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Orchestrating Learning Scenarios for the Borderless Classroom

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Presentation Outline

1. Theoretical background on boundary-crossing learning scenarios

2. Case Study: Singapore Future School project on in-and-out of the classroom inquiry-based learning

What is context?

- The combination of all of the elements surrounding a given event that can be psychologically meaningful, including interpersonal dynamics, situational features owing to a place or location, memories, goals for the future and internal body or brain states (Wager & Atlas, 2015).

- Context arises from the activity. It is not just 'there', but is actively produced, maintained and enacted in the course of the activity at hand (Dourish, 2004)

- Context is largely composed by the interactions that individuals have with entities in the different "compartments" of the world. Entities can be 'objects', 'people', 'processes' and 'ideas' (Westera, 2012).

Example setting

External context

Verbal suggestions:
"This is going to make you feel better"

Place cues:
Doctor's office

Social cues:
• Eye gaze
• Body language
• Voice cues
• White coat

Treatment cues:
• Syringe
• Needle puncture

Internal context

• **Outcome expectancies:**
"My pain will go away"
• **Emotions:**
"I am less anxious"
• **Meaning schema:**
"I am being cared for"
• **Explicit memories**
• **Pre-cognitive associations**

Why is context important for learning?

- The real world attributes of a context enable learners to directly link concepts with their real world counterparts and to put knowledge into action (Westera, 2011, p.201)

- Experience and learn about properties (e.g. smell, weight) of world entities interwoven with context (Schank & Cleary, 1995 in Westera, 2011; Greeno, 1998)

- It allows learners to apply knowledge, skills and attitudes, see their effects and that they are useful to achieve objectives (meaningful learning)

- Construction of knowledge as meaning making in situations and activities in authentic contexts" (Situated learning , Lave & Wenger, 1991)

- Knowledge co-construction (Social learning , Scardamelia and Bereiter, 1999, 2005)

Out Class

Type II
Planned learning out of class
E.g. Field trip to heritage site which is part of a school curriculum

Type III
Emergent learning out of class
E.g. Using mobile phones to capture pictures and video clips of animal and directed by self-interest

In Class

Type I
Planned learning in class
E.g. Searching for answers in the classroom

Type IV
Emergent learning in class
E.g. teachable moments not planned by the teachers

Planned

Emergent

Seamless learning

- "Seamless learning is when a person experiences a **continuity of learning** and **consiously bridges the multifaceted learning efforts**, across a combination of locations, times, technologies and social settings" (Sharples et al., 2012, p.24)

Aims:

- to enable people to **engage in productive self-regulated learning** that spans times, locations, devices and tasks (Wong & Looi, 2012)

  - A learner may experience **a flow state of continual engagement** with a topic regardless of the passing time and changing surroundings (Sharples, 2015). They are **engaged in an overarching context** where they are impervious to physical, temporal, social or technological changes (Sharples, 2015)

What learning and monitoring processes are important for seamless learning?

- Goal-setting, monitoring and reflection

- Flow (Sharples, 2015), focus/attention and motivation (Ryan & Deci, 2002)

- Encoding of cognitive schema (de Jong & Ferguson, 1996; van Merrienboer, 1997)

  – conceptual, procedural and strategic knowledge
     E.g. by cognitive dissonance, induction, deduction, repetition etc.

- Transfer of learning

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How can we foster these learning processes?

Facilitating an 'overarching context' by means of e.g.:

- Inquiry-based learning (weSPOT)

- Experiential learning (Zull, 2002)

- Networked and collaborative learning

- Learning by play; play-based learning

- Problem-based, project based, design based and competence based learning

Fostering activities like:

- Collaboration: knowledge co-construction, argumentation, logics, cognitive conflict/grounding, organization, social binding

- Observation and imitation of examples/role models

- Comparison (of performances, of experiences) and critical thinking

- Story-telling and story-making

- Inquiring/researching and designing/creating

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Case Study:
Singapore Future School Project

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Research Context

1. One of the Singapore Future Schools
   - whole school approach (IDM tools & mobile technologies)
   - small teacher-student ratio (1:20)
   - 1:1 computing (1 Macbook per student)

2. Research project: Mobile learning activities to foster knowledge building & critical thinking skills in integrated humanities
   - Mobile: technological affordances that enhance connectivity and mobility
   - Learning: pervasive knowledge building practices across contexts

