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Towards Research-based Innovation and Reform: Singapore schooling in transition

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The challenges facing the Singapore education system in the new millennium are unique and unprecedented in Asia. Demands for new skills, knowledges, and flexible competencies for globalised economies and cosmopolitan cultures will require system-wide innovation and reform. But there is a dearth of international benchmarks and prototypes for such reforms. This paper describes the current Core Research Program underway at the National Institute of Education in Singapore, a multilevel analysis of Singaporean schooling, pedagogy, youth and educational outcomes. It describes student background, performance, classroom practices, student artefacts and outcomes, and student longitudinal life pathways. The case is made that a systematic focus on teachers’ and students’ work in everyday classroom contexts is the necessary starting point for pedagogical innovation and change. This, it is argued, can constitute a rich multidisciplinary evidence base for educational policy.

Unique Histories—Unprecedented Questions

Education in the Asia Pacific faces unique challenges. They can be described from varied standpoints and disciplinary frames. Current regional policy debates typically are defined in terms of the capacity of education systems to respond to the human and intellectual capital requirements of global markets and economies. Working from the perspectives of the humanities and cultural studies, a principal reference point is the emergence of pan-Asian, cosmopolitan cultures (Cheah & Robbins, 1998; Wee, 2003), accelerated by digital technologies, mass communications and emergent forms of mass, popular and corporate culture. From sociolinguistic perspectives, persistent issues include official linguistic media of instruction, language loss, change and creolisation, and the variable performance of children from different linguistic and cultural backgrounds (Tollefson & Tsui, 2004).

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In this journal and this article, we use the term “Asia Pacific” provisionally and strategically, knowing that it is but an analytic construct that refers to a diversity of unique yet connected histories and contexts, communities and cultures (Wilson & Dirlik, 1995). In many South Pacific and South-East Asian countries there are ongoing struggles to achieve basic schooling and teaching infrastructure, the education of girls and women, coherent national curricula, universal state provision to non-urban areas, and compulsory secondary education. There are also contexts like Singapore, Hong Kong, Korea and Taiwan, for whom “first wave” questions about basic education have been largely dealt with. In general terms, then, educational policy and practice in Asia is a context for the playing out of tensions between centralisation and decentralisation (Bray, 2003), between colonial and postcolonial educational cultures (Tan, 1997), and the establishing of new linkages between traditions, identities, practices and generational ideologies. Across the region, educational policy thus is inevitably linked to everyday matters of language and cultural identity, economy and society.

From a sociological perspective, the challenges in East Asia are about nation states in ongoing formation and transition, and a general movement from highly regulated to more open, secular societies and linked economies. As the events since the economic crises of 1997 have signalled, the balances and tolerances required for sustainable social, economic and educational policy are tenuous and contingent. For many countries, these will be tested again in the aftermath of the tsunami disaster of 2004. As the events since 9/11 and Bali signal, the issues always have been about the emergence of new complex national multicultures, in the case of Singapore bound together less by single language or race or religion, but by national history, urban space and place (cf. Kong, 1999; Ooi, 2003). It is in this unique context of interwoven and networked societies—a hothouse of economic change, of nations new and old, of cultures and languages in perpetual and longstanding contact, of youth and generation in transition—that we can speak of “reform”, innovation, and change in knowledge and pedagogy in Asian education.

While some of these pressing matters confront education in the West and North, they are without comparable urgency, contingency and risk. It is not, if it ever were, a simple matter of development or importation of reform. Nor is it a simple matter of an inexorable external force of western “globalisation” impacting on Asia (Burbules & Torres, 2001). Many of the educational problems cannot find their lineage or analytic repairs from educational systems in the US and UK, Australia and Europe, which face their own issues. These are products of distinctive histories of schooling, social problems and political economies, however these are taken as global, globalising or universal in the educational research literature. A quick scan of the international educational literature marks out: problematic structural and ideological relations between key social institutions (e.g., state, school, religion); competing federal/state/local funding and control agendas; aging state educational infrastructure; shifting pathways from school to further education and work; poor articulation between education and affiliated social and economic policy, exacerbated in some areas by tenacious poverty and urban violence. It is not surprising that educational policy
responses in the West remain focused on decentralisation and school-based management, accountability and testing, corporate rationalisation of post-secondary education, teacher quality, and persistent moves towards the marketisation and commodification of curriculum, teaching and knowledge. As the comparative work of Tan (1998), Bray (2003), Mok and Chan (2002), and Wong (2002) has noted, there has been a systematic application of many of these aspects of western educational governance and “development” to systems in Asia, with mixed effects and results. This does not preclude sensitive graftings of research prototypes, classroom approaches or innovations from the US, UK, Canada, Australia and Europe. But such applications would have to begin from a rigorous “inside out” empirical, local documentation and critical analysis of the distinctive demographic and cultural contexts, institutional and classroom contexts of the Asian education systems in question. Such an approach is outlined in this paper.

The perennial questions of “post-war” state education in the West were: What should count as educationally acquired knowledge, skill and competence, value and belief? How should these be taught and learned? What are their material consequences for individuals, communities and societies? How are these consequences produced and reproduced with differential effects across populations? These questions—central to educational sociology and at the heart of state schooling for the past half century—have different inflections in the political and educational economies of the Asia Pacific.

The questions in Asia over the past three decades have been about postcolonial approaches to curricular knowledge and cultural identity, and the place of secular education in relation to ongoing economic, social and political transformation. These have been addressed in the face of the need for infrastructure and capacity building, ongoing knowledge dependency and centre/periphery relations (Gopinathan, 1996), and the contingencies of racial and linguistic, cultural and religious complexity after decolonisation (Nozaki, Openshaw, & Luke, 2005; Tan, 1997). Yet while comparativists and critical theorists, aid and development proponents heatedly debate “dependency”, “development”, and “postcolonialism”, everyday educational practices have been further unsettled by the forces of fast, multinational capitalism, economic and cultural globalisation. Old diaspora have become new centres, even as seeds of new diaspora were spread (Cheah & Robbins, 1996; Wee, 2003). This shift has been abetted by the shrinkage of time/space and historical/cultural relations enabled by new media, new communications, computational and transportation technologies. The fragility of trying to model the medium-term effects of these changes was brought home in the economic crisis of 1997 (Stiglitz, 2000). Long-standing binary categories of social and economic analysis—not just those of left/right and socialist/capitalist, but also those of east/west, north/south, free/regulated markets, autocratic/democratic—require careful reconsideration and analysis in these new conditions.

