Evidenced based ICT reform

Singapore Education System

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Can technology aid in enabling 21st century learning? And be a catalyst for system change?
Our ICT Masterplan Journey

**MASTERPLAN 1**
(1997-2002)

Building the foundation
ICT become an accepted tool for learning and teaching

**MASTERPLAN 2**
(2003-2008)

Seeding Innovation
Generate innovative practices through schemes

**MASTERPLAN 3**
(2009-2014)

Strengthening & Scaling
Harnessing ICT, Transforming Learners

**MASTERPLAN 4**
(2015 & beyond)

Deepening Learning, Sharpening Practices
Future-ready and responsible Digital Learner
“What is critical... is that we fire in our students a passion for learning, instead of studying for the sake of getting good grades in their examinations. I must say this passion is generally lacking among our students, including many among our most able. Their knowledge will be fragile, no matter how many ‘A’s they get, unless they have the desire and aptitude to continue discovering new knowledge well after they leave school.

Prime Minister, Goh Chok Tong, Speech at the Opening of the 7th International Conference on Thinking in 1997, para. 21.

Teach Less, Learn More (TLLM, 2004)

<table>
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<tr>
<th>MORE….</th>
<th>LESS….</th>
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<tbody>
<tr>
<td>Focus on Quality of Learning Engaged Learning</td>
<td>Focus on Quantity of Learning Drill and Practice</td>
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<td>Differentiated Teaching</td>
<td>‘One-size-fits-all’ Instruction</td>
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<td>Guiding, Facilitating, Modelling</td>
<td>Telling</td>
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<td>Formative and Qualitative Assessing</td>
<td>Summative and Quantitative Testing</td>
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<td>Spirit of Innovation and Enterprise</td>
<td>Emphasis on Examinations</td>
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Inquiry-Based Learning (IBL) through Interventions

**Process-learning** embedded within Inquiry-based practices

- Questioning
- Problem Solving
- Critical Thinking
- Argumentation
- Metacognitive Thinking
- Knowledge Construction
- Creativity & Imagination
- Aesthetics & Design Thinking

*Performative Pedagogies (PP)*

Adapted from David Hogan

MOVING FROM MONOLOGUE TO DIALOGIC PEDAGOGIES

Interventions beginning at classrooms and not at labs

- Knowledge transmission
- Content receiving
- Textbook Abstractions
- Embodied Cognition
- Linear modes of learning
- Learning about

- Knowledge Co-creation
- Appropriating lenses for meaning-making
- Experiential Learning
- Conceptual Understanding
- Formative Tracking
- Iterative Cycles
- Learning as Becoming
From knowledge transmission and acquisition to knowledge co-creation
From Content Receiving to Appropriating lenses for meaning-making

Now, why do you think the author chose this title? What do you think the author wants you to understand from this book?”

Teacher modelling: “I’m not clear on that. I wonder why the author doesn’t give more explanation?”

Teacher: How would you feel if you were in that position? What would have been your reaction?

Level 0: Emphasis on Polya stages e.g. What Polya stages are you in now? Do you understand the problem? What exactly are you doing? Why are you doing that?

Level 1: Specific heuristics e.g. What don’t you try with ...... (problem specific)?

Level 2: Problem specific hints e.g. Think in terms of smaller number...... what numbers will you try?
From *textbook abstractions* to *experiential understandings*

*Disciplinary intuitions*
From Embodied Cognition to Conceptual Understanding

Semantic Gravity Maps

Scientific Explanations (gestures)
From summative evaluations to formative tracking
From linear modes of learning to Iterative cycles
From Learning About to Learning as becoming

Informal learning
Equitable access for 21st century learning

Model of systemic change

- Change processes occurring at multiple levels of system
  - Leaders
  - Teachers
  - Students
  - Other stakeholders

- Supporting Policies and Infrastructure

- Organizational structures, norms, and routines
Model of System Change

IMPACTFUL EDUCATION RESEARCH

Theory of Action (science of Learning)
- Letting Go: Seeding innovations on the ground
- Arising from CORE, emergent and designed needs

Design an Intervention
- Implementation design (teacher PD, Classroom context)

