Research Policies on Technology-Enhanced Learning: Perspectives from Singapore

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Where is Singapore?

- Singapore’s educational system is recognised worldwide for its rigor.
- Trends in International Mathematics and Science (TIMMS), constantly rank students in Singapore as top performers in mathematics and science.
Need for ICT in Ed Masterplans

- Human capital development – key national focus

- Alignment of economic, manpower & education policies

- ICT in Ed:
  - Preparation for knowledge-based environment
  - Enhance learning experiences
ICT in Ed Masterplan Journey

Building the Foundation

Seeding Innovation

Strengthening & Scaling

1997

2003

2009

Slides 4-12 courtesy of Director, ETD, MOE, Singapore
Core ICT Training for all teachers

ICT Infrastructure & Support for all schools

Educational software & resources for relevant subjects

1997: Masterplan 1
Building the Foundation

ICT became an accepted tool for teaching & learning
2002: Masterplan 2
Seeding Innovation

Baseline ICT Standards for all

Established Baseline ICT Standards for pupils

Generate innovative practices through schemes

Gave autonomy through devolved ICT funds

FS@SG 5% schs

LEAD ICT Schools 15-20% schs

Remaining Schools

Table C: Integration of ICT in Different Subjects

<table>
<thead>
<tr>
<th>Subject</th>
<th>English</th>
<th>Mathematics</th>
<th>Science</th>
<th>Humanities</th>
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<tbody>
<tr>
<td>ICT Skills</td>
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<tr>
<td>Info-seeking</td>
<td>✔️</td>
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<tr>
<td>Design</td>
<td>✔️</td>
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<td>Data Communication</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Fun</td>
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<tr>
<td>ICT-as a Tool</td>
<td>✔️</td>
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<td>✔️</td>
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<tr>
<td>ICT-as an artifact</td>
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IC...
Examples of ICT Use in Schools

- **Learning language using podcasts**

- **Using broadcast technology for English**

- **Mobile Learning**
  - With PDAs and data loggers

- **Role-playing in Second Life**

- **Using blogs and e-portfolios to reflect on their learning**
Future Schools

- School-based curriculum for engaged learning & 21st Century skills
- School-wide innovation of learning & teaching models using ICT/IDM
- R&D to develop understanding & depth
- Partnership with industry
Lessons Learnt

1. The need to bridge the gap between ICT competencies and effective teaching

2. The need to balance between centralisation and autonomy
**‘Curriculum 2015’ Student Outcomes**

<table>
<thead>
<tr>
<th>Confident Person</th>
<th>Self-directed Learner</th>
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<tbody>
<tr>
<td>Thinks independently</td>
<td>Takes responsibility for own learning</td>
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<tr>
<td>Communicates effectively</td>
<td>Questions, reflects, perseveres</td>
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<tr>
<td>Has good inter-personal skills</td>
<td>Uses technology adeptly</td>
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<tr>
<th>Concerned Citizen</th>
<th>Active Contributor</th>
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<tr>
<td>Is informed about world and local affairs</td>
<td>Exercises initiative and takes risks</td>
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<tr>
<td>Empathises with and respects others</td>
<td>Is adaptable, innovative, resilient</td>
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<tr>
<td>Participates actively</td>
<td>Aims for high standards</td>
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**mp3 Goal**

Students develop competencies for self-directed and collaborative learning through the effective use of ICT as well as become discerning and responsible ICT users.
Necessary Transformation

1st Masterplan
Build Foundation

Curriculum, & Assessment
~ ICT supporting curriculum

Professional Development
~ Core training for all teachers and school leaders

Research & Development
~ Spearheading R&D efforts in collaboration with industry & schools

Infrastructure for Learning
~ Central provision to equip all schools
~ One-size-fits-all

2nd Masterplan
Seed Innovation

~ ICT integrated into curriculum & assessment
~ Differentiated Prof Development
~ Consultancy to school leaders
~ Consultancy to school leaders
~ Seeding innovation in schools
~ Seeding innovation in schools

3rd Masterplan
Strengthen & Scale

~ ICT embedded into syllabuses & teaching guides
~ Professional Learning Communities
~ Spearheading R&D efforts in collaboration with industry & schools
~ Spearheading R&D efforts in collaboration with industry & schools
~ Translating research to influence classroom practices
~ Translating research to influence classroom practices
~ Closer alignment to curriculum changes and schools needs
~ Closer alignment to curriculum changes and schools needs
mp3: From Ideas to Practice

- Ideas creation to Proof-of-concept
  - IDM in Education R&D

- Translation
  - Prototype development
  - Prototype research
  - Future Schools 2.0

- Scaling
  - ICT Mentor, PD framework, ICT connection
Our Research Work in Singapore

LSL set up in 2005 with MOE funding

To foster deep student learning with technology-enabled pedagogical practices for cultivating 21st century knowledge and skills through learning sciences research in Singapore schools

Virtual Science Inquiry
Argumentation in 2\textsuperscript{nd} Life
Mobile Learning
Goals and Deliverables

Long Term Goal: Scalability and Sustainability

- Teacher Education Models
- Alternative Pedagogies
- Conditions and Designs for Innovation
- Making Deep Learning Happen
- Alternative Assessments
- Change Strategies
- Teacher Resources
- Learning Environments

Create Point-at-Able Models of Practice
Work with Partner/Prototype Schools
What Kind of Research is Needed?

- Learning Sciences research to understand how students learn
- **School-based Design Research** to create point-at-able models
- Plan for sustainability and scalability
- Translational research
- Build capacity in teachers to do action research
Design Research

DESIGN RESEARCH FOR BRIDGING PEDAGOGY

Cycle 0 (pilot)
- Intervention Package
  - Instructional lessons/activities
  - Teacher moves
  - Software
  - Professional Development

Cycle 1
- Implement
- Collect Data
- Develop
- Evaluate

Cycle 2
- Collect Data
- Develop
- Evaluate
- Redesign

Cycle 3 and so on...
- Collect Data
- Develop
- Evaluate
- Redesign

End Product
- Comprehensive Instructional Package
- Evidence of what works & how it works
- Deeper understanding of teaching & learning of algebra

Initial Inputs to Design
- Prior research findings
- Pedagogical experts' input
- Teachers' input
- Learning sciences perspectives
- Math education
- Theoretical framing

Design Principles
- Modelling
- Scaffolding
- Automated Feedback
- Mediation for Classroom / Peer Discourse
the Big Challenges

- Gap between articulated policy goals and *what actually happens in classrooms*
- Alignment is key between curriculum, pedagogy and assessment
Bridging Research to Practice: Challenges to Innovations in Schools

- Research communities and schools (practice communities) are 2 separate ecologies
- Innovation needs systemic change (and alignment!)
- How to sustain research innovation in the schools involved in the research?
- How to “translate” to more classes/schools?
What can we do as a Research Lab?

- Build up capacity of researchers and dialogue with stakeholders --- MOE, school leaders, pre-service teachers, in-service teachers, parents, etc

- Recognize synergies across projects for models of
  - Methodology and research design
  - PD
  - Assessment
  - Theory improvement
  - Sustainability and scalability
The End

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