The city state of Singapore is the site of an unprecedented convergence of powerful forces of educational development innovation, knowledge and semiotic economies, language ideologies and cultural identities (Tan, Gopinathan, & Kam, 1998). Simply, as a small economy with little primary industry and natural resources, it has defined its
future as an information/service/digital economy driven by educational investment and development. It is a small-scale prototype of what we could term a “semiotic economy” (Luke, 2003)—an economy based around codes, signs and symbols—where the lion’s share of productive work and consumption, lifestyle and community is based on linguistic and communicative competence, information and capital flows, engagement with new media and technologies.

At the “top of the class” on many of the international comparative measures of conventional educational achievement, Singapore has outperformed many of the traditional educational centres in North America and Europe. Its powerful ideological and cultural consensus on the national significance of education has been established by political will and sustained governmental funding from a “strong state” model (Sharpe & Gopinathan, 2003). The overall belief that the education system is a prime engine of economy, nation and identity is shared by the public and many parents, politicians and the corporate sector. Educational and school-related issues surface in a unique blend of sensitivity and obsession in press and media, professional and academic, political and parliamentary debates, with curriculum content and high-stakes assessment debates the regular focus of banner headlines and heated exchanges in editorials and letters to the editor. In sum, the establishment of a state-of-the-art schooling, technical education and university system—as an essential and foregrounded part of nation building—has been undertaken with great force, speed and sustained fiscal resolution. Information technology capacity, infrastructure building, curriculum writing, teacher training, and basic system capacity questions are in hand. In the last decade, the expansion of top-end laboratory capacity, research and development funding and infrastructure has surpassed that of many Organisation for Economic Co-operation and Development (OECD) countries. In the next decade, the push will move past sciences, technology and business into the arts and humanities as part of an overarching creative industries policy.

But this educational situation—a unique and to many outsiders, quite startling “post-postcolonial” one—raises a further series of questions about educational reforms and futures. The policy question is about how to take schooling and education in Singapore to the “next level”. Yet there are few international prototypes of what such a level might be. Current systems in the West cling to industrial educational models. Many are unwilling or unable to take on substantive educational reform, particularly in curriculum and pedagogy. On the table, then, is nothing less than the reconceptualisation of educational theory and practice, with challenges comparable to those that were faced in the West during industrialisation and urbanisation, or in the Asia Pacific at the point of decolonisation.

How, then, do we study and engage with an educational system in transformation? We might begin in terms other than those of models of economic rationalism and systems accountability, all of which are geared to push change-resistant systems. A visit to websites of state education systems, transnational non-government organisations (e.g., the Asia Development Bank, OECD, UNESCO) outlines the emergent responses to the impacts of economic, cultural and technological globalisation. Questions include: What are the model functions, contents
and processes of education in relation to late-capitalist, transnational economies? How will these systems accommodate and generate new technologies, new knowledges and identities? How will they support and engender durable national identities and cultural cohesion? How will they contribute to the fair and equitable distribution of intellectual and cultural capital, ensuring that all regions, cultural, ethnic and religious communities are able to access educational services and credentials? What might count as sustainable educational pathways and lifelong learning? These are the questions for Singapore, a city state that sits both at centres and margins, real and virtual, of economic globalisation and rapid change. They also are the kinds of focal issues raised in this and future editions of *APJE* (see especially, Koh, this volume).

**Focusing Policy on Pedagogy**

Where better to start than to ask basic empirical and descriptive questions. The questions above return us to issues around the core practices of schooling, the contexts where knowledge, practice and identity are shaped, and the material consequences for students’ life pathways. One recourse is to refocus on teaching and learning, on knowledge and discourse, on classroom pedagogy and teachers’ work. This metaphor of pathways or trajectories across schooling but also through new economies, cultures and institutions offers a sociologically rich and empirically focused way of looking at the relationship between individuals, generational and subcultural cohorts of students, and the futures of their communities and, indeed, the nation.

This paper describes the Core Research Project of the Centre for Research in Pedagogy and Practice, Singapore. This project aims for a comprehensive empirical and interpretive, quantitative and qualitative picture of the Singapore school system. It provides a critical social science evidence base for educational innovation. Its overt “bias” in design and philosophy is on everyday classroom pedagogy, on the intellectual and discourse work of teachers and students in classrooms. This is a logical extension of Singaporean educational reforms that began in the mid-1980s. By focusing on teaching and learning, knowledge and discourse, we have the opportunity to concentrate research in ways that are constructive and look at situated responses to local institutional and cultural context. At the same time, we set out to work around and outside of the many “internalist” stereotypes of how and what Asian educational systems do, specifically those that attribute results and outcomes to different cultural or intellectual predispositions (e.g., the popular public and professional discourses that ask “Can Asians think?” or those that attribute particular historical and social conditions to immutable habits of cultures or minds). That is, our position here is that a thorough and rigorous empirical and interpretive research agenda is both a way of responding to national imperatives, and of holding stereotypes about Asian learners and learning, schools and classrooms up to critical scrutiny.

Two decades ago Singapore embarked on a number of reform initiatives to diversify educational provision (see Ministry of Education, 1987, 1997a, 1997b, 2001, 2002a, 2002b). These have been the focus of numerous critical debates and policy analyses.
Studies have focused on, among other things, international comparative achievement and standing, political precedents and ideological dimensions, tricky ongoing issues of language and culture, similarities and differences of these reforms to neoliberal policy in the West, marketisation of education, comparative responses of Taiwan, Hong Kong and China (Sweetling & Morris, 1998; Tan, 1998; Wong, 2002). In 1987, the *Towards excellence in schools* report advocated the establishment of state-funded independent schools and various categories of schools with specialised curricular missions. Yet diversification of school type, a first move towards decentralised, school-based management, was not geared towards innovation in curriculum or classroom-based pedagogy.

