A Participatory Approach in the Design of Mobile Learning Trail and Resources

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Introduction
The attributes of a 21st century classroom pose an enormous challenge for the 21st century teachers as designers of technology-enhanced instructional programmes and learning resources. Teachers are expected not only to integrate technology into learning, but also, to facilitate a learning space that is increasingly fluid and dynamic. Our design-based research study at one of the future schools of Singapore, examines how the affordances of 1:1 mobile technologies premised upon knowledge building principles, can help students develop critical thinking and collaborative knowledge building skills in integrated humanities (i.e. history and geography). Apart from the state-of-art technological infrastructure and smaller class size, this future school engages a cohort of teachers who attempt to harness ICT to engage and immerse students in day-to-day learning. And one of the key milestones of the professional development sessions in our research project, is to equip and to empower teachers to leverage the use of ICT to enhance knowledge building pedagogies and practices in mobile learning trails.

This paper discusses the purpose and the process of a participatory approach in the design of mobile learning trails and resources. In the efforts to bridge the gap between pedagogy and practice, we attempted an inclusive operation protocol, comprising of researchers and collaborating teachers, and at times, software engineers in the design and development of the learning trails and the technology-mediated resources. Aligning with the participatory design framework, the education treatment of the professional development sessions sees an appropriate fit of plenary discussions, case studies, recce trips and small group hands-on sessions. We will discuss the theoretical underpinnings of the participatory approach and the iterative work processes of activity design and development of technology-mediated learning resources. In conclusion, we will surface the findings from the narrative interviews; the small successes, as well as, lessons learnt from the participatory trajectory and the teachers' design experience.

Theoretical Background
The culmination of a participatory approach for the professional development sessions stems from two fundamental considerations: first, the design-based research methodology undergirding our research study, second, the notion of teachers as “professionals” and the need to concretize “professional knowledge”.

The Participatory Approach for Design-based Research
The iterative process of our design-based research methodology presupposes a participatory approach, which promotes the active engagement of collaborating teachers from design to execution and from execution to after-action-review and refinement. According to Reeves, McKenney & Herrington (2011), the design-based research (Kelly, 2003) is not a new methodology, but rather, another label which bore similar features and research trajectory to that of the education design research drawn from the works of Brown (1992) and Collins (1992). Reeves et al. (2011) see the educational design research as a research methodology that affords the necessary alignment between research and practice for three critical reasons: first, it promotes collaborative efforts of teachers and researchers in identifying problem areas, second, in devising prototype solutions to address teaching and learning needs, and lastly, in the iterative process of application, review and refinement. Likewise, Reason and Bradbury (2006) advocate that research ought to be carried out ‘with’ people rather than ‘on’ people in a co-operative inquiry operational mode. This is also akin to participatory action research where McIntyre (2000) surfaces the need to heighten awareness via a collective inquiry and evaluation process. Similarly, Carlgren (1999) contends that, “theorizing is not something ‘behind’ or ‘beneath’ practice or action, but in the action” (pp. 51-52). Effective theorizing begins at the very act of doing and of getting involved. Hence, in significant ways, we could say that the participatory approach aligns with the nexus of the design-based research since it epitomizes an authentic platform for teachers’ involvement in real practices of design and execution, as well as, in concretizing theoretical knowledge.

The Practising and the Thinking Professional
On the general perception of teachers as professionals and the notion of professional knowledge, Carlgren (1999) surfaces two thought provoking ideas - “tacit professional knowledge” and “knowledge by acquaintance”. The latter stems from the works of Kjell Johannesen and Tore Nordenstam (in Carlgren 1999, pp. 47), they were the ones developed the Wittgensteinian thinking. Herein, Carlgren (1999) reiterates the critical implication of “knowledge by acquaintance” – a knowledge that is premised on experience and on contexts where she posits that, “the experienced practitioner knows by seeing, sensing, smelling, hearing…” (p.47). In sum, we could say that it is a knowledge that is
processed and practiced; otherwise, it shall remain as latent professional knowledge. And by practice, Carlgren (1999) promotes the notion of “a design practice” and expounds on the concept of “the reflective practitioner” (Schoen 1983) where teachers as designers, ought to have experience in “reflective curriculum planning”, that is, teachers must be given the liberty of “a simulated practice” to test out alternative ideas without the confines of the four walls of the classroom and institutionalized social practices. Interestingly, Sawyer (2011) also discusses Schoen’s (1983) notion of the “reflective practice”, and he postulates that, “to be a professional is, essentially, the ability to improvise effectively within structures” (p.7). Sawyer (2011) likens teaching to “an improvisational activity”; he contends that best classroom teaching often witnesses a “disciplined improvisation” where expert teachers are able to re-create lesson activities within given “structures and frameworks”, to bring about effective and meaningful learning. Likewise, Hakkarainen (2009) argues that the transformation of classroom practices often necessitates an “improvisational and dynamic co-evolution between patterns of using shared instruments, trialogical objects pursued, and teachers’ and students’ activities” (p.221). To which, we are increasingly convinced that the translation of knowledge building design principles into the local educational landscape, requires the adaptive expertise of our teachers. Hence, the adoption of the participatory framework essentially seeks to develop our teachers into a doing and a discerning professional who is able to theorize and to apply pedagogical principles in real practices, more importantly, able to improvise amid curriculum, cultural and contextual constraints.

