Teacher Agency and Student Autonomy in Inquiry-based Mobile Learning Trail

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Abstract: This research study investigates students' capacity at greater autonomy in an inquiry-based mobile learning trail in relation to the agent of the teacher (e.g., instructional design, facilitation and scaffold support). To afford a more coherent study, narrative interviews and web-based data capturing student-student and teacher-student interaction were obtained for analysis. Data were analysed based on three key areas: (a) the design of the mobile learning trail in facilitating autonomous learning, (b) the interaction with the teachers and (c) the collaboration with peers. Overall findings showed that students' capacity to engage in autonomous learning rests on learning trail design, collaborative efforts and an awareness of teachers' "presence". The teachers cited students' profile, the motivational factor and instructional design as important determinants for autonomous learning. In conclusion, we argue that students' capacity for more autonomy in mobile learning does not necessarily lie in a decrease in teacher's control, but rather, it is contingent on student readiness, learning design, technological mediation, as well as, the community of learners.

Keywords: Teacher agency, student autonomy, inquired-based mobile learning

Introduction

The advent of mobile technologies has dramatically revolutionized the conventional role of teachers and students. Harnessing the affordances of technology-mediated cognitive tools to engage learners, enhance learning effectiveness, empower and enable synchronous and asynchronous interaction and collaboration is believed to bring about greater student autonomous learning. Teachers presumably best function as facilitators to scaffold the learning milestones and to mediate technological support to enhance learner autonomy. However, what essentially facilitates the occurrence of more student autonomy and/ or how teachers can orchestrate such learning situations, are needful areas for more intense research and investigation. On supporting learner autonomy, Black and Deci (2000 as cited in [1]) liken this phenomenon to a situation where the learners are equipped and empowered to make autonomous decisions in the learning process given the accessibility and availability of "pertinent information and opportunities for choice" (p.28). And In theorizing mobile learning, Sharples, Taylor, and Vavoula [2] surface "control and context" as two of the key areas for reflection: *control* is distributed across multiple elements from teacher, peers, technologies to environmental artefacts, and *context* is constructed by the learners interacting with the environment, which comprises of communities of learners and all mediating technologies. And in our context of inquiry-based mobile learning trail, the imminent challenge would be to apportion the right measure of teacher "presence" without jeopardizing student's capacity at autonomous learning. Hence, supporting learner autonomy is not a simple equation of decentralizing teacher agency and control; rather, it calls for an informed action taking into account all

contextual elements in the said learn setting.

1. Theoretical Framework

To encapsulate the nature of the inquiry-based mobile learning trail, the contextual elements and the social actors (i.e., the teacher and the students), we employ situated cognition to make sense of how learning takes place for two fundamental reasons. First, the key theoretical premises of situated cognition afford an insight into the dynamic interplay of critical constructs such as the learning activities, all mediating "tools" (e.g., physical environment, social actors, artefacts, etc.), and importantly, the cultural and social practices in the learning context. According to Brown, Collins and Duguid [3], "Knowledge is situated, being in part a product of activity, context, and culture in which it is developed and used" (p.32). Second, the theoretical underpinnings of situated cognition provide a conceptual framework to make sense of student autonomy and teacher agency in a mobile learning trajectory for it is impossible to discuss sensibly the changing roles of teachers and students without making reference to the contextual configurations and their relations. Brown and Duguid [4] contend that, "One of the powerful implications of situated learning is that the best way to support learning is from the demand side rather than the supply side…" (p.8). This has strong implications on the role of the teacher and the place for students' autonomy in the learning process. On the design of the learning environment, Choi and Hannafin [5] advocate a shift from organizing and sequencing content to creating and designing environments that "induce, then facilitate, understanding" (p.67). The functional role of the teacher here would be to allow an unstructured space within the structured learning environment, whereby learners have the liberty to exercise judgment, set new learning intent and pursue new inquiries/ interest areas. On this note, Snow (1994 as cited in [6]) posits, "we must not only learn in context but also by context" (p.84). Learners are empowered to respond to contextual changes within the framework that guides their inquiry process.