The major initiatives, long in the planning, began in 1997. *Thinking schools, learning nation (TSLN)*, the first *Masterplan for IT in education* and the *National education initiatives* signalled the next wave of reform, specifically focused on pedagogy and curriculum. The *TSLN* initiative was designed for increased instructional flexibility and relevance. It pushed the system towards a more student-centred, active learning paradigm, with the aim of producing autonomous and independent learners. In these ways, the discourses of *TSLN* were prototypical attempts to address the new conditions of nationhood and globalisation. We find comparable post-Fordist discourses in later strategic statements of educational systems in the North and West, as well as Hong Kong, Taiwan, Australia, Canada, Sweden, and New Zealand. They typically include calls for: less risk-averse citizen workers, creative and entrepreneurial in recognising and generating new markets and services; capable of continual learning, re-learning, unlearning; dispositionally able to deal with community, workplace and institutional cultural diversity and multilingualism; and thereby economically flexible in the face of volatile employment and industrial futures.

In 2002, in pursuit of broad-based competencies for its students, Singapore undertook a review of junior college/upper secondary education. The aim was to accelerate the “shift from efficiency to diversity, from knowing to thinking, and from fitting people to specific jobs to equipping them for lifelong learning and creating their own opportunities” (Ministry of Education, 2002b, p.i). The report recommended greater diversity in school-learning pathways through the introduction of the Integrated Programme, which would cater to the top 10% of students and had the scope to allow alternative curricula and qualifications, such as the International Baccalaureate. At the same time, Singapore education adopted project work as a part of junior college (senior secondary) students’ work and assessment matriculation profiles. The project work initiative is an attempt to move the system towards more problem-based pedagogy, with an emphasis on teacher co-curricular planning, student interdisciplinary study, and the making of textual/multimodal artefacts with community and intellectual application.

These initiatives occurred in the context of a focus on digital technologies. Like many educational systems, Singapore began from the hypothesis that information technology would be a key means for the remediation of pedagogical practice. This view was enhanced by both the scale of the task at hand (340 schools) and the relatively advanced levels of public and corporate IT infrastructure on the island.
The IT masterplan (1997–2002) sought to increase the tools and resources available and to ensure that teachers had the skills to employ them in their classroom work. A follow-up strategy, Masterplan 2 (ongoing since 2003), sought to consolidate the effort required to appropriate new technologies into teachers’ and students’ personal plans and actions for teaching and learning. The aim was to create an ICT culture across the educational community that would generate depth of teacher and student use.

This suite of initiatives is unified by at least one major policy theme: a recognition that the didactic, traditional and rote reproductive character of pedagogy needed to change. This is a recurrent topic of discussion across educational systems in the Asia Pacific, including Japan and China. Many of the more specific Singaporean policy moves aim to generate flow-through effects to classroom practice. These include: reductions in curriculum content; a gradual lessening of focus on high-stakes assessment systems; the encouragement of integrated, multidisciplinary programmes; project work; and the development of alternative pathways through the streaming system. The reforms have not been restricted to primary and secondary schooling. At the input level, they have also involved the introduction of child-focused early childhood education, more educationally focused state, community and private funded childcare infrastructure, the expansion of community self-help organisations, and family support. At the demand level, they have been marked by the opening up of university entry pathways and criteria, and major post-secondary expansion with targets for university participation over 30%. Yet whether and how these policy initiatives and programmes have yielded change in classroom practice has not been empirically studied. At least in part, then, the issue is a classical one of policy implementation—of the effects and consequences, intended and otherwise, of various centrally driven interventions on the everyday work of students and teachers in classrooms. Hence, the need for a major research initiative on schools and pedagogy.

**Research and Evidence-based Educational Policy**

Education policy is about the strategic regulation of flows of resources to schools and communities, teachers and students to achieve normatively established educational outcomes and consequences (Luke, 2005). These resources include: fiscal, material and technological infrastructure required for teaching and learning; the human resources of teachers, administrators and support staff; and, indeed, the discourse and intellectual resources of curriculum materials, assessment instruments and teaching practices. As described in the previous section, ministries and departments of education like Singapore’s set overall policy directions that reflect the normative, narrative orientations of the state and polity, communities and cultures. But once the state has negotiated a “grand narrative” of education, state, family, community, language, religion and so on, the hard and tricky work of educational policy and reform, leadership and innovation comes into play.

The work of policy into practice involves the translation of the claims and propositions of these narratives into changed classroom practice and discourse and,
thereby, different student/teacher, knowledge/curriculum relations. In the context of
the national “settlement” around the importance of education in Singapore, we would
argue that the “proof” of the system is not solely in the generation of publicly
disseminated performance indicators to establish the legitimacy of the system and its
governance. In this context, the stories of state educational policy are not simply about
the production of better test scores and economies of scale. They come to ground in
the power of education in making material and intellectual differences in the pathways
and consequences for students, teachers and their communities.

The response of governments internationally has been to rationalise policy
formation in relation to empirically derived indicators; hence, “evidence-based”
social and educational policy (Bascia, Cumming, Datnow, Leithwood, & Livingston,
2005). But limited data has been allowed to count as evidence, with an overreliance
on test and examination scores as a principal indicator of system efficacy, and classical
experimental design models as the sole model for the selection and implementation of
reform. An alternative is to build a rich, multidisciplinary and interpretive social
science as the evidence base; and to disseminate the findings of a range of studies
broadly across the educational community to prompt debate and discussion, and to
focus innovation. This would provide a picture of the workings of an educational
system, describing the relative alignments and disalignments, continuities and
discontinuities between the educational message systems of curriculum, pedagogy
and high-stakes assessment. It would also provide a documentary picture of its
capacity to produce combinatory forms of capital—skill and knowledge, identity and
disposition—with value and power across peoples’ life and work, family and
community. Such a task requires the study of: (1) the sociodemographic, linguistic
and cultural resources and variables brought to bear in schools; (2) the actual
everyday lives of students and teachers in classrooms; and (3) the substantive material
and cultural consequences of education in students’ lives, pathways and communities.

Yet the search for accountability and performativity has led to few attempts to study
and understand pedagogical events in classrooms, their variable patterns and
resources, mediating processes and consequences for students. There are many
reasons for this. In part it is the result of insufficient resources, infrastructure and
commitment to educational research; in part because of an ideological and
paradigmatic narrowing of what might count as research; in part because of paucity of
data, and lack of governmental commitment to the development of databases and
analyses as part of policy formation. The notable exceptions are Newmann and
Associates’ (1996) work on US school reform; and the Queensland School
Longitudinal Reform Study (Lingard, Ladwig, Mills, Bahr, Christie, Gore et al.,
2002). Yet both of these operated at different, considerably smaller scales of research
design, sampling and data sets than what is currently underway in Singapore.

