TSLN and TLLM initiated, to the school classroom where it was thought to matter most—at the same time concealing the possible impact other programmes, that took place beyond them, might have. Thirdly, where school-initiated innovative programmes of pedagogical change under TLLM were concerned, the research design assumed that all participating schools would focus their curriculum, pedagogical and classroom innovation efforts on primary 5 and secondary 3 Mathematics and EL subjects (Hogan et al. 2009c) though only results for secondary 3 were eventually reported as a journal article (Hogan et al. 2013). This imposed uniformity however, was far from the case in schools' actual programme implementation practices. A range of innovations, in various subject areas and combinations, were carried out at different primary, secondary and post-secondary levels by participating schools, many of which the pre-defined scope of the research project could not take into consideration (see MOE 2013, pp. 100–111).

The reported findings from Core 2 also require further explanation as they sit uneasily alongside findings communicated by the aforementioned PISA, TIMMS and PIRLS which collectively highlight that Singapore's education system—and by extension its classroom and beyond classroom curriculum, teaching and learning processes—has been generally consistent and effective in developing students with a selection of skills needed for the twenty-first century. While some might highlight the limitations and inadequacies of these international benchmarking tests in measuring twenty-first century competencies, and undoubtedly numerous limitations exist (Conroy 2016; Deng and Gopinathan 2016; Greenhalgh 2016), this article addresses a different concern.

Research purpose

In developing a critical realist explanatory critique, the article aims to disrupt the perpetuation of a simplistic, one-dimensional view and narrative of Singapore's educational landscape as one of, presumably, several '… educational systems in which the iron laws of high stakes assessment drive classroom pedagogy day in and day out…' (Hogan et al. 2009a, p. 228). Such narratives have had unintended but nevertheless, entrenching fallout effects on how Singaporean youths and workers have been, and continue to be constructed. Kramer-Dahl (2004, p. 219) shares that,

> In the Singapore case, it tends to mobilize constructions of youth as narrowly achievement-oriented, 'exam-smart muggers', as local academics have deridingly categorized them, who 'lack an enquiring mind' … are 'not likely to read extensively and seek alternative solutions to problems' … and are 'deficient in expression and critical thinking skills' … What makes this way of essentialising young Singaporean … learners especially dangerous is that it gets lived out, largely unquestioned, in local research and teaching.

A more recent expression, of similar depictions, reared its ugly head in debates over wages and skills, extending its reach to highlight the 'inadequacies' of Singapore's Professionals, Managers, Executives and Technicians or the PMET segment of Singaporean white-collar workers. 'Pampered, Mediocre, Expensive, Timid? Are these fair descriptions of the new Singaporean worker?' (Chan 2013) emblazoned the front-page headlines in the main local newspaper, which again rehashed—like an old, broken record player—the need for Singaporeans to undertake a mindset change, and for schools to start honing communication and critical thinking skills, team and project work, and presentation and public speaking skills.

Lim (2014, p. 79) has also observed how, 'The recent population policy debate has thrown up a number of references to the inadequacy of Singaporeans—by quantity or quality—for many jobs in the country (both labour and talent) …' noting that in the eyes of employers, 'Singaporean university graduates … [are] "cookie-cutter", "risk-averse", "not at all entrepreneurial", "provincial", "materialistic" and simply "boring" (Lim 2014, p. 90)'.

What Kramer-Dahl's (2004) and Lim's (2014) observations alert us to is how local official and public framings, of the 'inadequate-Singaporean', consistently opt to fall back on a simplistic, go-to, fail-proof, 'double-confirm correct' (as locals might say) explanation that inevitably points towards the 'limited' and 'exam-oriented' educational experiences of Singaporeans and some projected 'intractability' of aspects of the system (see Hogan et al. 2013, pp. 60, 95)—circulating rather uncritically as ''truth' in staffrooms, classrooms, boardrooms and among researchers' (Kramer-Dahl 2004, p. 219).

While what perpetuates such views is undoubtedly a very complex matter, the situation is helped little by an empirical research orientation that brackets or focuses on a decidedly 'most important' aspect of a complex system in isolation, and then proceeds to recommend whole system solutions because the decidedly narrow fixation apparently leads researchers to 'see no other solution in sight' (Hogan et al. 2013, p. 101). Such an approach, undertaken to inform policy yet leading to conclusions that only end up reifying contexts undergoing change, seems to lose sight of the existence of a broader picture.

In this article, a sociological account of the structural changes made to Singapore's educational landscape—through TSLN and TLLM, which aimed to broaden the educational experiences of students to meet the needs and demands of globalisation—is developed. The explanatory critique also responds to a theme that Connelly (2013, p. xi) identifies needs further development in his foreword to 'Globalization and the Singapore Curriculum'. According to him, this theme

'accepts the innovative quality of policy and programme while claiming that Singapore's culture and practice of student testing and achievement emphasis prevents the adoption of new practices and innovative ideas at the practical classroom level'. This critique looks beyond the primary and secondary school classroom to search for some answers.

Overall, the explanatory critique suggests that the present government administration holds strongly to certain ideological commitments it has about education. However, its equally strong, if not stronger, commitment to continue to work in partnership with global capital (Tan 2012) and maintain Singapore's economic relevance has necessitated making important shifts in the education system as a whole. When research takes into account the larger educational landscape in Singapore and moves beyond the classroom, there is evidence of shifts occurring which are contributing to the shaping of the varied educational experiences of local students, gearing them to operate in our present day twenty-first century environment with a good degree of competence, as international benchmarking tests seem to indicate—provided Singapore's economic and social institutions are able to provide conditions that draw on the skills and talents of Singaporeans rather than suppress them (cf. PISA's Schleicher in Davie 2016). In the next section, the critical realist perspective is outlined in a manner that states how the meta-theory has been deployed in investigating educational change in the present study.

Methodology

Bhaskar's (2008) critical realism (CR) proposes that reality is stratified and that, independent of empirical observations and human thought, other layers of reality also exist comprising observable and unobservable natural and social structures. These structures have powers and potentials, which under certain conditions activate causal mechanisms that lead to the occurrence of events (De Souza 2014b).