Theoretical Framework

| Control distributed across multiple agents e.g. peers, trs. & tools | Sharples, Taylor & Vavoula 2005 Mobile Learning | Context constructed by the learners interacting with the environment |

Orion & Hoffstein 1994

Cognitive space + Psychological space + geographical space

Process-oriented design to frame learners' discourse & interaction: learning objectives, task type, level of pre-structuring & technology mediation as critical design elements

(Strijbos, Martens & Jochems 2004)

Process-oriented Design

1. Learning Objectives

- Inquiry-based Learning:
  BIG (Beyond Information Given) Question

- Collaborative Knowledge Building

- Integrated conceptual understanding (History & Geography)

BIG Question: What is the role of Sentosa in the British's big plan of defence?

Station A

Station B

Station C

Station D

Student groups either follow the route **A-B-C-D** or the route **A-C-B-D** to complete tasks at each station.

Process-oriented Design

2. Task Type

Progressive task structured-ness: well-structured to ill-structured

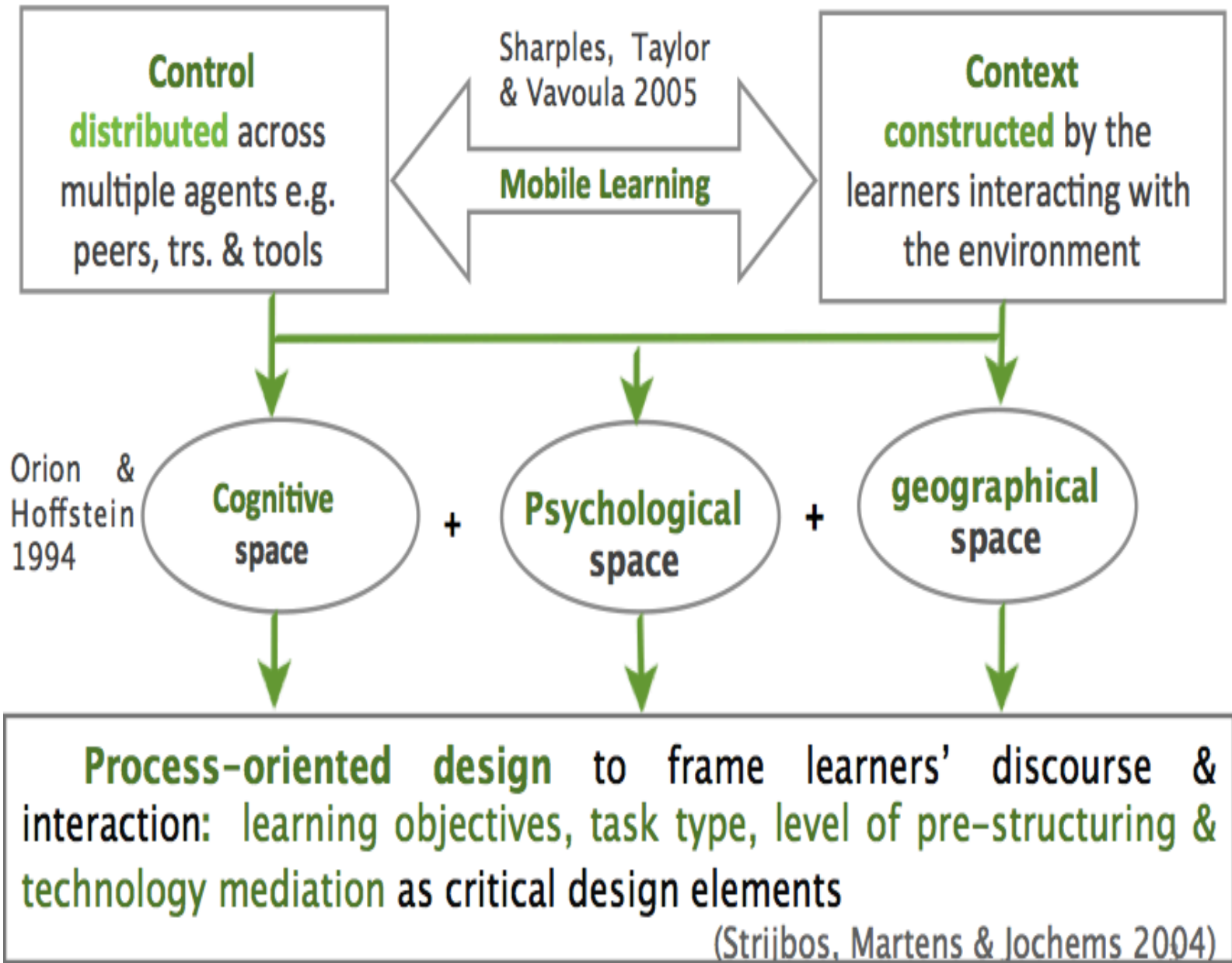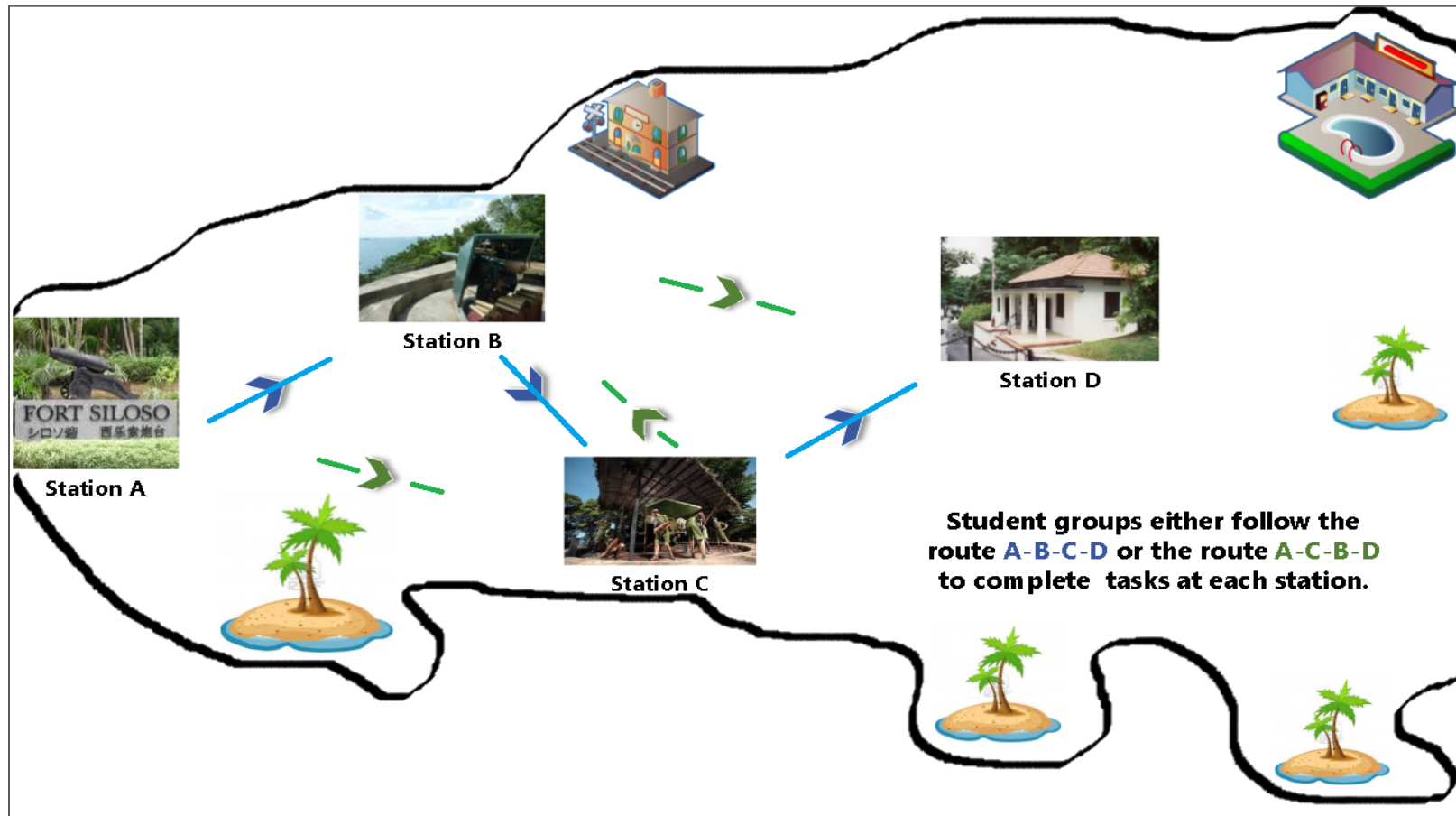| Task type	Description of tasks
Performative	Determine the direction of the guns using the iPad compass
Knowledge Generative	Describe the dimension of the tunnel and state its purpose
Knowledge Synthesis	Why did the British erect another tower in this area?