In 2002, the National Institute of Education—Singapore’s sole teacher-training
institution, affiliated with the Nanyang Technological University—established the
Centre for Research in Pedagogy and Practice (CRPP). It is an independent
educational research body funded by the Singapore Ministry of Education. The level
of commitment for research was S$48 million over a five-year initial period—or, by
local calculations, more than 10 times the per capita investment in educational research of the UK, Australia or Canada. Its brief was the enhancement of classroom practice in Singapore schools in the curriculum areas of English, Chinese, Malay, Tamil, Mathematics and Science, and digital information technologies. A further goal of the Centre is to build overall national infrastructure and capacity in educational research, and to train a new generation of educational researchers, teacher educators, policymakers and curriculum developers from Singapore and Asia.

To assess the scope of this venture, consider for a moment the global educational context. In North America, the UK and other major educational systems, the relationships between educational research communities and government has become tense. Disputes between advocates of experimental design and qualitative, interpretive work have been exacerbated by the moves of state and federal governments to narrow what counts as legitimate evidence for selecting curriculum and pedagogic methods. Further, among many teacher educators and senior educational bureaucrats, the divisions between policy and the reform of practice appear tenacious and resistant to systemic approaches. Add to this an air of continual and manufactured distrust and “crisis” over the quality of teacher education and the relevance of educational research (e.g., Cochran-Smith & Fries, 2001). For their part, the Singapore ministry, teacher education and educational research establishment committed to a medium- to long-term agenda of well-funded, multidisciplinary research for the analysis of practice, with a central focus on remaking pedagogy.

At its establishment, we framed the central questions for CRPP in general and open terms, using a simple “black box” model of inputs, processes and outcomes.

- What are the sociodemographic, community, cultural and linguistic, and institutional factors contributing to academic achievement?
- What is the experience of teaching and learning in Singapore classrooms? How can teaching and learning in classrooms be enhanced?
- What are the consequences of education for Singaporean students? How does education have an impact not just on school achievement per se, but upon employment and citizenship, upon attitudes, beliefs, aspirations, identity, upon social and economic capital? How are educational outcomes translated and mediated into life pathways?

Answers to these questions could provide the basis not just for policy development, but for intervention and innovation in teacher education and professional development, school organisational capacity and leadership, curriculum development and high-stakes assessment.

The Core Research Program

The CRPP Core Research Program sets out to build a multidimensional baseline of descriptive, observational and intervention-based data on all aspects of Singaporean schooling. It is the collective production of the authors, other lead researchers, and a team of over 100 research professors, associates, assistants and postdoctoral fellows.
(see Acknowledgements). Its key research question is: What factors contribute to educational success and outcomes in Singapore schools? Figure 1 provides a schematic overview to the core research program.

The research design goes beyond the acceptance of conventional indicators of success (e.g., test and exam scores, school-assigned marks) to explore the question of “What might count as an outcome?” in the evaluation of educational efficacy. That is, following the prototypes of the Wisconsin Center on Organization and Restructuring of Schools studies (Newmann & Associates, 1996), the design makes problematic the conventional measures of success to look at alternative accounts of achievement. Its classroom coding observational scheme builds upon previous schemes developed by Newmann and Associates (1996) and Lingard et al. (2003), but makes more explicit use of curriculum theory and discourse analysis categories. The Core Program also extends the conceptualisation of outcomes to begin tracking the longitudinal consequences of schooling, tapping into the prototypes of the World Youth Attitudes Study (Inglehart, Basanez, & Moreno, 1998); the Longitudinal Study of Australian Youth (e.g., Marks, 1998); and previous studies of Singaporean youth and adolescent social and cultural capital by the National Youth Council (Ho & Yip, 2003).

As this article goes to press, the Core Program is in its second year of operation. Over 100 schools are involved in data collection and the first analyses are available as technical reports. The data from the program has already informed policy debates on the teaching of Chinese and on integrated teaching in early childhood education (e.g., Liu, Kotov, Abdul Rahim, & Goh, 2004). While awaiting the analyses of major data sets, preliminary descriptive data on pedagogical practice has been circulated across the educational community to participating teachers and principals, Ministry planners and policymakers, teacher educators and researchers. The aim of the dissemination strategy to date

Figure 1. Schematic representation of the components of the Core Program
has been, wherever possible, for the educational community to own the findings and, in turn, for the Core Program to act as a catalyst for teacher and administrator, policymaker and research debates over pedagogy and change. At the same time, some key areas identified in early findings have been mapped out for developmental and intervention strategies. These include: the development of alternative assessment models, co-curricular planning of integrated programmes in primary and lower secondary years, in-service work on classroom talk, and various other teacher development activities. Without pre-empting the findings of the Core, the overall strategy is to move from descriptive to targeted teacher, school and curriculum development strategies as soon as evidence is in. This has begun in 2005.

The research program employs a variety of design and analytic strategies, over short-, medium-, and long-term time spans. The central focus is pedagogy. Principles for the Core Program therefore include:

- A rich description of pedagogy and pedagogical change as the central dynamic of educational experience;
- Multiple design strategies and analytic methods. These include: blending quantitative and qualitative methods to enhance both generalisability and validity of findings; the blending of cross-sectional and longitudinal studies to provide both synchronic and diachronic views of pedagogy and student pathways; and the use of multilevel quantitative analyses to provide as contextually rich a view of the mediation of achievement and consequences as possible;
- A redefinition of educational outcomes to include: conventional institutional measures (e.g., exam and test scores, school-assigned marks), as well as student-produced artefacts (e.g., student work produced in class and at home) and, as tracked through online and face-to-face surveys, student beliefs, attitudes and values and their subsequent life pathways and destinations.

The Panels

The Core Program comprises six distinct lines of research, referred to as “panels” (see Table 1). Each panel addresses a specific question about current practice, and its findings have conceptual and empirical relationships with those of other panels.

Panel 1: What Student, Community and School Factors Contribute to Test/Examination Results?