While other orientations may prioritise the empirical layer of reality asking, 'what empirical evidence (event) is there to support this hypothesis', CR looks at events occurring in the empirical layer and theorise about the natural and social structures, the causal mechanisms, and the conditions that need to exist that would explain the occurrence of the observed events. These theories, which are temporarily completed analyses open to future contestations and corrections (Bhaskar 2010), are presented as explanatory critiques of how events came to be so, given the entities' structural configurations and the prevailing contextual conditions.

The observed patterned-occurrence of events is said to be evidence of certain structural tendencies. However, the absence of events may be because the tendencies of a structure 'may be possessed [but is] unexercised'—because the necessary conditions are not present to activate causal mechanisms to produce the event; alternatively they may be 'exercised unrealised' if other offsetting causes impede the complete operation of activated causal mechanisms; or they may be 'realised unperceived (or undetected) by men' (Bhaskar 2008, p. 18). For example, school-organised holiday enrichment programmes may be introduced into several schools to instill, in students, team-based problem solving skills. The programmes

may contribute to students acquiring such skills, but the skills remain latent because students are just not required to demonstrate them under the conditions of classroom lessons or examinations. Alternatively, after attending the enrichment programme students may demonstrate team-based problem solving skills but may not be able to fully realize the solutions to an assigned problem because of lack of experience, task difficulty or insufficient time. Students may also be demonstrating team-based problem solving skills however, they may be doing so in the absence of an interested observer.

Where educational change is concerned, these CR propositions provide alternative scenarios for consideration. These scenarios prompt researchers to theorise and develop more nuanced understandings about complex social structures and why a particular or expected change in outcome is not being observed in the context, despite the reported transformations made to the social structure of interest.

CR-informed document-selection and document-analysis methods

While CR provides a philosophical account of the nature of reality, when determining the research methods to adopt, this explanatory account paid particular attention to the development of CR for research purposes in programme reviews and evaluations, and for sociological explanations.

Document-selection

In realist review and evaluation, currently adopted in large-scale health service provision research (e.g. Best et al. 2012; Eastwood et al. 2013), CR and realist social theory (RST) have been operationalized by Pawson and Tilley (1997; Pawson 2006). In this paper, decisions pertaining to the selection of sources, and when to stop searching for more, aligned with recommendations outlined in their work (Pawson et al. 2005). The decision to rely on primary (original) rather than secondary (interpreted) sources, as far as possible, was also guided by practices common to historical research, as CR is associated with historical sociology (Steinmetz 1998).

Purposive sampling was used to select documents to answer the research question. Parliamentary debates and speeches made by education policymakers were identified and selected because they provide first-hand information about the scope of the initiatives, giving details and examples of the intended structural changes to the system, often absent in secondary sources. As numerous documents are available, realist review proposes to stop searching when theoretical needs are met, when questions posed are answered, and when searching further yields no new answer. Searches are also often constrained by time and funding (Pawson et al. 2005).

The examined documents are indicated with an asterisk in the reference list. For TSLN, Teo Chee Hean was the Minister of Education (1997–2003) spear-heading the initiative. The minister, who took over the education portfolio from 2004–2008 and rolled out TLLM was Tharman Shanmugaratnam. Most of the documents drawn on TSLN and TLLM, what constitutes the scope of the initiatives and the

programmes within them, are taken from speeches made by these two ministers and their communications to principals and teachers during the education work plan seminars conducted yearly, since 1998 (MOE 1998).

Document analysis

While the document selection used practices proposed for realist reviews and evaluations, the document analysis procedures differed. Realist evaluation and review entail deploying the context–mechanism–outcome configuration (CMOc) to develop programme-related theories about what works, for whom, under what conditions. This critique however, aimed to develop a theory about the modifications in Singapore's educational landscape resulting from changes brought about by TSLN and TLLM. Realist Social Theory (Archer 1995, 1996, 2013), rather than the CMOc, was used as a framework to develop a sociological account of macro-level transformations occurring in Singapore's education system and to make propositions about why the system has taken on the shape it has.

Realist social theory (RST)

RST (Archer 1995, 1996) states that social structures comprise aspects of structure, agency and culture (SAC), which interact to shape and re-shape the conditions people have for engaging in action. Social structures are activity-dependent, requiring agents (like teachers and policy makers) to engage in social activities in order to sustain or transform them. The structural dimension provides agents with contexts within which to pursue activities and interests. It pertains to institutional, physical, material and human resources and relations. The cultural dimension, in comparison, relates to ideas and ideational influences that operate at the propositional register of social interaction. Ideational influences, also have a bearing on agential activities, and may be consistent with or contradictory to prevailing, dominant ideas held by other groups or individuals, thereby facilitating or hindering change. Definitions and explanations of SAC and how they interact to bring about change or reproduction have been provided elsewhere (De Souza 2013). The following paragraphs provide an account of how these concepts were used to inform the analysis of documents and to assist in the development of the explanatory theory.

RST concepts

Social structure

In this study, what constituted the educational social structure investigated was dictated by how the policies were crafted and their extent. It moved beyond the classroom and included primary, secondary and post-secondary institutions in Singapore because TSLN and TLLM especially, implemented programmes and changes, which systemically affected these institutional structures. They did so by introducing more mechanisms that operated between institutional structures, for

example broadening entry criteria for primary students into secondary schools. Although TSLN included changes to pre-school education (Teo 1999), this aspect of change did not continue into TLLM and so was not pursued further.

Structural aspect

Investigating the structural aspect entailed examining relevant documents to identify the educational structures TSLN, and TLLM especially, were targeting to reorganise through their programmes (e.g. school organisation, classroom instructional practices, the examination system, etc.) and the kinds of changes recommended—whether to modify, add to, replace or eliminate.

Agential aspect

As macro-structural changes were introduced to the education system by TSLN and TLLM, inferences were made about how policy changes affected the micro-level classroom teaching context, and the kinds of agency the changes allowed teachers to exercise in terms of making classroom pedagogical improvements. How did the macro-structural changes affect classroom contexts, and did they allow or require teachers to exercise the kind of agency that would enable them to meet specifications implied by Core 2's four theoretically specified 'models' of instructional strategy—or were some of these difficult or impossible to achieve given the reported and actual structural changes schools experienced?