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Process-oriented Design

3. Level of pre-structuring

- Three-essential pre-field trip variables: "Cognitive, psychological, geographical novelty"

- "… the place of the field in formal curriculum." (Orion & Hofstein, 1994)

Pre-Trial Tune-in Activity	In-Trail Activities	Post-Trial Summary of learning

Process-oriented Design

4. Technology mediation

- Web-based platform hosting all trail tasks, students' collected data & artifacts

- Virtual facilitation: broadcast alert & feedback features

- iPads with embedded apps

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Web-based Platform

Design Progression of the Four Mobile Learning Trails
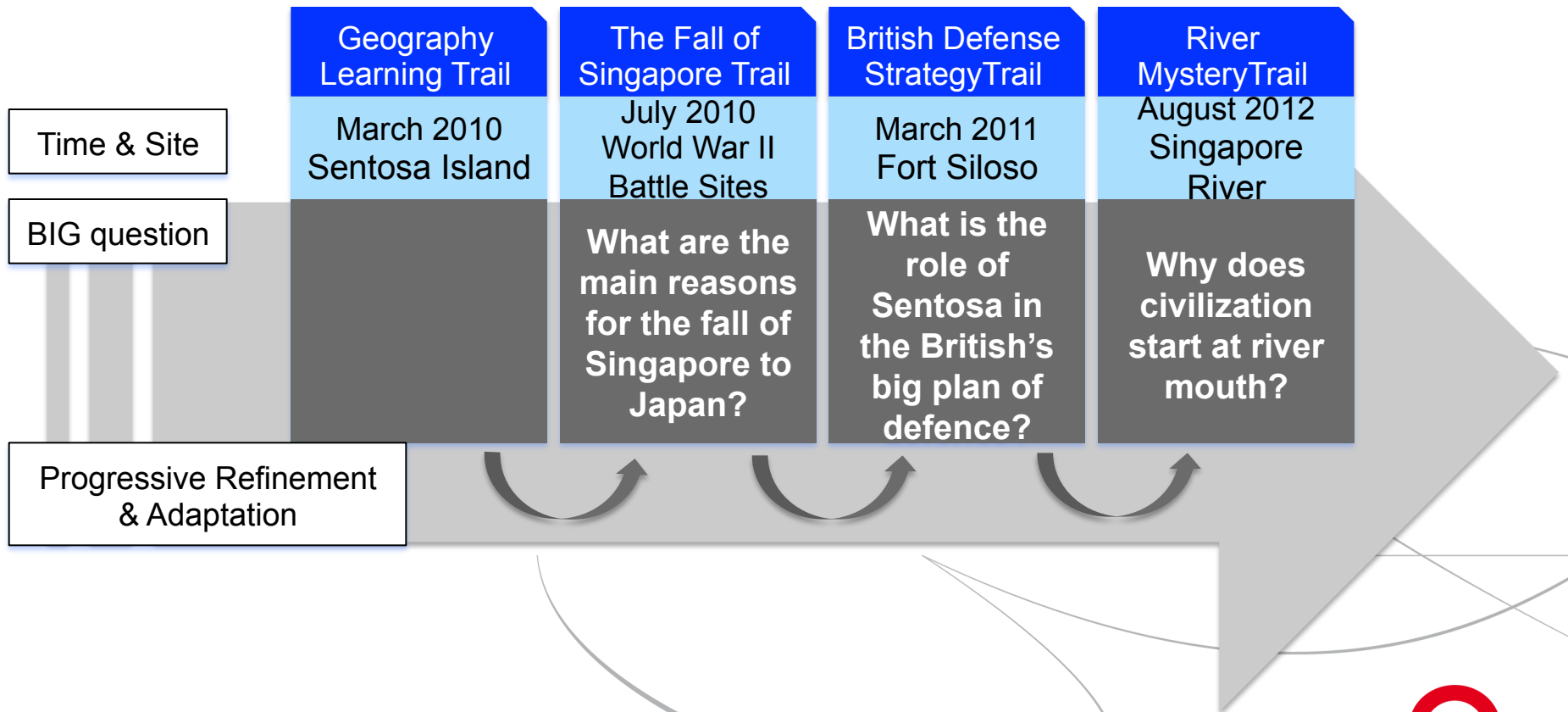
	Geography Learning Trail	The Fall of Singapore Trail	British Defense StrategyTrail	River MysteryTrail
Time & Site	March 2010 Sentosa Island	July 2010 World War II Battle Sites	March 2011 Fort Siloso	August 2012 Singapore River
BIG question		What are the main reasons for the fall of Singapore to Japan?	What is the role of Sentosa in the British's big plan of defence?	Why does civilization start at river mouth?
Progressive Refinement & Adaptation				

