Seamless Learning with Mobile Technologies: Perspectives from Singapore

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Policies and practices on ICT in education in Singapore
- MasterPlans for ICT in education
- FutureSchools@Singapore
- Edulab Programme

Research in seamless learning with Technologies
MasterPlan on ICT in Education I, II & III

Launched in 1997
Vision for the use of IT in education
Prepare students for 21st Century

1997
Building the Foundation

2003
Seeding Innovation

2009
Strengthening & Scaling

Conceptual Framework for mp2
- Pupil
- Teacher
- Process
- School
- National
- Global
- Curriculum & Assessment

Self-Directed Learning
- Ownership of Learning
- Extension of Own Learning
- Management and Monitoring of Own Learning

Effective Group Processes
- Individual and Group Accountability of Learning

Collaborative Learning
Multi-Party Collaboration Approach

Propel-T (Prototyping Pedagogies for Learning with Technology)

EduLab

ICT Connection

FutureSchools Programme

IDM for Education Research

Beacon 1:1

mobile learning for in-situ KB

Seamless Learning

Industry Partners

...
FutureSchools@Singapore

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**Progress**
- Practices
- Review
- Cascading

**Networks**
- Learning Communities
- Communities of Practice

**Places**
- Learning Spaces

**People**
- School Leaders
- Teachers
- School Culture
- Partners

**Programmes**
- Curriculum
- Pedagogy
- Assessment
- Administration

**Engaged Learning (Pupils)**
- Highly-Motivated digital learning life style
- Anytime, anywhere learning
- Enhanced knowledge construction and skills development
- Enhanced collaboration at local, national and government levels
- Enhanced participation by all education stakeholders
EduLab Programme (Seed, Scale, Sustain)

- **Objectives: bringing ideas to practice**
  - Foster ideation and collaboration in experimenting with technology in education
  - Promote adoption of successful use of technology in education
  - Provide ICT infrastructure to facilitate technology experimentation with schools and MOE HQs to assess potential solutions prior to adoption

- **Multi-party collaboration approach**
Where I am coming from?

- 1:1 m-education is experiencing exponential growth.
- Many 1:1 initiatives are not sustainable.


**Education in Peru: Error message**
A disappointing return from an investment in computing

*The Economist, April 7, 2012, “children receiving the computers did not show any improvement in maths or reading. Nor did it find evidence that access to a laptop increased motivation, or time devoted to homework or reading”*
### Why did this happen?

- Focus on device instead of teaching and learning
- The device is supplemental for students’ learning
- Lack good pedagogical model

### Paradigm Shift

<table>
<thead>
<tr>
<th>Device Centric</th>
<th>Content Centric</th>
<th>Student Centric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn <strong>about</strong> Technology</td>
<td>Learn <strong>from</strong> Technology</td>
<td>Learn <strong>with</strong> Technology</td>
</tr>
</tbody>
</table>
Notion of Seamless Learning

- continuity of the learning experience across different scenarios or contexts
  - between formal and informal contexts
  - between individual and social learning
  - between physical and digital worlds
  - across time and locations
  - multi-modality
  - Ubiquitous knowledge access, synthesis and creation

- one device or more per student
### Our pedagogical Model: Seamless Learning with Technology

<table>
<thead>
<tr>
<th>Out Class</th>
<th>Planned Learning</th>
<th>Emergent Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type II</strong></td>
<td>Planned learning out of class</td>
<td>Emergent learning out of class</td>
</tr>
<tr>
<td></td>
<td>E.g. Field trip to heritage site which is part of a school curriculum</td>
<td>E.g. Using mobile phones to capture pictures and video clips of animal and directed by self-interest</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>In Class</th>
<th>Planned Learning</th>
<th>Emergent Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type I</strong></td>
<td>Planned learning in class</td>
<td>Emergent learning in class</td>
</tr>
<tr>
<td></td>
<td>E.g. Searching for answers in the classroom</td>
<td>E.g. Teachable moments not planned by the teachers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Planned</th>
<th>Emergent</th>
</tr>
</thead>
</table>
Lesson Example 1: Project 3Rs

- **Curriculum**: Environmental issues
  - Project 3Rs: Reduce, Reuse, Recycle

- **Pedagogy**:
  - Challenges-Experiential learning (Bransford, et al, 2000; Kolb, 1984)

- **Approach**
  - mobile application to scaffold deeper learning
3Rs: Mobile Learning Activity Design

Activity 1: Packaging

Activity 2: Use of plastic bags

Activity 3: Customer interview

Q1. Do you bring your own shopping bag when you go to the supermarket?

- Yes
- No

Comment:
Challenge:

we will have less fresh water, trees and sea creatures will die and more heat will enter the Earth.