Cultural aspect

Investigating the cultural dimension entailed understanding the ideological beliefs and commitments the governing body has towards education, globalisation and the economy. These prevailing beliefs and commitments would guide decision-making and place the direction of changes along certain trajectories more than others.

RST change process

While SAC are concepts used to explain shifts within a social structure, RST proposes that the process of change comprises three overlapping analytical phases; structural conditioning, social interaction and structural elaboration (Archer 2013).

Structural conditioning occurs because social structures necessarily pre-exist the actions that transform them as they provide the conditions within which actions occur. For example, a particular notion and activity of schooling has to exist before present-day students can be enrolled. This implies that the way education has been relationally organised in the past has conditioning effects that exert causal influences, which differently constrain and/or enable present-day activities and the changes that can be made. Investigating and explaining how the past influences present-day change efforts, is done in the structural conditioning phase.

However, it is not only historical conditioning that influences change and needs explanation. Present day social interactions, often driven by competitive conflict

(internal and/or external) and the interests of people with decision-making powers, also play a part in swaying the direction of change. Social interactions, like a dominant political party prioritising economic development and competitiveness amidst global economic change, also affects what in a system eventually gets transformed.

Structural elaboration pertains to the alteration or reproduction resulting from the process.

RST and the possible outcomes of change

Structural elaboration (Archer 1995) may result in the social structure (1) remaining 'invariant under certain transformations' (Sayer 1992, p. 94) for example the teacher-student social structure can remain relatively unchanged despite people varying in age, sex, religion, race, occupying these roles over time; or (2) reproducing and reinforcing the existing configuration leading to the crystallization of these forms over time; or (3) undergoing different degrees of transformation from a previous state resulting, for example, in reorienting the organization of practice or supplementing and extending existing practices (cf. James 2010).

Research question

The explanatory critique that follows responds to the research question, 'What social structural changes were implemented by the TSLN and TLLM initiatives and why'? It utilizes the CR concepts of social structure, SAC, mechanisms and conditions, and is organized in accordance to the RST change process outlined earlier. The critique first theorises (a) about the structural conditioning effects and (b) social interaction effects that have had a bearing on the kinds of changes made to Singapore's educational landscape. It then moves on to (c) highlight the structural elaborations stemming from TSLN and TLLM and the different sets of relations resulting, adding to the system's complexity.

A CR explanatory critique also permits the correction of earlier proposed explanations (Bhaskar 2010, p. 4). As such, (d) responds to the view proposed by findings from Core 2 which extrapolated, from observations of secondary 3 classrooms, that the learning objectives prioritized in TSLN and TLLM would be difficult to realize given the government's ongoing commitment to the national high stakes examinations. This critique reports on evidence that suggests it was unlikely that the secondary 3 representative sample, observed by core 2, was part of any TLLM programme (though this seems implied by the study).

In assessing explanatory critiques, CR proposes that its confirmation is situated within 'the historico-cultural community in which debates about competing claims are staged' (Bhaskar in Al-Amoudi and Willmott 2011, p. 30), grounding explanations to their historical and cultural contexts and what is empirically observable.

Explanatory critique

Structural conditioning effects influencing TSLN and TLLM

There were prominent conditioning effects, both in the cultural and structural dimensions, which likely influenced the shapes of both TSLN and TLLM.

Cultural dimension

Since 1959, the People's Action Party (PAP) has been continuously elected into power and has had a very strong hand in shaping Singapore's educational development. The educational social structure existing today has been supported by ideological beliefs expressed in their speeches. For example each successive Minister of Education, since TSLN right through to TLLM, has expressed commitments to maintaining:

- The national curriculum and the high standards already achieved (Teo in Budget, MOE 1997, 1403; MOE 1997a; Shanmugaratnam 2004, point 7; Shanmugaratnam in Head K, MOE 2006, Polytechnics; Ng 2008, points 29–45; Heng 2011).
- A broad-based education, sometimes called 'ten years of basic education' (Heng 2013, point 22; also Teo in Budget, MOE 1998, 1768; Teo 1999, point7; Shanmugaratnam in Head K, MOE 2006, Polytechnics; Ng 2010, point 9; Heng 2013, point 24).
- The meritocratic system already in place.

Politically, Low (2014) notes that meritocracy is a 'core principle of governance in Singapore' and further states that the principle 'is as close as anything gets to being a national ideology' (Low 2014, p. 48). Much of this principle, whether one agrees about its national ideological status, is seen to be expressed through the mechanisms of the examination system which for that reason has shown, since 1998 or earlier (Cheah 1998), a tenacious resistance to being changed, at least so long as the PAP retains its power. Shanmugaratnam (2004, point 21), in introducing TLLM stated,

> Our exams serve a key purpose in education. They are an anchor in our meritocratic system. They provide transparency in the system, and give parents and students confidence that access to a school or tertiary institution is based on merit, confidence which is often lacking in other systems.

While there were explicit aims to seek a new balance in education because of social interaction effects (next section), it was not towards the direction of manipulating the high-stakes assessment as core 2 has recommended (Hogan et al. 2013) or as researchers might have advocated.

Structural dimension

For both TSLN and TLLM, changes were suggested under the conditions of an existing, structurally successful educational system which, while being strong and robust, needed modifications to meet the demands of global competition (Goh 1997, point 15; Shanmugaratnam 2004, points 8–10). In the views of policymakers therefore, the kinds of changes needed were not the dramatic kinds. Shanmugaratnam (2004, point 7) in no uncertain terms declared when introducing TLLM, 'But let me first state what must surely be obvious. We do not need to turn the cart over and start again'. The main concern seemed to be how to sustain the standard already achieved while addressing the need for change. Goh, in TSLN emphasized,

> Whichever way we cut back and redefine the curriculum, we will ensure our students retain mastery over the core knowledge and concepts that give them the basis for further learning. We must also retain the high standards … Whatever we do, we must not abandon these fundamentals …We must not level down. (Goh 1997, point 20)

The social structural conditioning effects, prevailing in the structural and cultural dimensions, necessitated that the changes be strategic rather than dramatic. They would have to allow the government to retain its meritocratic anchor, maintain the systemic success already achieved, while ensuring that students acquire what is believed to be essential core knowledge (Lee 2004, point 121; Budget, MOE 1998, 1775). Additionally, there was an expressed concern about 'effective resource deployment' (Teo 1999, point 14). The eventual strategy adopted was to add other possibilities within the existing examination system and to do so by placing 'equal emphasis on the non-academic curriculum' and 'to accept and promote more diverse measures of merit' (Shanmugaratnam 2004, point 21) resulting in targeted changes that extended and supplemented, rather than replaced parts of, the existing system.