Panel 1 draws upon system-wide data to develop descriptions of student cohorts, their achievement patterns, and the community and institutional contexts of Singapore education. In the tradition of Coleman studies in the 1960s, it attempts to provide a systematic account of how various individual and cultural, social and economic factors influence school achievement (for recent examples, see Lucas, 2001). The database includes individual student achievement data at years 4, 6, 10, 11 and 12, including high-stakes exam results. All students over a ten-year period from 1993–2002 are included in the database, which also captures data on students’ sociodemographic and
cultural/linguistic backgrounds. Additional major sociolinguistic survey and home/community observation studies are underway to provide a further detailed picture of the interaction of multilingual and bidialectal linguistic resources and school achievement. Institutional, community, staffing, and social-organisational profiles of all schools are also available. All data is fully coded and anonymised, and use is constrained by conventional ethics and confidentiality protocols.

Multilevel modelling is underway to determine school, demographic, institutional and individual student effects on academic performance. The comprehensiveness

<table>
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<tr>
<th>Panel focus</th>
<th>Research question</th>
<th>Instrumentation/data</th>
</tr>
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<tbody>
<tr>
<td>1. Student background and achievement</td>
<td>What student, community and school factors contribute to test and examination results?</td>
<td>Socioeconomic, demographic, cultural/linguistic background, achievement data on 500,000 students and 340 schools, 1993–2002.</td>
</tr>
<tr>
<td>2. Student and teacher attitudes, beliefs, motivations, strategies and practices</td>
<td>What student and teacher attitudes, beliefs and strategies contribute to educational achievement?</td>
<td>Online cross-sectional surveys of 4,000 teachers and 16,000 students.</td>
</tr>
<tr>
<td>3. Classification and framing of knowledge in classrooms</td>
<td>What are the pedagogic codes in Singapore classrooms?</td>
<td>Classroom coding and observation of 920 primary and secondary lessons from 56 schools in key curriculum areas over a two-year period.</td>
</tr>
<tr>
<td>4. Linguistic, interactional and activity structure of classroom phases, lessons and units</td>
<td>What are the classroom linguistic, interactional patterns and activity structures of Singapore classrooms?</td>
<td>Transcription, corpus linguistic coding, multidisciplinary text analyses of 920 lessons; detailed video- graphic analysis of selected lessons.</td>
</tr>
<tr>
<td>5. Knowledge and intellectual artefacts</td>
<td>What is the quality of knowledge and semiotic artefacts that students produce in schools?</td>
<td>Teacher-moderated assessments using aligned scoring rubrics of approximately 8,000 student classroom-produced artefacts, homework and project work pieces.</td>
</tr>
<tr>
<td>6. Life pathways, destinations and educationally acquired capital</td>
<td>What are the educational consequences and life pathways of Singaporean youth?</td>
<td>Longitudinal tracking study of attitudes and beliefs of 32,000 students in 115 schools and post-secondary institutions, including large cohort of school leavers as they go on to further study and enter the workforce.</td>
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Table 1. Core Research Program panels
of the database allows quantitative modelling of the complex interactions of student socioeconomic, cultural and linguistic resources; and how these differentially impact school achievement. This panel also provides correlational data for more focused analyses of the relationships between the factors studied in other panels. That is, the baseline student background data in Panel 1 can be connected to the results of Panels 2, 3, 5 and 6 for a series of studies on patterns of educational mediating factors and effects (e.g., how student background interacts with particular pedagogic, school or curricular contexts to produce differential outcomes, both in conventional and alternative measures). As in Panel 6 below, various sociological models of capital and mobility are under study for possible application (e.g., Lin, 2003; Lucas, 2001).

Panel 2: What Student and Teacher Attitudes, Beliefs and Strategies Contribute to Educational Achievement?

Panel 2 is a multicohort, multilevel cross-sectional study of pedagogical practice and student achievement across a sample of primary and secondary Singapore schools. In 2004, the sample size was about 16,000 students and 4,000 teachers, with replication of the survey planned for 2005 and 2006. It has three goals: (1) to document teacher and student accounts of teaching practice and student classroom experiences; (2) to examine how school-level, classroom-level, and student-level factors contribute to individual differences in student engagement, academic achievement, and other educational outcomes; and (3) to identify and model characteristic school-level practices.

Specifically, Panel 2 focuses on the following outcome measures:

- students’ academic achievement as measured by newly developed assessments in English and Mathematics;
- students’ exam performance as measured by the results of the PSLE, O-level, and A-level examinations;
- students’ orientations to learning, including levels of motivation and engagement;
- metacognitive and self-regulatory processes;
- patterns of regular pedagogical practice in classrooms;
- teachers’ orientations to teaching and pedagogical improvement;
- aggregated measures of students’ achievement and other outcomes at the school level.

Key independent measures include:

- individual characteristics of students (gender, age, previous exam performance, orientation to learning, educational aspirations);
- characteristics of students’ family background (family socioeconomic status, ethnicity/first language, family resources and support for learning);
- the social composition of schools and classrooms, as measured by aggregated measures of individual characteristics and family background characteristics;
• classroom organisation, teaching practices, classroom climate, opportunity to learn, task structure;
• school organisation, including decision making, leadership, climate.

Since students and teachers are active participants in day-to-day classroom activities, their reports of the classroom provide insights into various aspects of classroom features, processes, and dynamics. Survey data are collected via web-based administration on a large scale, and cover a large number of topics. Large sample sizes permit generalisation to the population, and allow analysis at both the full sample and subgroup levels. Subsequent qualitative and narrative studies of interventions, teachers’ work accounts and biographies, and school change are underway to augment this database.

Panel 3: What Are the Pedagogic Codes in Singapore Classrooms?

Panel 3 involves the classroom coding and observation of 920 primary and secondary lessons from 56 schools in key curriculum areas over a two-year period. The corpus principally focuses on classroom lessons in Primary 5 and Secondary 3 in the subject areas of English, Tamil, Malay, Chinese, Science, Mathematics, and Social Studies. In 2005, light sampling of early primary (primary 1–3), junior college (senior secondary 11/12) will be undertaken. The coding scheme has been augmented and modified to provide subject-specific curriculum and classroom discourse descriptions in the “mother tongues” (Tamil, Malay, and Chinese); and teams at the National Institute of Education are undertaking modifications of the scheme to look at early childhood, arts, and physical education.