Sneak Preview Featuring
the 3rd Mobile Learning Trail
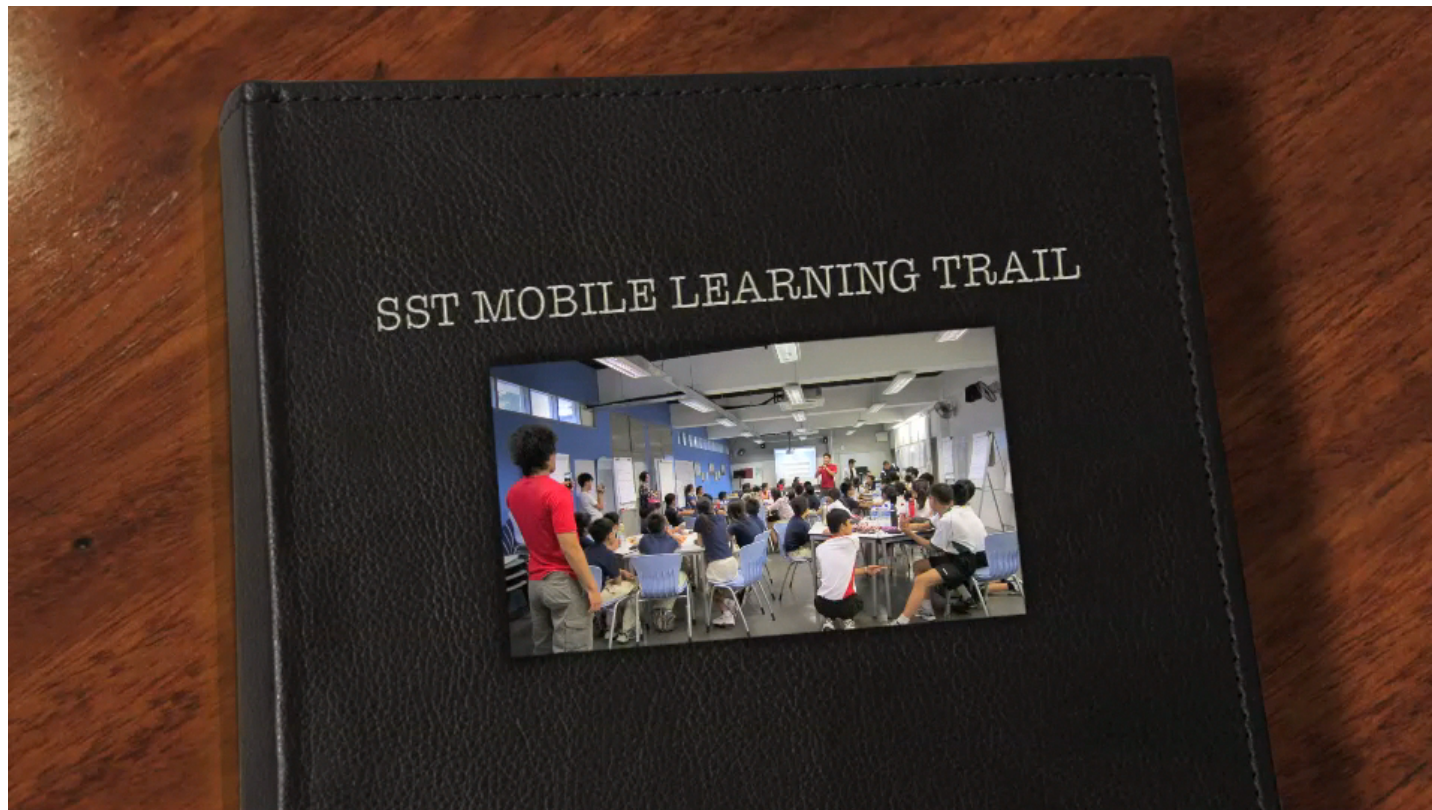
Methodology