Social interaction effects influencing TSLN and TLLM

The social interaction effects that mattered came more from external rather than internal sources since no real, internal obstruction from other political parties or groups presented itself. The impetus for educational change seemed very much guided by the projected economic demands of the twenty-first century and the government's interest in keeping Singapore economically relevant (Budget, MOE 1997, 1401; Teo 1999; Goh and Gopinathan 2008, pp. 29–33). Prior to TSLN, the Organisation for Economic Cooperation and Development (OECD 1996) elaborated that 'knowledge-based economy' denotes recognising the important roles of knowledge and technology for economic growth. TSLN led to policy moves that began restructuring Singapore's educational system, which envisioned a 'total learning environment' (Goh 1997). It incorporated the Masterplans for Information and Technology in education (MOE 1997a) and National Education (MOE 1997b). TSLN, as asserted earlier, tended to focus on macro-level infrastructural changes from pre-school through to tertiary institutions.

TLLM, in comparison, attended to the 'knowledge' aspect. What the government seemed to oppose was uniformity in implementation. Citing educational restructuring experiences in Japan, Shanmugaratnam noted that the top-down approach, for Japanese schools, had received little buy-in from the ground. The 'one-size fits all' strategy adopted to serve diverse student populations had brought about discomfort amongst Japanese stakeholders and the resulting observation was, Japan's international rankings in key subject areas declined over the years. To avoid a similar scenario for Singapore, MOE aimed for schools, operating within certain guidelines, to take ownership of the changes and programmes they wished to implement (Shanmugaratnam 2005, points 7–10). As such, the strategy MOE eventually adopted in implementing aspects of TLLM was school-based, allowing for bottom-up initiatives to develop with top-down support from MOE. Within certain guidelines, schools would take ownership and initiate meaningful changes for their students.

Guided by the constraining and enabling causal influences of social structural conditioning and social interaction effects, the TSLN and TLLM initiatives took on the shape they have and are outlined in the next section.

Structural elaboration

As highlighted earlier, core 2's findings—which bracketed TSLN and TLLM by focussing on their effects on classroom pedagogical practices in primary 5 and secondary 3 levels—steered researchers to conclude that a considerable conflict exists between the government's twenty-first century learning objectives outlined, and their ongoing commitment to high-stakes assessment (Hogan et al. 2013, p. 60), thereby constraining or preventing the system from attaining the policy priorities stated in TSLN and TLLM. This explanatory critique however, suggests that the structural elaborations introduced by TSLN and TLLM, have been highly consistent with the ideological beliefs held by educational policymakers in Singapore, their commitment to maintaining a strong partnership with global capital, and the situational demands brought about by globalization and social interaction. Due to the absence of any strong or significant opposition or event, which might destabilize or obstruct the implementation of the policies, TSLN and TLLM introduced the following programmes.

TSLN

It was earlier mentioned that TSLN targeted five areas of development. While there have been fairly comprehensive reports (e.g. Sharpe and Gopinathan 2002) on changes affecting primary and secondary schools, fewer accounts about how TSLN affected post-secondary institutions are available. In 1997, Lee also announced investments into upgrading and technologizing Singapore's further education institutions–universities, polytechnics and Institutes of Technical Education or ITE (Lee 1997, points 36–37). TSLN also initiated significant curriculum changes to ITE, Temasek Polytechnic and Republic Polytechnic, which made pronounced efforts to introduce Problem-based Learning (PBL). Figure 1 provides a

Responses to Thinking School, Learning Nation (1997 – 2003)

| **1996** Problem-based learning (PBL) in dental faculty of National University of Singapore or NUS (Khoo, 2000, p.3; Khoo & Chhem, 2001, p. 339) | **1999** PBL to be used in 20% of curriculum time in NUS medical faculty (Khoo, 2000, p.3) Temasek Centre for PBL established (Hee, 2005) Institute of Technical Education (ITE) introduced pedagogical model based on PBL principles (Yeow, 2002). | **2002** Temasek Polytechnic (TP) adopted PBL as the central pedagogy (Hee, 2005, p. 36) |
| **1997** Announcement of the Thinking Schools, Learning Nation initiative (Goh, 1997) | | **2003** Republic Polytechnic began One Day, One Problem pedagogical approach informed by PBL (Shanmugaratnam, 2003; O'Grady, et al., 2012). |

Fig. 1 PBL pedagogical approaches introduced in a few post-secondary institutions under TSLN

chronological trace of the introduction of PBL in higher education institutions in Singapore, up to 2003, before the introduction of TLLM in 2004.

TLLM

The polytechnics and ITEs are applied learning post-secondary institutions that receive students from mainstream government schools, whose results will qualify them for entry into the various courses offered. It is being suggested here that TLLM initiated programmes which increased the frequency of interactions between secondary and post-secondary institutions, with the latter playing a significant role in allowing the government to implement the first two goals of TLLM which included (1) fostering twenty-first century competencies, (2) reducing the overemphasis on exams by giving equal importance to non-academic curriculum and through different measures of merit, and (3) allowing for diversity within the educational landscape thereby encouraging a range of talents (Shanmugaratnam 2004). These interactions also enabled the government to better approximate the goal of effective resource deployment, 'within the bounds of practicality and sustainability' (Teo 1999, point 14). TLLM introduced many programmes, and not all have been listed in Fig. 2. Several important programmes like those pertaining to supporting and enabling teachers have not been included (see Shanmugaratnam 2004, points 28–38). The programmes elaborated, are those that support the above-mentioned assertions.