To date, only the Newmann and Associates (1996) and Queensland studies (Lingard et al., 2003) provide quantitative descriptions of classroom practice within school systems; that is, non-self report descriptions of practice beyond single case, ethnographic and narrative description. These coding studies enable claims about what teachers and students do in particular school types and population characteristics. Both studies also moved beyond a reliance on traditional outcome measures (e.g., standardised achievement test data and/or high-stakes curriculum examination outcomes), as we do in Panels 5 and 6 below. Yet due to sampling limitations, neither study was in a position to make generalisable claims about the quality of pedagogy across a system, which the current study proposes. Further, although the two prior models used higher level modelling techniques to connect pedagogical patterns with school achievement data, there were systemic limitations on the available individual student and disaggregated school and classroom-level data. In this way, both studies offered powerful aggregate descriptions but claims that are difficult to generalise across populations and school types.

Newmann et al.’s work changed the way that minority and “at risk” achievement and pedagogic strategies are conceptualised. Further, its nested design model has refocused international work on school reform from managerialism back to pedagogy and curriculum. In the Queensland case, the aggregated description of pedagogy,
specifically, findings about the limits of “higher order” work in classrooms, were used as the basis for ongoing in-service and curriculum reform work across Australia (Lingard et al., 2002; Luke, 2005).

Panel 3 of the Singapore Core Program has piloted and implemented a new coding scheme that reliably captures important features of classroom teaching and learning activities. Unlike the Newmann and Queensland models, it codes a series of nested elements, beginning from teachers’ thematic and content units, breaking these into lesson events, and thence into distinctive phases or activity structures. Coding is undertaken by subject specialists, and interrater reliability is monitored during extensive training sessions and in the field. Several items were developed in consultation with Singapore teachers and principals to capture what they perceived as key features of Singaporean classroom practice. These look specifically at aspects of classroom affective tone and structures of motivation.

This data leads in two directions: first, the broad quantitative picture of teaching and knowledge in the classroom will act as the basis for subsequent empirical analyses of the relationships between pedagogical practices, demographic and institutional variables, and success measures. That is, its quantitative outcomes will be used in subsequent higher level modeling of the empirical relationships between particular representations of knowledge and frames of classroom interaction, on the one hand; and particular student characteristics, conventional achievement patterns, and the production of textual artefacts, on the other. Second, Panel 3 classroom data is audio taped for transcription and secondary qualitative, linguistic and discourse analysis, described in Panel 4 below.

The Singapore Coding Scheme (Luke, Cazden, Lin, & Freebody, 2005) proceeds in different directions from the aforementioned studies. It operates on two separate axes drawn from the work of Bernstein (1996) on “pedagogic discourse”. It looks at how knowledge is framed; that is, how the social interaction of teacher/student discourse and behaviour creates a mediating environment for working with ideas, knowledge and texts, using a range of semiotic tools and artefacts. Its emphasis, then, is on the classroom as a discourse site for the construction of artefacts and knowledge. This translates into a reliable quantitative picture of the different “phases”, activity structures, and social relations in the classroom, including descriptions of the focus of classroom talk, its regulatory and behaviour functions, engagement levels, types of stated motivation structures, classroom spatial organisation and so forth.

The coding scheme also uses Bernstein’s (1996) notion of the classification of knowledge. Unlike the Newmann and Queensland studies, it moves away from an attempt to code “higher order thinking”, which proved too high inference as an observational construct. Instead, it focuses on the representation and scaffolding of knowledge, using a range of scales to examine epistemological sources of knowledge, disciplinary framing, depth of disciplinary concepts and discourse, knowledge reproduction and construction, and levels of critique. The capstone of the scheme is a description of “weaving” between kinds and levels of knowledge, under the operational hypothesis that effective teaching may shift kinds and levels of knowledge.
Panel 4: What Are the Linguistic, Interactional Patterns and Activity Structures of Singapore Classrooms?

While Panel 3 gives us an overview of classroom knowledge representation and social/interactional mediation, a more precise description of the distinctive features of Singaporean pedagogy requires more fine-grained analyses. Panel 4 provides illustrations of what the key coding categories actually look like in action, and of the ways in which these features operate together in actual classroom talk. This panel aims to engage in significant analyses of the classroom talk from qualitative perspectives, partly to discover new features of classroom activity, and partly to illustrate key findings from Panel 3. Finally, this panel provides a database from which material may be drawn, either in audio or video form, for use in follow-up research and professional development programmes.

All of the lessons observed and coded in Panel 3 are audio taped. They are then transcribed and archived. The transcribed corpus will comprise over 900 lessons from primary and secondary school classrooms. Using factor and cluster analyses from the Panel 3 coding data, specific lessons are subsampled for closer discourse analysis. There are many disciplinary techniques for examining the linguistic, pragmatic/interactional and social exchange patterns of classroom talk (Austin, Dwyer, & Freebody, 2001; Cazden, 1988; Edwards & Westgate, 2002). Various teams have begun to analyse the data using tools from ethnography of communications, systemic functional linguistics, ethnomethodology and critical discourse analysis.

Specific illustrative questions for this panel include:

- How do teachers participate in and structure the talk of students working in whole-class discussions sessions, small group work sessions, and individual seat-work sessions?
- What kinds and levels of knowledge do teachers and students emphasise as relevant to the classroom task at various stages of a work unit?
- How explicitly do teachers set out the demands and expectations of the classroom work (exchanges, phases, lessons and units)?
- How do teachers introduce and frame new, advanced and technical knowledge? How are these reiterated and connected with other kinds and levels of knowledge?
- What kinds of relationships to authoritative and powerful knowledge do students engage with? How do they relate to different sources and modes of knowledge?

The transcribed lessons will be tagged and compiled for corpus linguistic analysis. The total corpus of lessons will then be queried using both Panel 3 clusters (e.g., lessons that load on critical representations of knowledge), the findings of the multilevel analysis (e.g., lessons or phases that seem to engage at-risk science learners), by disciplinary field (e.g., Chinese lessons), school type, level, and by linguistic or discourse features (e.g., lessons or phases of a particular activity type, or with high use of nominalisation).

The analysis can then be used to illustrate, supplement or extend findings from Panels 2, 3 and 5. At the same time, specific teachers and units will be identified for
videographic recording and analysis. The aim is to capture model lessons in particular curriculum areas and methods for subsequent analysis and, where appropriate, pre- and in-service training use.