Apart from a theoretical emphasis on learning in an authentic platform as against "decontextualized contexts", situated cognition also exemplifies the importance of "cultivating learning processes versus learning outcomes" (p. 53) [5]. Here, it presupposes two significant groups of players in the learning process. One is the teacher-student and two, the student-student. First, it inherently implies a marked change in the role of the teacher – from a knowledge dispenser to a facilitator of students' learning processes (Bednar et al., 1991; Duffy & Jonassen, 1991; Winn, 1993 as cited in p. 67) [5]. And facilitation can take on varying forms such as "modeling, scaffolding, coaching and guiding, collaborating, fading" and via different technology-mediated cognitive tools and resources (p. 63) [3]. It is also the onus of the facilitator to develop in the learners the capacity and the ability to perform a knowledge and skill transfer across varying contexts. Second, the individual learner's interaction and collaboration with his/ her counterparts form a critical phase of this collective learning enterprise. Thus, we recognize that student autonomy is both enabled and shaped by a host of factors at play in a learning situation, of which, the mediation of cognitive tools and collective cognition play a definitive role. The teacher, thereby, assumes a more significant and complex function - a designer, a mediator, and sometimes, a participant and collaborator of the learning enterprise. In a nutshell, the fundamental role and responsibility of the teacher would be to "design the situation" (p.5) [7]: engineering the learning environment and ensuring the availability and the accessibility of technology-mediated cognitive tools and resources to bring about the desired learning outcomes.

In the context of an inquiry-based mobile learning trail, the purpose of this qualitative research study is to examine how the agent of the teacher in learning design, in appropriating technology-mediated cognitive tools to support collaborative mobile learning, and in apportioning the measure of teacher "presence" can impact students' capacity to exercise autonomous learning. We are also interested to identify which of those above-mentioned elements (e.g., learning design, technology, facilitation, student readiness) form the key determinants that shape student autonomy and to what measure.

2. Methodology

2.1 Research Background

Building on our previous research efforts to promote collaborative knowledge co-construction on mobile learning trails, the present research study seeks to explore the teacher's role in facilitating more student autonomy in an inquiry-driven mobile learning trajectory leveraging on the rich affordances of the physical environment and technology mediation. Aligned with the theoretical premises on situated learning, the mobile learning trail was designed with a focus on inquiry task-type and space for more independent learning via collective effort, technological mediation and teacher facilitation. Figure 1 illustrates the three-pronged approach - F.A.T (Facilitation, Activity Design, Technology), a design framework we conceptualized to guide our trail design and implementation. This holistic approach sees activity design as the primary driver of the other two equally critical components - facilitation and technological mediation in the design of the learning situation.

Figure 1: The 3-pronged Approach toward Mobile Learning Trail Design

2.2 Design Consideration

The trail tasks were co-designed by the researchers and collaborating teachers in the integrated humanities department. The F.A.T. design framework guides the design process (i.e., the overall focus on inquiry-based learning) and the range of activities primarily determine the type of technological tools and the features of web-based platform to support the collaborative learning space, the facilitation and the communication process. The design of the trail seeks to promote interdisciplinary inquiry-based discourse. This move sees an unprecedented rich integration of History and Geography with the intent to develop a holistic understanding of the body of cognitive and procedural knowledge and skills in the integrated humanities. All trail task questions point to an ultimate problem statement where learners will need to see relationships across the findings to the various task questions and eventually evaluate and synthesize shared knowledge and understanding as a collective body. As illustrated in Table 1, trail tasks range from

performative (application) to knowledge generative and knowledge synthesis where the findings and inferences should enable learners to respond to the overarching big question on Sentosa's role in British defence plan.