Fostering twenty-first century competencies   To foster twenty-first century competencies in mainstream secondary schools (see MOE 2016b for different streams and types of schools in Singapore), TLLM introduced a modular approach. In 2004, it was announced that the Normal Technical (NT) curriculum would be enriched to focus more on practice-oriented learning (Shanmugaratnam 2004, points 83–85). The curriculum now includes Elective Modules (EMs) collaboratively designed and developed with ITE (MOE 2005, 2016c). The choices of electives available to students began with lighting and sound engineering, computer assembly, music

Some Programmes making up the Teach Less Learn More (TLLM) initiative	
2004 • Introduction of Teach Less Learn More (TLLM) initiative (Lee, 2004; Shanmugaratnam, 2004) • Integrated Program began for 4 schools (MOE, 2003) • Official opening of 1st Specialised Independent School (Shanmugaratnam, 2003, pt. 8) • Announcement of new frameworks for admission into secondary schools, JCs and universities (Shanmugaratnam, 2004, pt. 22) • Announcement to provide schools with resources to develop niches of excellence (Shanmugaratnam, 2004, pt. 44) • Announcement to trim 10-20% of secondary to pre-university curriculum on average over a few years (Shanmugaratnam, 2004, pt. 57) • Announcement made to enrich the Normal Technical curriculum with Elective Modules (EMs) (Shanmugaratnam, 2004, pt. 83)	**2006** • 29 prototype schools collaborate with MOE under TLLM initiative to bring about School-based Curriculum Innovation (SCI) (Shanmugaratnam, 2006; Update on Teach Less, Learn More Programme, 2010) • 12 Niche program schools specialising in Sports, Performing Arts, Uniformed Groups, Robotics (Shanmugaratnam, 2006) • From 2006 under the new Joint Polytechnic Special Admission Exercise (JPSAE) polytechnics will be able to admit up to 5% of their annual intake of students based on special talents and aptitude, rather than purely on their GCE O' level results (Shanmugaratnam, 2005, pt. 95) • 37 schools begin offering Advanced Elective Modules (AEMs) or 40 hour courses with polytechnics in 2006 – 2007 (MOE, 2006)
2005 • Announcement to create 'White space' for teachers through content reduction (Shanmugaratnam, 2005, pt. 26) • Announcement that cuts will free up 10% to 20% of curriculum time in content-based subjects at primary and secondary school (Shanmugaratnam, 2005, pt. 31) • Announcement to free up an average of 2 hours per week for each teacher. (Shanmugaratnam, 2005, pt. 32) • Announcement that 39 schools have implemented a total of 85 EMs involving 2430 N(T) students (Shanmugaratnam, 2005, pt. 68) • Announcement to extend the EMs to students in the N(A) track from 2006 (Shanmugaratnam, 2005, pt. 73) • Direct School Admission – Secondary Exercise (DSASec), 43 secondary schools select some of their 2006 Sec 1 students earlier using criteria other than the PSLE results (Shanmugaratnam, 2005, pt. 94) • $100,000 given to certain primary schools to start niches of excellence (Shanmugaratnam, 2004)	**2007** • Announcement that 50 schools rolled out Advanced Elective Modules (AEMs) with polytechnics and 20 more were making plans to work with Polytechnics to implement AEMs. An additional 27 AEMs to be added to the existing 36 by the end of 2007 (Shanmugaratnam, 2007, pt. 17). **2008** • TLLM Ignite package provided to about 100 schools each year (till 2010). In 2008, 51 primary schools, 48 secondary schools and 1 post-secondary institute were given TLLM package to catalyse School-based Curriculum Innovations (SCIs) (MOE, 2008). • PETALS: The Teacher's Toolbox distributed to all schools (MOE, 2008).

Fig. 2 Some programmes making up the TLLM initiative

technology, digital photography, and culinary, pastry and hospitality skills (see Shanmugaratnam 2004, point 85). A recent report states there are now more than thirty elective modules related to STEM and non-STEM disciplines available for students in the NT-stream, and that completion of the modules can count for credit requirements if students continue education in ITE in future (Teng 2016; MOE 2016f).

In 2006, these modules were extended to the Normal Academic (NA)-stream students, and now both NA and Express-stream students in the upper-secondary levels are eligible to enroll, through their schools, for Advanced Elective Modules (AEMs) designed and run by the polytechnics (MOE 2016c). These are government-subsidised courses, involving 30 h of contact time with polytechnic lecturers, and a school can enroll students for up to 8 courses, in a year. While a SGD$50 course fee is charged, this can be paid for from students' Edusave Accounts, which is a government-funded scheme introduced in 1993 to provide resources to support

school enrichment activities (MOE 2017). Students requiring further financial assistance can draw on an Opportunity Fund available in all schools (MOE 2006).

There are now 150 AEMs for students to opt for (Teng 2016), though not all of them are available at one time. A browse through the Polytechnics' and MOE AEM portal Course websites highlight modules such as 'Application Science in Forensics', 'Engineering in Medical Applications', 'Gene Therapy and Regenerative Medicine', 'Exploring Interior Design and Architecture' and 'Cartoons in Motion'—courses which might cater to twenty-first century career interests (MOE 2016c; Singapore Polytechnic n.d.; Temasek Polytechnic n.d.). As with elective modules, their successful completion may be used for future admission into post-secondary institutions and for credit exemptions in related courses (Shanmugaratnam 2007).

The EMs and AEMs may be conducted in schools, the ITE or polytechnics respectively, or in both secondary and post-secondary institutional premises since the latter are equipped with the appropriate apparatus and technological resources, which secondary schools may not have, suggesting effective resource deployment. These institutions also have lecturers—who use more collaborative, problem-based pedagogical and applied approaches, in their day-to-day lessons (O'Grady et al. 2012; MOE 2016c)—facilitating the modules for the secondary school students.

Yet, despite an apparent early and ongoing uptake of this TLLM programme [since there is a report on its expansion indicating some degree of policy effectiveness (Teng 2016)], and increased funding in educational research since 2003, the actual status and outcomes brought about by these out-of-school-classroom modules (numbering more than 180 in total now), still remain overlooked, even in more recent local publications about globalization and its effects on mobilising change in the Singapore curriculum (see Deng et al. 2013).