- Participants
  - ✓ School of Science & Technology (Future School)
  - ✓ Two classes of students
  - ✓ One high ability (HA) & one mixed ability (MA)

- Data Source
  - ✓ Self Report Measures (Questionnaires)
  - ✓ Focused group interviews with students and teachers
  - ✓ Audio & video-recording
  - ✓ Field notes

Data Analysis Approach

1. Quantitative Analysis

2. Qualitative Analysis

- Verbatim transcription of all audio footage

- Content analysis
Use of semantic boundaries i.e., discussion threads, ideas and turn of talks to define an unit of analysis (Chi, 1997)

Key Findings from the Four Mobile Learning Trails

	Geography Learning Trail	The Fall of Singapore Trail	British Defense StrategyTrail	River MysteryTrail
Time & Site	March 2010 Sentosa Island	July 2010 World War II Battle Sites	March 2011 Fort Siloso	August 2012 Singapore River
BIG question		**What are the main reasons for the fall of Singapore to Japan?**	**What is the role of Sentosa in the British's big plan of defence?**	**Why does civilization start at river mouth?**
Progressive Refinement & Adaptation				
Findings		Lack of continuity & intentional learning	Lack of deep discourse	Task-focused > understanding focused
Repair Strategies in Design		**3-stage model (pre-to-post trail to connect varying contexts of learning)**	**Embed unforeseen variables & contextual resources**	**Embed unstructured activity & facilitate common grounds**

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1. Design Intentional learning Experiences Across Spaces & Time

   ▪ Reduce the 'novelty space': 3-stage Model (Pre-to-post)

   ▪ BIG question: connecting different learning contexts

   ▪ Structured vs. Unstructured learning activity

2. Promote interdisciplinary thinking and discourse

3. Mobile technology - a mediating tool enhances connectivity & mobility in the learning processes.

References

- Bereiter, C., & Scardamalia, M. (2005). Beyond Bloom's taxonomy: Rethinking knowledge for the knowledge age. *Fundamental Change*, 5–22.

- Brown, E., Sharples, M., Clough, G., Tangney, B., Wishart, J., Wijers, M., Polmear, G. (2010). *Education in the wild: contextual and location-based mobile learning in action*. Nottingham, UK. Retrieved from http://dspace.ou.nl/handle/1820/2840

- Dourish, P. (2004). What we talk about when we talk about context. *Personal and Ubiquitous Computing*, *8*(1), 19–30. doi: 10.1007/s00779-003-0253-8

References

- Greeno, J. G. (1998). The situativity of knowing, learning, and research. *American Psychologist 53*, 5–26. doi:doi: 10.1037/0003-066X.53.1.5

- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. (R. Pea & J. S. Brown, Eds.)*Learning in doing* (Vol. 95). Cambridge University Press. doi:10.2307/2804509

- Looi, C.-K., Seow, P., Zhang, B., So, H.-J., Chen, W., & Wong, L.-H. (2010). Leveraging mobile technology for sustainable seamless learning: a research agenda. *British Journal of Educational Technology*, *41*, 154–169. doi:10.1111/j.1467-8535.2008.00912.x

References

- Orion, N., & Hofstein, A. (1994). Factoring that influence learning during a scientific field trip in a natural environment. *Journal of Research in Science Teaching, 31*(10), 1997-1119.

- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *The American Psychologist*, *55*(1), 68–78. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/11392867

- Sharples, M., Mcandrew, P., Weller, M., Ferguson, R., FitzGerald, E., Hirst, T., Whitelock, D. (2012). *Innovating Pedagogy 2012: Open University Innovation Report 1.* doi:10.2791/83258

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References

- Sharples, M., Taylor, J. & Vavoula, G. (2005). Towards a theory of mobile learning. Paper presented at 4th World Conference on mLearning, Cape Town, Africa.