**Panel 5: What is the Quality of Knowledge and Semiotic Artefacts That Students Produce in Schools?**

Following Newmann and Associates' (1996) designs, the focus of Panel 5 is on the institutional framing and construction of student work, as well as the cognitive and intellectual, disciplinary and textual features of student artefacts produced. This is central to the overall design, providing an alternative but valid way of assessing students' work, and seeing how these assessments may differentially align with conventional outcomes on tests and exams.

Its object is a corpus of 8,000 student-produced artefacts, collected from all lessons coded in Panels 3 and 4, by students described in Panels 1 and 2. Its aim, therefore, is to examine the relationship between institutional, background and pedagogical factors, and the artefacts produced by students in daily classroom work and homework. The collected samples of student work range from worksheets, specific prose genres, to multimodal texts. As they collect student work, Panel 3 coders document how the work is instructionally set up in the classroom, how procedures and expectations are framed, and how criteria for assessment are explicated.

Two sets of scoring rubrics have been developed for panels of expert teachers to rate the quality of assessment tasks and of students’ work. These rubrics rate student work on both descriptive grounds (e.g., genre, topic), and categories for disciplinary depth, intellectual and knowledge demand, critique, levels of technicality that match the “knowledge classification” domains of the Panel 3 classroom coding scheme. Following extensive trialing, teams of experienced teachers from each priority curriculum area (i.e., English, Social Studies, Mathematics, and Science) rated the student artefacts collected from the first year of research. The psychometric quality of the task and student work rubrics is being studied and generalisability studies are underway to investigate the consistency of raters in their scoring of the assessment tasks and students’ work. Extended prose samples are being assessed using quantitative discourse analytic methods that will focus on genre, discourse contents, themes, lexicalisation and other technical features.

Panel 5, therefore, will provide us with cross-sectional analyses of the characteristics of student work produced in Singapore classrooms, from worksheets, to extended prose, multimedia artefacts, and integrated projects. This should provide valuable descriptive pictures of the daily evaluation and assessment practices and the actual intellectual and cognitive products of classroom work and homework. Subsequent correlational studies should be able to identify: (1) which pedagogical practices appear to produce particular kinds and levels of student knowledge, skill and competence. Further, they should also provide data on (2) where these classroom work and home-produced artefacts align or disalign with the domains of conventional tests, examinations and grades.
Panel 6: What are the Educational Consequences and Life Pathways of Singaporean Youth?

Panel 6 is a longitudinal study designed to capture and measure individual changes over time as students move through and out of the school system (e.g., Singer & Willett, 2003). It is a multicohort, multilevel longitudinal study of a representative sample of primary, secondary and post-secondary students over a period of five years. At end of 2005, 30,000 current students will have participated over the course of this panel's data collection period. The objective is to measure and explain changes over time in the social and educational experiences, attainments, and pathways of three cohorts of young Singaporeans.

Educational effects, including social, cultural and economic effects, may be readily evident only in short-term follow-ups; or they may take some time to become fully evident in their consequences for school learning and post-schooling pathways, in particular when interventions are aimed at close-simulation, authentic learning. A range of time frames allows for good estimates of the stability and longevity of teacher and pedagogical effects. Similarly, the intended effects of an educational intervention may be visible immediately or in the short term, but potentially significant unintended effects may emerge only after the passage of some time in or out of school.

Specifically, the study focuses on measuring and explaining changes in, and relationships among, the following sets of outcome measures:

- educational outcomes, such as exam performance, educational attainment, engagement, post-secondary aspirations;
- labour market outcomes, such as labour market participation, occupational attainment, acquisition of “new economy capacities”, attitudes to risk and uncertainty, IT competencies;
- understandings of social and economic opportunities structures, such as the importance of educational qualifications;
- emigration plans;
- social participation, such as school activities, community groups, friendship and sociability patterns;
- citizenship variables, such as civic dispositions, civic skills, participation, identity and attachment, knowledge;
- sense of subjective well-being/life satisfaction, self-concept, identity formation, agency, mental health; and
- life plans and pathways goals and choices in such areas as work, family, education, friendship, community, citizenship.

Analytically, Panel 6 focuses on answering the following key questions:

- To what extent and in what direction do the outcome measures change over time?
- How do growth rates in the outcome measures vary by institution, stream, and demographic group?
- What factors explain variations in growth rates in the outcome measures? For example, to what extent are variations in longitudinal measures of educational
achievement accounted for by individual characteristics, family background, schools attended, streaming, and exposure to specific pedagogical practices?

- What life pathways do young people construct and pursue through and after school? What distinctive configurations of life goals, plans and choices can we identify? When do these life pathways patterns emerge? How do these pathways vary by social background, social circumstance, and educational experience? What factors—individual characteristics, family background, school practices and experiences—explain variation in these pathways?

- In what ways and to what extent do schools and school practices construct particular kinds of life pathways for different kinds of students? How porous or elastic are the boundaries between life pathways; that is, to what extent do school practices permit mobility across pathways?

- How much of the variance of changes in the outcome measures is explained by differences between schools—how much is explained by primary school attended, how much by differences between classrooms and streams within schools, and how much by differences between students within classrooms?

- What schools have the strongest impact on growth rates in key relevant outcome measures controlling for the initial or intake characteristics of students? What are the characteristics—and characteristic practices—of these schools?

The Core project, then, leads via a close inspection of pedagogical action and practice to a consideration of impacts of schooling on the material conditions, cultural forms and discourse practices, identities, aspirations and pathways, patterns of work, leisure and consumption in the everyday lives of students (Heinz, 1999).

**Multilevel Design**

We began this article noting the complexity of moving from narrative educational policy goals to practical classroom change. We also outlined that the limitations of simple test and exam score driven approaches to systems accountability. The central problem facing educational innovation and reform at the systems level is the empirical and interpretive gap in understanding the complex relationships between decisions about curriculum change, resource flows, institutional organisation and so forth; and how these impact on individual classrooms, ultimately yielding patterns of changed student performance, whether construed in test scores or other measures.