Reducing overemphasis on exams Rather than making structural changes to modify the existing examination system TLLM, like TSLN, focused on making structural modifications to the entry criteria into schools and institutions, broadening them to include academic attainment along with other measures (see Budget-MOE 2001). Introducing additional qualifying entry mechanisms into the system, would theoretically work to attenuate, to some degree, the sole reliance on academic results as a criterion. The Direct Schools Admission (DSA-secondary) programme for example, was first planned in 2004 and put in operation in 43 secondary schools in 2006 (MOE 2005). This programme allows schools to select 10–20 per cent of their students based on specific and holistic criteria of merit set by the school, before the release of the high stakes Primary 6 School Leaving Examination results. To date, more than 100 schools are participating in this programme (MOE 2016d), which has also been extended to the junior colleges and polytechnics. The Joint-Polytechnic Special Admission Exercise allows polytechnics to admit up to five per cent of their annual student intake using non-academic related criteria (Shanmugaratnam 2005).

These structural modifications that broaden entry criteria have raised grave concerns about some possible negative consequences of the DSA programme. Tan

(in Ong 2014) for example, argues that while its initial purpose may have been to recognize the various achievements of students rather than rely solely on academic results, the DSA programme may provide an unfair advantage to students with affluent parents who have better social networks. 'Parentocracy' was coined to indicate that parents' social standing and social capital may be more important than a student's individual merit and talent, when gaining entry via DSA.

Allowing for diversity in the educational landscape TLLM introduced greater diversity into the structure of the educational landscape in three ways, by: adding to the different types of schools already existing, introducing different programmes for different mainstream schools, and supporting school-based curriculum innovations (SCIs).

Diversification came in the form of Specialized Independent Schools, which aimed to recognize and nurture exceptional, talented individuals in Sports, Mathematics and Science, the Arts, and Science and Technology (MOE 2002, point 5; Shanmugaratnam 2004). The Singapore Sports School opened in 2004. By 2008, the National University of Singapore High School and School of the Arts were established, with the School of Science and Technology opening in 2010 (MOE 2008a). For students who would thrive from a hands-on curriculum, Northlight and Assumption Pathway Schools began in 2009.

Diversity was also implemented through the introduction of the Integrated Programme in four schools in 2004. This programme allowed students to bypass high-stakes examinations in Year 10 but still continue to prepare for the Year 12 high-stakes examinations, allowing space for a more flexible learning environment in the secondary school years (MOE 2003). To date, 18 schools offer this programme (MOE 2016e).

This change however has also caused disquiet about the longer-term impact, which the increasingly diverse structure of the educational system might have, on intergenerational mobility in Singapore (Ng 2011). Social work specialists like Ng (2013) have cautioned that,

> … the increasing differentiation by school-based streaming and by different types of schools with different fees and curricula looks to have segregating effects that are detrimental to mobility. Theoretical models have found that more homogeneous systems… beget greater intergenerational mobility (Davies et al. 2005; Ho 2010). (Ng 2013, p. 6)

In relation to the Integrated Programme, some have observed a troubling trend where schools selected to offer this programme are the better performing mainstream schools (Lee 2011). Uneasiness still persists about the creation of what has come to be perceived as different classes of schools, with mounting stress placed on students to compete for entry into the various programmes and surmount the perceived and real barriers these differentiated programmes set for students.

For mainstream schools—and drawing lessons from the Japanese experience— bottom-up initiatives with top-down support to create diversity was preferred over a one-size-fits-all approach. In 2005, MOE announced that sums of up to $100,000

would be provided, for meaningful programmes initiated by mainstream schools, to promote the development of niches of excellence to differentiate schools. By 2006, 12 schools reported having niche programmes with specializations in Sports, Performing Arts, Uniformed Groups and Robotics (Shanmugaratnam 2006). In 2012, this number increased to 190 with the range of programmes being 87 (MOE 2012). Recently however, MOE began phasing out the Niches of Excellence programme in primary schools because of its tendency to focus more on achievement than on providing learning opportunities (Ng 2015).

A large programme within TLLM was the SCI ground-up initiatives from 327 primary, secondary and post-secondary institutions, developed with support from MOE. Thirty-two additional schools undertook SCIs independently (MOE 2013, p. 10). This was out of a total of 366 institutions that were reported to be still functioning in 2016 (MOE 2016a). SCIs aimed at supporting schools and teachers in innovating engaging lessons that would also improve the quality of classroom teaching and saw collaborations taking place between teachers and curriculum development specialists. Shanmugaratnam (2007, point 21) provided an example:

> In Marsiling Secondary, teachers felt that the curriculum should do more to expose students to the environmental issues of the day. So this year a group of Science and Geography teachers … develop [sic] a non-examinable Environment Education Module (EEM) – 4 periods a week for a semester - for lower secondary students. Students use a problem-based approach, and work together on projects, which help them understand the environmental challenges facing Singapore, the region and the world.

Table 1 lists the range of focus areas reported by schools participating in SCIs and findings state that, 'In 2011, 96% of the schools involved in TLLM sustained their SCIs … [and] scaled up their projects to include more classes within the same level and across different levels and subjects' (MOE 2013, p. 11). Structurally, this indicates that a degree of diversification currently exists in the overall curriculum of mainstream Singapore schools.

2 Interpretations of TLLM

TLLM, as evident from the programmes elaborated before, may take on two interpretations. While the sociological account here interprets TLLM as comprising the range of listed programmes announced by Shanmugaratnam (2004) and their follow-ups, a greater tendency has been for educational researchers in Singapore to interpret it as specific initiatives relating to teaching and the school classroom. It is the latter interpretation that was seemingly adopted in the design of the Core 2 research programme.