- Strijbos, J. W., Martens, R. L., & Jochems, W.M.G. (2004). Designing for interaction: Six steps to designing computer-supported group-based learning. *Computers & Education, 42*, 403–424.

- So, H., Kim, I., & Looi, C. (2008). Seamless mobile learning: Possibilities and challenges arising from the Singapore experience. *Educational Technology International*, 9(2), 97–121.

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References

- Van Merriënboer, J. J. G. (1997). *Training Complex Cognitive Skills*. Educational Technology.

- Wager, T. D., & Atlas, L. Y. (2015). The neuroscience of placebo effects: Connecting context, learning and health. *Nature Reviews Neuroscience*, *16*(7), 403–418. doi:10.1038/nrn3976

- Westera, W. (2011). On the Changing Nature of Learning Context: Anticipating the Virtual Extensions of the World. *Educational Technology & Society*, *14*(2), 201–212.

- Wong, L.-H., & Looi, C.-K. (2011). What Seams Do We Remove in Mobile Assisted Seamless Learning? A Critical Review of the Literature. *Computers & Education*, *57*(4), 2364–2381. doi: 10.1016/j.compedu.2011.06.007

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References (Future Sch. Proj)

- Cober, R., Tan, E., Slotta, J.D., So, H.J., & Könings, K.D (2015). Teachers as participatory designers: two case studies with technology-enhanced learning environments. *Instructional Science* (2015). DOI: 10.1007/s11251-014-9339-0

- So, H. J., Tan, E., & Tay, J. (2012). Collaborative mobile learning in situ from knowledge building perspectives. *The Asia-Pacific Education Researcher*. 21:1, pp. 51-62.

- So, H. J. & Tan, E. (2014). Designing the situation for pervasive knowledge building: Future school experiences. In Tan, S. C., So, H. J. and J. Yeo, J. (Eds.), *Knowledge creation in education,* (pp. 123-142). Springer.

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References (Future Sch. Proj)

- So, H. J., Tan, E., Y. Wei., & Zhang, X. J. (2015). What makes the design of mobile learning trails effective: A retrospective analysis (pp. 335-352). In L. S. Wong., M. Milard., & M. Specht. (Eds.), *Seamless learning in the age of mobile connectivity.* Springer.

- Tan, E. & So, H. J. (2011). Location-based collaborative learning at a Geography trail: Examining the relationship among task design, facilitation and discourse types. In H. Spada, G. Stahl, N. Miyake, & N. Law. (Eds.). In the proceedings of CSCL 2011 conference: *Connecting computer-supported collaborative learning to policy and practice, Volume 1,* (pp.41-48). International Society of the Learning Sciences.

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References (Future Sch. Proj)

- Tan, E., So, H. J., & Zhang, X. J. (2012). *Teacher Agency and Student Autonomy in an Inquiry-based Mobile Learning Trail.* In the proceedings of the 20th International Conference on Computers in Education (ICCE), Nov 26 to 30, 2012, Singapore.

- Tan, E. & So, H. J. (2013). Students' Capacity for Autonomous Learning in an Unstructured Learning Space on a Mobile Learning Trail. In Rummel, N., Kapur, M., Nathan, M., & Puntambekar, S. (Eds.) (2013). *To See the World and a Grain of Sand: Learning across Levels of Space, Time, and Scale: CSCL 2013 Conference Proceedings Volume 2,* (pp. 169-172). International Society of the Learning Sciences.

References (Future Sch. Proj)

- Tan, E. & So, H. J. (2015). Rethinking the impact of activity design on a mobile learning trail: The missing dimension of the physical affordances. *IEEE Transactions on Learning Technologies*. DOI: 10.1109/TLT.2014.2376951

- Tan, E., & So, H. J. (2015). How learners employ semiotic resources for collaborative meaning-making in outdoor mobile learning. Lindwall, O., Häkkinen, P., Koschman, T. Tchounikine, P. & Ludvigsen, S. (Eds.) (2015). *Exploring the Material Conditions of Learning: The Computer Supported Collaborative Learning (CSCL) Conference 2015, Volume 1*, (pp. 268-275). Gothenburg, Sweden: The International Society of the Learning Sciences.

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Thank you…

Questions & Discussion

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