**Methodology**

**The Participatory Approach in Trail and Resource Design**

Translating theoretical convictions into practice entails putting in place an appropriate treatment to foster the discourse of a participatory approach that embodies both real design practices and reflective work. Also, such a treatment has to be relevant and responsive to teachers’ needs in the professional development and training journey. In our research project, teachers are confronted with an arduous task of not only designing technology-enhanced resources in the context of mobile learning, but also, to ensure that these learning materials are able to foster critical thinking and knowledge building skills in mobile learning activities. As such, our professional development sessions see a gradual evolvement and a good fit of plenary discussions, case studies, small group hands-on, recce trips and simulation. Figure 1 shows the treatment of the participatory approach in activity and resource design, and the phases in this recursive process are by no means always linear.

**Figure 1.** The Treatment of a Participatory Approach in the Design and Development Stage

The series of professional development sessions culminating to each mobile learning trail assume relatively similar work processes as illustrated in figure 1. To date, we have implemented three mobile learning trails. Following is a description of the design and developmental phase for the mobile learning trail in Mar 2011.

**Plenary Session**

The professional development sessions witnessed more plenary discussions than small group work forms. Plenary sessions serve chiefly three purposes: firstly, to review findings and feedback from the most recent learning trail, secondly, to revisit key knowledge building pedagogical principles and challenges faced in the design and execution phase, and thirdly, to serve as incubation sessions for the next impending trail. The three-pronged approach – F.A.T (Facilitation, Activity Design, Technology) as illustrated in figure 2 on mobile learning trail design was a by-product of our first research intervention (Tan & So, 2011). It serves as a guiding framework in conceptualizing trail design and in the appropriation of technology-mediated resources in the mobile learning environment.
Case study
Case study was an attempt to concretize concepts about knowledge building pedagogy as we were confronted with an enormous challenge of translating key knowledge building principles - a profound and complex educational innovation in the Asian classrooms. It calls for an epistemic shift in teachers’ entrenched perception of classroom teaching and learning in relation to students’ academic ability (So, Seah & Toh-Heng, 2010). Moreover, the pedagogy and practice of knowledge building goes beyond the mere integration of technological devices and cognitive tools since it honors learning at the community level, the collective continual improvement and advancement of ideas (Scardamalia, 2002). Case studies of how knowledge building pedagogy was adapted and practised in Japanese and Hong Kong classrooms were carried out to facilitate discussions on the integration of topics and lesson procedures to support knowledge building discourse types. In the break out sessions, a researcher or a project investigator would lead each small group (a mix of geography and history teachers) in the discussion on the application or adaptation possibilities.

Small group
For the design of activities and technology-mediated resources, the geography and history teachers work closely to ensure the sound integration of topic areas, concepts and skills, and the provision of appropriate learning tools. The integrated humanities trail in 2011 witnessed a rich integration of History and Geography to develop a holistic understanding of the body of cognitive and procedural knowledge and skills in the integrated humanities. Table 1 illustrates the task-types at one of the learning stations. Tasks range from performative to knowledge generative and knowledge synthesis which require learners to leverage on the findings and inferences to respond to the overarching big question on Sentosa’s role in the British’s big plan of defence.

Table 1: Activity Questions and Learning Resources at Station B

| Big Q: What is the role of Sentosa in the British’s big plan of defence? |
|---|---|---|
| Task Type | Task Description | Desired Learning Outcomes |
| Performative | T3. Using the digital map, locate the “stealth” boat entering the harbor entrance. | To identify location of a feature on a topographical map. |
| Knowledge Generative & Synthesis | T4. Explain why the previous artillery gun (Learning Station A) and this one are pointed in the same direction. | To examine and evaluate various information from the source content and construct valid explanations. |
| | T5. Give reasons for the British’s plan to locate the tower at area B. | |