Contesting core 2's interpretations about TSLN and TLLM

This section contests Core 2's assertions about the effectiveness of TSLN and TLLM, and suggests that the study failed to measure, in a systematic manner, any programme introduced by TLLM. There were 3 possible introductions from TLLM,

Table 1 List of TLLM Prototype and Ignite! School-based Curriculum Innovation (SCI) Projects. *Source*: Adapted from MOE (2013, pp. 100–111)

	Focus area	Primary	Secondary	Post-secondary	Total
1	English	61	21	1	83
2	Science	40	36	1	77
3	Mathematics	40	24	0	64
4	General	16	26	1	43
5	Chinese	13	6	1	20
6	Social Studies	1	5	0	6
7	English and Science	2	0	0	2
8	English, Mathematics, Science, Aesthetics, Character Education	1	0	0	1
9	Aesthetics	0	4	0	4
10	Art	0	1	0	1
11	Biology	0	1	0	1
12	Chemistry	0	0	1	1
13	Chinese and Geography	0	1	0	1
14	Design and Technology	0	3	0	3
15	Economics	0	0	1	1
16	English Literature	0	1	0	1
17	Geography	0	4	0	4
18	History	0	5	0	5
19	History and Geography	0	1	0	1
20	Humanities	0	5	0	5
21	Malay	0	1	0	1
22	Mathematics and Science	0	4	0	4
23	Physics	0	1	0	1
24	Project Work	0	5	0	5
25	Science and Geography	0	2	0	2
	Totals	174	157	6	337

taking place at the macro-structural level, that would have led to teachers modifying and/or changing classroom pedagogical practices at the micro-level: (1) the 10–20% reduction in curriculum, (2) the 2 h of 'white space' proposed for every teacher, and (3) the SCI projects previously elaborated.

The 10–20% curriculum reduction

When TLLM was announced, there was an explicit intent to judiciously reduce syllabi content (Lee 2004, point 112). This intent to make a change, that would affect classroom teaching content, was reiterated in 2004 and 2005 during the MOE

work plan seminars (Shanmugaratnam 2004, point 57; 2005, points 15 and 31). The seminar typically involves participants from MOE, schools and institutions of higher learning coming together to 'prepare our education system to meet future challenges', 'to discuss and debate the future of Education [and] to lay the foundations for Singapore's future success' (MOE 1998). During the 2006 seminar, it was announced that only 10% cuts would be made to the English Language and lower secondary Mathematics syllabi. Content reduction, it was emphasised, would be undertaken using 'scalpels, not axes' (Shanmugaratnam 2006, point 9) and was done to free up white space for teachers. Although it was anticipated that by 2010, 'content cuts ranging from 10 to 20%, in all content-based subjects at all levels' (Shanmugaratnam 2006, point 10) would be implemented, it remains unclear if these modest structural changes amounted to teachers having sufficient agency and white space to make significant classroom pedagogical transformations in their specific subject areas as Core 2 anticipated. This is because other constraining, prevailing structures were sustained—like how a school day is organised, how time-tables are arranged, the teaching time assigned to each subject area, and so on, which teachers did not have the agency to change. These would constrain the shape that any teacher-initiated pedagogical transformation might take.

White space

TLLM also proposed giving teachers '1 hour 'timetabled time' per week to reflect, plan their lessons, and engage in professional sharing' (Shanmugaratnam 2005, point 33). This free hour, another modest macro-level structural modification, would come from within a teacher's existing timetable and would be made possible through recruiting more teachers. More free time was also presumed to be available through the provision of an additional administrative staff per school to assist teachers in non-teaching related administrative duties (Shanmugaratnam 2005, point 35). Core 2 proposed their anecdotal evidence suggested that teachers used this 'White Space' to exercise their agency in 'Singapore's pedagogical regime' (Hogan et al. 2013, p. 98) and examination preparation (Hogan et al. 2013, p. 96), rather than by pursuing their curriculum preferences or interests. This view however, fails to consider that this white space—set aside for teachers to engage in planning and professional sharing—might have been spent working on SCI focus areas decided by schools, which required teachers' inputs and participation (MOE 2013; Shanmugaratnam 2005, point 33) but not necessarily in a teacher's specific subject specialization.

SCI projects

The SCI projects were school-based indicating that not all classes in a school participated in introducing pedagogical and assessment innovations under TLLM. The design of Core 2 and its selection of a 'representative' sample however, seemed to assume that every primary 5 and secondary 3 English and Mathematics classroom in every school, would otherwise be engaging in transforming instructional practices and classroom culture but for the 'persistent institutional grip that the national

assessment system in Singapore has over classroom practice' (Hogan et al. 2013, pp. 95–96). To the contrary, the national assessment system did not prevent Singapore mainstream schools from undertaking over 300 SCI projects that would make instructional changes and innovations to a selected focus area decided by the school (MOE 2013). It was Core 2's focus on the secondary 3 sample that failed to represent and capture what was happening on the ground, where TLLM was concerned, despite an initial list of 100 participating schools being available in 2008 (MOE 2008b), prior to the design of Core 2 in 2009.

Table 1, which summarises information from a recent report on the SCI projects, shows that the majority of SCI projects tended to cluster around EL, Science and Mathematics, in that order. For primary schools, most innovations took place within the subject area of EL whereas the secondary levels tended to focus on Science.

Tables 2 and 3 highlight the number of EL and Mathematics projects undertaken at the primary level, and secondary and post-secondary levels, respectively.

Table 2 shows that out of a total of 174 primary schools, 6 schools focused their SCI (EL) project on primary 5 level students, while 3 schools did the same for their SCI (Mathematics) projects. Out of a total of 61 SCI (EL) projects, 21 projects did not specify the level of the target students while 9 SCI (Mathematics) projects out of 40 did not convey this information.

Table 3 highlights that no school, in the MOE (2013) list provided, reported conducting SCI (EL) projects at the secondary 3 level, though 10 out of 22 schools did not specify the level of students their projects targeted. For SCI (Mathematics) only one school, out of 24, targeted its pedagogical and curriculum innovation project for secondary 3 level students while 7 projects did not specify which levels their SCI (Mathematics) projects were geared towards.