Activity 1:

<table>
<thead>
<tr>
<th>No of Activity</th>
<th>Product</th>
<th>Brand</th>
<th>Type</th>
<th>Comment</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>biscuits</td>
<td>kraft</td>
<td>Paper</td>
<td>it is made of paper.</td>
<td><img src="image" alt="Ritz Crackers" /></td>
</tr>
</tbody>
</table>

Response to the challenge presented to pupils

Data from Activity 1 with pictures taken of packaging

Activity 2:

<table>
<thead>
<tr>
<th>No of Activity</th>
<th>No. of customers served?</th>
<th>No. of customers using reusable bags?</th>
<th>Estimate the No. of plastic bags used?</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9</td>
<td>1</td>
<td>16 (his is 16)</td>
<td>This is the express lane.</td>
</tr>
</tbody>
</table>

Data from Activity 2 on usage of plastic bags
Learning effectiveness

Paired-sample *t* test of Students’ Understanding on 3Rs

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>S. D.</th>
<th><em>t</em></th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Test</td>
<td>1.95</td>
<td>2.05</td>
<td>-7.858**</td>
<td>.95</td>
</tr>
<tr>
<td>Post-Test</td>
<td>4.07</td>
<td>2.35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: ** *p* < .01

Role of mobile application

- To scaffold seamless learning (type I – II) through the Challenges-Experiential Cycle
- To collect data
- To capture students’ thoughts
- Enable collaboration by comparing, contrasting and peer commenting
- Easily adapted to other topics
Example 2: Science – Plant System

- **Pedagogy**
  - Inquiry-based learning
  - Multi-modal learning

- **Approach**
  - Mobilize whole curriculum.
  - Mobile device as a learning hub
Plant System: Activity Design

- Overview of Lesson on Plants and their parts
- Instructions for Plants Activity 1
  - Pen system
- Instructions for Plants Activity 2
  - Plants and their parts
- Instructions for Plants Activity 3
  - Activity 3- Functions of plant parts
- Instructions for Plants Activity 4
- Instructions for Plants Activity 5
  - Plant System
- Rubrics for Choosing the best Sketchy
- Instructions for Plants Activity 6
  - Plants and their Parts
Goals of Lesson

PiCo Map

Sketchy

Picture Taking

Experiment (video)

KWL

Comparison Table

MLE Lesson Package

For learning Plant Systems
Applications for Informal Learning

Mobile discussion forum: for “formalize informal learning”
Applications for Informal Learning

ColInq

Mobile Client

- Picture taking
- Drawing
- inquiry
- video taking

Web 2.0 Client

1. Search results
2. Create discussion
3. View all discussions for this image
4. Maps with location markers
5. Select users to share this content with:
   - Ali Tan
   - Rachel Lin
   - Linda Wu
   - Isabel Ooi
   - Ray Lim
   - Jane Koh
Applications to Capture Seamless Learning

- Developed application to capture log file data & screen shots
Impact of Seamless Learning Project
Experimental class has the highest scores at year-end science exam among the 6 mixed-ability class.

The class difference explains 41% of the variance in year-end exam scores.
### Impact: Attitudes towards Mobile Learning

#### Paired-Sample t test on students’ attitudes

<table>
<thead>
<tr>
<th>Statement</th>
<th>Method</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile device helps me learn my class subjects.</td>
<td>Pre Survey</td>
<td>1.46</td>
<td>.643</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post Survey</td>
<td>1.82</td>
<td>.451</td>
<td>-2.765**</td>
</tr>
<tr>
<td>Mobile device helps me learn things outside of school.</td>
<td>Pre Survey</td>
<td>1.42</td>
<td>.683</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post Survey</td>
<td>1.76</td>
<td>.490</td>
<td>-2.321*</td>
</tr>
<tr>
<td>I like the learning activities using computers and gadgets.</td>
<td>Pre Survey</td>
<td>1.05</td>
<td>.223</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post Survey</td>
<td>1.23</td>
<td>.536</td>
<td>-2.016*</td>
</tr>
<tr>
<td>I learn more when I work in a group than alone.</td>
<td>Pre Survey</td>
<td>1.37</td>
<td>.633</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Post Survey</td>
<td>1.68</td>
<td>.662</td>
<td>-2.634*</td>
</tr>
</tbody>
</table>

- Significant at p < .05
- Significant at p < .01

- students’ attitudes have a positive change towards the use of mobile devices for learning in class
Deeper Impact

- **Infrastructure changes**
  - “mobilized” P3 and P4 science curriculum
  - Less worksheets

- **Teacher changes**
  - From being dominant to being a facilitator
  - Not worried about telling “I do not know”
  - Be able to design effective mobile learning activities

- **Student changes**
  - More ownership of personal constructed artifacts
  - Demonstrated self-directed and collaborative inquiry learning
Characteristics of Seamless Learning

- **Portable:** cross time and location
- **Contextualized:** construct knowledge in situ
- **Networked:** enhances communication & facilitates collaboration
- **Unobtrusive:** use of device assimilated into daily life for communication, reference & learning
- **Personalized:** Adapt to learner’s evolving abilities, skills, knowledge & learning styles
- **Multi-Modal:** accommodating versatile learning activities
- **Accumulative:** resources and knowledge are archived and are immediately accessible

Seamless Learning:

“formalize” informal learning
“Informolize” formal learning
Current Issues for Mobile Learning

- **Device**
  - Balance between functionality and portability
  - School’s decision on device selection is largely depend on the applications and resources
  - Business model: buying or leasing?

- **Mobile application development**
  - Spoon-feeding VS scaffolding

- **Understand school’s perspectives**
  - Driven by traditional assessment
  - Teachers lack support

- **Address parents’ concerns**
  - Eyesight
  - Cyber wellness
Thanks You!

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