Targeted Translation
- Pilot, generate evidence, POCs

Breakthrough Outcomes
- Iteration with Larger Population
- Continual Adaptation and refinement
<table>
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<tr>
<th>Country/City</th>
<th>Focus Reforms that have aligned education systems to 21st century education goals.</th>
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| Hong Kong   | Emphasis on equitable opportunities  
Operational aspects that addresses inter and intra schools’ disparity and diversity  
Holistic education, including ethics and the arts |
| Korea       | Equal learning opportunities according to aptitude and interests  
Quality learning by developing school leaders’ and teachers’ capacity for autonomous school management and school-based curriculum as well as involve stakeholders in decision-making  
Smart textbooks and ecology for change |
| Shanghai    | Social cohesion and selection is interconnected with social equality.  
Social equality in Shanghai’s education context, refers to providing an open opportunity for all to realize upward mobility. Social equality does not mean the same quality education for all.  
Policies which enable reforms |
| Taiwan      | Require supporting structures and teacher training  
To adopt a gradual evolutionary stance with multiple feedbacks and refine loops |
| Singapore   | Policies for encouraging student centered learning and 21st CC  
Centralization and decentralization balances  
Future orientations for preparing learners for the workforce and globalization |
Context and System Logic

The Logic of Instruction in Singapore: Core Programme Model

Cultural and Institutional Environment (Globalization, Knowledge Economy, Cultural Beliefs)

Status Attainment / Social Mobility Practices (Parents, Society)

Labor Market Demand for 21st Century Skills

Parental Social Mobility Aspirations

Parent & Student Social Mobility Aspirations

Folk Pedagogy: Beliefs, Discourses (Society, MOE)

MOE Policy Settings (TSLN, TLLM, PERI, C2015)

C2015 Priorities

Meritocratic Ideology

Curriculum (MOE, School, Teacher)

National High Stakes Assessment System

Textbooks (MOE, Publisher)

Teacher Accountability System

Teacher Capacities and Beliefs

Classroom Instruction (Enacted Curriculum)

Student Outcomes

Teaching to the Test

PCK

Curriculum Mediation

My eyes were opened [to this pedagogy] when I saw my students ask questions … when they saw connections to the concepts we were exploring and going beyond the covered syllabus. …

When the teachers I work with see their students’ change … it is the most powerful

Teacher mentor

previously I just teach based on the syllabus … now I will ask students to make authentic real world connections…

it is OK if I cannot answer the students’ questions …

students direct the learning

Epistemic Shift in Teachers
Student: the teachers are very worried, ‘confirm cannot come up one’, ‘what if they don’t come up with what I want to hear?’ …That’s always their worry. So that’s why, just let go. They just don’t want to let go. So we show that, see, you can let go…. And then show them how we make the links. And they’re like, okay it’s possible. Okay let’s try.

Our research indicates teachers’ epistemic shifts as the highest point of leverage for sustainability
Leadership enabling socio-technical infrastructure for Epistemic Change

- designing for inquiry
- evidence of student gains and development
- Disciplinary ways of seeing meanings

- culture of innovation, risk taking and low recourse to failure
- creating sociotechnological supports and structures for teachers to innovate and learn

- peer apprenticeship learning facilitated through PLCs
- peer observation and modelling facilitated through open classrooms
- embodied participation in lesson re-design

- Micro Layer
- Meso Layer
- Macro Layer
Day (2013, p. 2) states that school leaders “play an important role in establishing the conditions, structures, cultures and climate for professional learning and development in their schools” (p. 2)
.... I think for me, before I could move into being very open about listening to other people … I find that it’s [I come to] an acceptance. Because it’s different from tolerance. You tolerate… every week, you come and you tolerate. You are not taking joy in it. You will not want to participate in it but once you accept it … it’s part of learning as a teacher. And you have to look at it as my students benefit. It’s not just me. But, if I don’t translate all these information or share it with my students, my students do not have the chance. So, why should I be a blocked vessel? So, I would rather take in whatever is good. Of course, I could make my own judgement and then if it is applicable to my class and it benefits them, then why not. Taking joy in acceptance …
Teacher Learning through PLCs and NLCs


Teacher is the heart of system change

- School leadership creates the social-technical infrastructure for sustainability.
- Network of schools create the double-safeguards for change and sustainability.
- Organizational structures, processes, and routines.
“The biggest change we observed through the mp3 years was a change in school culture, based on and enabled by ICT use.”

Robert Kozma & Nancy Law
Students’ gains (agency for learning)

Epistemic change of teachers (by teachers)

Schools with culture and organizational routines for change

Policies which support and enable change
Learners’ agency as a powerful leverage for system change
Grounding all reforms on Learning
Conclusion

Leadership & supporting infrastructures

The Culture of Learning Communities @NLC/ PLC

Teachers engaged in Lesson Co-construction

Agentic Learners

System change at work