Given the broad range of projects undertaken in the SCI programme, the scope of Core 2's research design did not consider important and specific details relating to the SCI projects, despite the early availability of documents, identifying participating schools (MOE 2008b). Additionally, from Table 3 in particular, there is a noticeable pattern. For secondary schools that did specify the level of their target students in EL and Mathematics SCIs, most chose to undertake the SCI projects with lower rather than upper secondary level students. This would most likely be because in the Singapore curriculum, 'syllabuses [*sic*] are not designed to be covered in one year, but over a number of years' (Teachers 2007, Column 1514). Schools and teachers would be more cautious about disrupting student preparations for the Singapore-Cambridge General Certificate of Education (Ordinary Level)

Table 2 SCI English Language (EL) and Mathematics projects list (primary level). *Source*: Adapted from MOE (2013, pp. 100–111)

Subject	Primary									
	P1	P2	P1 and 2	P3	P4	P5	P4 and 5	P6	Levels not specified	Total
EL	4	6	1	11	11	1	5	1	21	61
Mathematics	1	7	0	10	10	3	0	0	9	40

Table 3 SCI English Language (EL) and Mathematics projects list (secondary level). *Source*: Adapted from MOE (2013, pp. 100–111)

Subject	Secondary							
	S1	S2	S3	S4	S5	Levels not specified	Junior college	Total
EL	7	4	0	0	0	10	1	22
Mathematics	11	5	1	0	0	7	0	24

Examination—which most students would sit for at secondary 4, but the preparations for which would begin from secondary 3. It is therefore not evident why Core 2 focused on these students, and from its findings then proceeded to make whole system claims about 'Singapore's pedagogical regime' (Hogan et al. 2013, p. 98), 'examination-driven instructional regime' (p. 59) and 'national high stakes assessment regime' (p. 60), simultaneously perpetuating and crystalising the narrative that Singapore's 'national high stakes assessment system has resulted in a pedagogy that is intractably didactic…' and one which 'constrained the ability of the system to successfully introduce substantial and sustainable pedagogical improvements despite a strong policy commitment to doing so' as stated in TSLN and TLLM (Hogan et al. 2013, p. 60).

The nationally representative sample of 4000 secondary 3 students and teachers would be more representative of what goes on in EL and Mathematics classes when teachers are preparing students for a high stake examination in the upcoming year, not necessarily what goes on in all classrooms throughout the entire system, despite the programmes introduced by TLLM. While it is highly possible that the sample was selected mainly because secondary 3 students are representative of those who performed well in the PISA tests, it is largely improbable that they were chosen because their level of participation in TLLM programmes was nationally representative of all schools in Singapore.

Discussion and conclusion

The above explanatory critique has provided a sociological account of the social structural changes implemented into Singapore's educational landscape as a result of the TSLN and TLLM initiatives. The critique has also theorised why the changes have taken place in a certain manner and not otherwise. The account highlights specific issues pertaining to research into educational change in general, and educational change in Singapore.

Issues pertaining to research into educational change

Firstly, the explanatory critique shows that Singapore's educational change efforts have moved beyond the classroom, and seems to lend support to assertions made by educational change scholars. They have suggested that, 'the greater proportion of

effects on student achievement comes from outside the school' and have likened efforts which aim to instill improvements within the school, let alone within the classroom, as 'trying to improve performance within what is actually the lesser variable of influence on student achievement' (Hargreaves et al. 2010, p. xix). In Singapore's case the strategy adopted to strengthen an already high-performing system, has been (a) to retain the core of the system supplementing it with school-initiated programmes to allow for minor differentiations, (b) to broaden entry criteria into secondary and post-secondary institutions, and (c) by educational outsourcing or introducing additional modules students can opt for through their schools, that are outsourced to post-secondary institutions equipped for and specialized in applied learning. These modules expose students to practical and theoretical learning in twenty-first century industry-relevant areas related to Business, Engineering, Media and Design, Mathematics and Science, and Information Technology. These changes regarded as mere 'tinkering around the edges' just because they have not transformed school classroom pedagogical practices, might be important programmes contributing to Singapore's consistent performance in international benchmarking tests—providing students with opportunities to hone their interests in skills relevant to the twenty-first century, and opportunities to apply classroom learning in more authentic contexts (MOE 2016c).

Secondly, this paper highlights the viability of adopting CR in educational change research and has demonstrated how its concepts, its accounts of change and apparent absence of change, are able to deal with the complexity involved in investigating transformations in educational landscapes. Its usefulness stems particularly from the ability of the framework to generate theories about why things are so and not otherwise. The CR perspective enables researchers to deal with change as a process happening over time rather than as an event, and takes into account the importance of history and context in influencing the direction and type of change that eventually takes place. The approach also acknowledges that present-day internal and external social interactions affect change thereby avoiding the reification of contexts. These features temper unreasonable expectations of change that discount the conditioning effects of culture and history.

Issues pertaining to educational change in Singapore

Thirdly, the growing complexity in the structure of Singapore's educational landscape implies that there may be newer structural tendencies the system is producing that are being realized in some way but are going undetected by educational researchers who may still be focusing mainly on primary and secondary school classroom sites. The nature of change taking place in the secondary school institutional structure in Singapore, for example, underscores a need for educational researchers, interested in local secondary school education and curriculum, to expand research efforts to include post-secondary institutional sites. This is needed as the latter are now involved in designing and delivering modules to supplement secondary school mainstream education.

An ongoing and growing concern, which needs close monitoring, pertains to the evolving structure of Singapore's educational landscape, and the nature of diversity

the complex structure is generating. The landscape, especially its secondary school component, now comprises different streams, different types of schools and permits the use of multiple mechanisms for entry rather than relying solely on results attained for academic performance in examinations. The pursuit of a more diverse educational landscape, through compartmentalizing different talents and different abilities, may be reinforcing rather than diminishing the social structures that generate segregating effects which have been shown to hinder social mobility in the longer term (Ng 2013).

Finally, narratives which configure Singapore's educational social structure as comprising a primarily exam-oriented system with 'intractable' didactic pedagogical practices, resulting in the notion of the 'inadequate Singaporean', need to consider if this is the only part of empirical reality that exists in Singapore's present-day educational landscape; or if it is merely the part that educational researchers typically tend to investigate and report on. This narrative has long been functioning as a crutch, permitting the development of explanations that more frequently regresses to 'problematic' Singaporeans, rather than to the 'problematic' social structures within which Singaporeans have to navigate—side-stepping investigations into equally important questions that need to be queried, as Singapore's economy and institutions try to keep pace with the demands of globalization, international and regional competition, and change.

PISA's Schleicher has opined that, 'At the end of the day, besides having a high performing education system, Singapore needs an economy and companies that are able to extract value from its skilled and talented people' (Schleicher in Davie 2016). In the light of Singapore's successful and consistently high performing educational system, and following Schleicher's observations, critical realists would be interested in asking: What—in Singapore's institutional and social structures, their mechanisms and prevailing conditions—is hindering and short-circuiting, rather than facilitating, the emergence and realisation of Singaporeans' latent talents and potentials?

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