Recce
Recce of trail sites form a very critical phase in the design and development process. The design of learning activities and resources for such “situated learning” (Brown, Collins, & Duguid, 1989) contexts, requires teachers to obtain a contextual understanding of the practices of knowledge building, and also, an insight into the dynamics of the learning space endowed with rich physical affordances. The context surrounding mobile learning rises above the elements of “time and space”, in particular, the “social space of participants and technologies” and more importantly, the “fluid space” of how learners relate to one another and the objects of inquiry, pose equally significant variables for concern (Winters 2007 in Laurillard, 2007). Hence, a design of the technology-mediated cognitive tools for mobile learning trial also demands a review of the socio-techno space and relevant scaffolding strategies to bring about the desired learning outcomes, akin to what Dillenbourg (1999) coined as “designing the situation”. Thus, the presence of teachers, researchers, and even, software engineers is of paramount significance in our review and refine of trail tasks and learning resources, as well as, to discuss the facilitation process and know-how.
Simulation
Dry-run takes place prior to actual implementation, to allow a simulation of technology-mediated cognitive tools and web-based platform. Figure 3 shows a page of the web-based platform for one of the learning stations in the mobile learning trail. The cognitive tools (e.g. digital map, iPad apps, etc) are embedded in the platform for students’ easy access, and the web-based platform is created to host all findings and responses to the trail tasks. The public space and comments column affords immediacy in facilitation and feedback/comments on ideas from fellow teammates. According to Hakkarainen (2009), technology-mediated tools and socially institutionalised practices are inter-related since they co-evolve and have a definitive impact on the learning outcomes. Hence, the final walk-through allowed teachers to perform a dry-run of the actual trail; more importantly, to assume the role of learners and pre-empt probable problems that could arise with technology-mediated learning and virtual facilitation in mobile learning.

![Web-based platform to host trail activities & technology-mediated resources](image)

Figure 3. Web-based platform to host trail activities & technology-mediated resources

Findings
This segment offers a brief discussion of the initial findings from the narrative interviews with the six collaborating teachers.

Teachers' Narratives on the Trail and Resource Design Experience
In the one-to-one narrative interview, Ms. Lee shared that “the humanities department really came together to do a lot of iterations to ensure greater cohesion between geography and history in the design of the activities”. Geography teacher, Ms. Lam remarked that the “recce trips were necessary to see what could be achieved at each station… to analyse how both subjects could lend content to each other”. History teacher, Mr. Toh also observed that, “much effort put into contextualizing the activities to incorporate both history & geography in the best natural way.”

One teacher felt that the web-based platform and technological tools allowed students to take charge of their own learning, they were able to “engage students without taking control and create space for students to exercise judgment and solve problems”. Ms. Lin also remarked that the device and embedded tools “increase the proximity of the learners to the object of inquiry” and “technology makes possible a virtual facilitator …. feedback column and broadcast make possible for students to receive guidance and they could relook at their options”. They acknowledged that the provision of technology-mediated resources had also brought about immediacy of teacher facilitation and greater ownership of learning for the students. However, Mr. Ahmad felt that the platform would need to provide features for teachers’ easy customization.

Teachers' Narratives on the Participatory Approach and Treatment
Four of the collaborating teachers expressed appreciation for the built-in of case studies in the professional development sessions. Both Ms. Tay and Mr. Tan requested for more such sessions to demonstrate the translation of theory into practice and Ms. Tay appreciated “using case studies on how knowledge building has been worked out in an actual context – in educational systems more similar to Singapore at large”. Likewise, Mr Koh preferred case studies approach “when you take out a case, you dissect it…and anything can evolve from an actual case”.

4
Teachers see knowledge and authentic experiences as a form of empowerment in designing learning trials. Professional development sessions enabled clarification on theoretical issues and facilitated discussion on identifying specific goals for knowledge building in the context of the school and the research project. However, teachers felt that time factor was a huge constraint.

**Discussion and Conclusion**

The participatory approach and the treatment we adopted afforded a very contextual and hands-on experience from design to execution. It is both a reflective practice and process. Primarily, it gives teachers a voice in the very act of doing, of planning and of execution. The benefits of such a participatory model are manifold. First, there is greater pedagogical conviction for the process of being involved and actively participating help teachers overcome “barriers to adoption” of the knowledge building pedagogy (Scardamalia 2002). Second, the teachers’ personal engagement in the process of activity and resource design, empowers them to diagnose problem areas early, and find feasible alternatives should there be any change in variable. Lastly, it emphasizes adaptive expertise for it develops in teachers, the ability to apply the three-pronged approach (F.A.T.) to future mobile learning trial design. This could also serve as a framework for a design-check in the simulation phase. Participating teachers are currently working on integrating biology and geography in the 2012 mobile learning trail.

At the workshop, we hope to share some critical aspects of engaging teachers in this participatory model in trail and resource design. Although we have witnessed relatively promising progress, challenges and issues persist, such as the actual exercise of knowledge building pedagogies in mobile learning, the measure and the mode of facilitation (face-to-face, virtual) to be apportioned in such learning contexts and the assessment of students’ knowledge building efforts. We are in the process of greater in-depth analysis of the interview narratives: to gain some insight into the tensions between adaptive expertise and institutionally established structures and practices. Also, we are not sure how this participatory model and treatment works for other disciplines and pedagogical innovations. We acknowledge that there could be limitations such as the integration of other disciplines whose cultural and social practices differ with changing context. We are still in the process of refining this participatory approach for we hope to engage teachers in the real practices of designing mobile learning activities and resources that foster collaborative knowledge building and critical thinking. We believe that the very act of participation is instrumental in the development of teachers as designers.

**Reference:**