The original research design by Newmann and Associates (1996) recognised the ecological characteristics of schools as systems. Multilevel designs are nested designs; they recognise the hierarchical nature of much of social, institutional and organisational data. In education, for example, students are nested in classrooms, classrooms in schools, and schools in communities and/or systems. In terms drawn from sociocultural psychology (Cole, 1996; cf. Freebody, 2004), these environments are mediating environments, where social relationships between teachers and students create different enabling conditions for knowledge and intellectual, discourse and textual work. These in turn generate student products and artefacts—read and
written, spoken and thought, print and digital. The artefacts model and illustrate the kinds of skills and knowledges, beliefs and ideologies, competencies and practices that are then translated into credentials used in gainful life pathways. The Singapore Core Project enables the analysis of which factors—individual and group, outside of formal schooling and within schools—work together to contribute to and constitute student educational outcomes. At the same time, the design expands beyond the assessment of educational “outcomes” to broader concepts of the individual, community and, indeed, national consequences of education.

By the end of 2005, two years since its start, the Core project will provide a comprehensive overview of the inputs, processes and consequences of schooling. Its achievements to date are due to the scale of the system, physical and professional accessibility of the schools, the relationship between the Ministry and the educational research teams involved (now numbering over 100 researchers), the support of literally thousands of principals and teachers, and the commitment of all to the multilevel, multidisciplinary research programme described here.

Bringing Together Research, Innovation and Pedagogy

In a historical moment where educational systems everywhere seem engaged in a perpetual, at times superficial, celebration of “traditions of the new”, it is all too tempting to chase pedagogic trends and vogues, and to sidestep the reality that the actual grounds for educational policy and planning remain unfixed. Rhetoric and official websites aside, school systems internationally are proceeding without prototypes about how to educate by and for new globalised knowledge economies, the creative and intellectual demands of new institutions and cultures, complex multilingual and multi-ethnic cultures and religions, and critical, informed and cosmopolitan citizenship. The claim that decentralisation, school-based management, marketisation, the standardisation of curriculum into commodity, or technology will address these problems sans fundamental consideration of classroom practice is at best naive.

The Core project brings together research, innovation and pedagogy as key nodal points for change. It assures that educational innovation and reform in this Asian-Pacific context will be based on a clear analysis of “what is”, of the local convergence of histories, cultures, languages, policy and practices—rather than an imported or extrapolated model that might have worked in another context. Further, it models what educational policymaking and debates based on comprehensive, multilevel, multidisciplinary research might look like. Finally, it pushes Singaporean and Asian researchers to the forefront of research design and analysis, with innovative instrumentation and interpretation.

The automatic importation of state-of-the-art pedagogic and policy models from North America or the UK does not logically, historically or scientifically apply. No one would purport that No child left behind would be the policy of choice for any educational system committed to the production of new knowledges and competencies suited for rapid and transformative economic and social change,
state-mandated multiculturalism and multilingualism, and cosmopolitan cultures and
citizenship. The classical move of assuming a priori that a particular Western
educational reform (e.g., increased testing; decentralisation and school-based
management; any of the extant varieties of progressivism; or, even, direct instructional
phonics methods transplanted into other writing systems, languages and literary
histories) might generally apply has run its course.

The research agenda presented here has a singular focus on what happens in
Singaporean classrooms as teachers and students engage with both traditional,
longstanding practices and more recently initiated activities and approaches. It
addresses two of the key local and regional issues noted at the onset of this piece. First,
it will provide us with an accurate classroom description of teacher and student
interaction around knowledge and text. Such a description will for once move beyond
sterotypes about Asian education, and provide empirical grounds for a debate over
the future directions and shapes of new pedagogies and knowledge.

A well documented view of everyday classroom life also provides vocabulary for
discussing reform, innovation and change in pedagogy. This approach to innovation
anticipates and works with and through the complex teacher and student uptakes of
centrally mandated reforms. It has the potential to push past the presuppositions
of neoliberal school reform—that “steering from a distance” via central manipulation
of performance indicators, that innovation in pedagogy and school organisational
capacity via marketisation of schools and commodification of curriculum and
knowledge are inevitable approaches to school governance. To date, over 3,000
teachers have been engaged in briefings, discussions and dialogue over preliminary
findings. In 2005, the Centre will attempt to reach and engage a third to half of the
Teaching workforce in Singapore. If the focal point of the analysis is teachers’ and
students’ work in classrooms, then the audience for much of the research should and
will be principals, heads of departments and teachers.

As importantly, the design enables us to address the key sociological problem in
economies, societies and multicultures in rapid historical transition. The Core will
follow students through formal schooling into further educational and training,
vocational and social environments. It will document their engagements in the labour
market, education and training, social and community activities; and examine their
sense of social, psychological and economic well-being. The result will be a rich
picture of new generational identities, beliefs, ideologies and practices, new material
forms of mobility and location—literally, the shapes of new life pathways.

The discovery and invention of new, innovative pedagogies that fit these new
contexts and pathways is central for an education system tasked with the sustainability
of a geographically small, multiracial and multireligious, historically “at risk” city
state. To enlist a cliché, as technical as the Core research project may seem, it isn’t
exactly rocket science. It begins from what should be self-evident to teachers and
students, principals and educational policymakers: that what counts as education and
that the outcomes and consequences of education are made and remade each day by
teachers and students in classrooms. Further, the argument goes something like this:
that to innovate, reform or take this or any system to the next level—one that has
national, regional and cultural salience and relevance, economic and social power, intellectual and cognitive capacity—requires that we begin from teachers’ and students’ work. Educational innovation is first and last about teachers and students, where they begin, what they experience, and where they end up. All our other efforts depend upon our attention to this simple proposition.

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Notes

1. These estimates were based on a calculation of total expenditure by national funding bodies on educational research (e.g., Australian Research Council, Social Sciences and Humanities Research Council) for 2003, divided by total population. Singapore’s per capita investment in educational research—not teacher education and professional development—is approximately SG$2.10 per capita.

2. See relevant papers and technical reports at the CRPP website: www.nie.crpp.edu.sg. The first major technical reports from the Core Program will be completed in mid-2005.

3. See the project description for the Speak Campaign study by Vaish, Aman and Bokhorst-Heng. This is the first comprehensive sociolinguistic survey of home and community language use of 700 Singaporean students, who will be matched to Panel 1 and 3 data above. A subsample will be culled for ethnographic home studies, several of which have already been undertaken by Abu Bakar, Shegar and others. For details, see the CRPP website: www.crppe.nie.edu.sg.

References