Table 1: Examples of Tasks at Fort Siloso Mobile Learning Trail

Big Question: What is the role of Sentosa in the British's big plan of defence?		
Learning Station	*Task Type*	*Task Description*
A	Performative	T1. Determine the direction of the guns using the iPad compass.
	Knowledge Generative	T2. Describe the dimension of the tunnel and state its purpose.
B	Performative	T3. Locate the "Stealth" boat entering the harbor entrance.
	Knowledge Generative & Synthesis	T4. Explain why the previous artillery gun (Area A) and this one are pointed in the same direction.
		T5. Give reasons for the British's plan to locate the tower at area B. Describe the role and purpose of the tower and the guns.

Facilitation forms a critical determinant on students' capacity for autonomous learning. Three main modes of facilitation were put in place. First, a web-based platform was designed and developed to host all trail activities with embedded apps (e.g., digital map) for students to carry out their activities. Each team (max. 4 students) had an iPad, and students were also able to upload their findings and collated artifacts onto their teams' respective web pages. Further, they were also able to communicate with other teams through the feedback feature; giving comments and/ or suggestions. Second, trained facilitators were assigned to all four activity-stations and teachers were also present to monitor students' progress. The physical presence serves mainly to provide students a sense of assurance of aid should they be confronted with any major difficulties in an outdoor situation. Facilitators were also briefed to adhere to more unstructured questioning techniques to avoid constricting students' capacity to leverage on situational resources in the learning process. Third, apart from face-to-face facilitation, virtual teacher facilitation was deemed necessary to provide immediacy of facilitation, which is of significance in a mobile learning trail. Virtual facilitation via the public space feature in the web-based platform affords teacher-student interaction and communication.

2.2.1 Participants

The collaborating institution is also a member of the FutureSchools@Singapore project. The school leverages on its 1:1 computing initiative to create a technology-rich learning environment and advocates a small class size of 20–25. The mobile learning trail took place at Fort Siloso, Sentosa Island in March 2011. Participants of the trail were two classes of secondary one students - Class A (total class size = 20) included mostly high-achieving students while Class B (total class size = 22) included mixed-ability students.

2.3 Data Collection and Analysis

The focused group interviews with teachers and students were rendered necessary to find out about students' and teachers' perceptions of their inquiry-based mobile learning experience, as well as, the actual occurrence of discourse amongst students and between students and teachers. Post-trail focus group interviews with ten students (randomly

selected five from each of the two classes) and a one-to-one interview with six collaborating teachers were held. The interview questions were semi-structured to solicit feedback on three critical areas, namely, trail activities and collaboration efforts, facilitation and technological mediation. In addition, relevant excerpts of data captured on the web-platform of students' interactions with other groups and the teacher facilitators were also cross-examined to afford a more accurate insight into the research inquiry on student autonomy and teacher agency in inquiry-based mobile learning.

3. Findings

Aligning with the conceptual framework on situated cognition, we examined and analyzed the corpus of data in relation to the three key themes: (a) the activities in relation to contextual elements (b) the mediating tools and (c) cognitive apprenticeship.

3.1 Students' Narratives

3.1.1 Impact of Trail Design and Collective Efforts on Students' Capacity for Autonomous Learning

Students felt that task questions integrating Geography and History, opened up the platform for further inquiries, generation of ideas and hypotheses; triggering a chain of discussion. One participant voiced that the course of finding answers to the history questions, had enabled them to see how geographical factors affected human decisions – 'why they did what they did' and this provided the explanation to the historical events back then. Students felt that there was better engagement with the abstract concepts and a stronger sense of ownership of their learning during the trail without the constant physical presence and supervision of the teachers.

Next, for the majority of the students, the inquiry-based approach lends itself better for collaborative efforts over individual undertaking. On this note, Mark contended that "if you have multiple people working on the same problem …so even if you get stuck, maybe another person know how to do it …". Another participant, Cayden concurred that the very act of coming together to resolve an issue would inevitably give rise to a convergence of human thinking resources. It promotes distribution of the think processes and gave rise to the possibility of multiple perspectives on a common task and also assistance within group when one is confronted with tougher task questions. Other participants felt that it had increased their overall learning and thinking capacity when group converged again to share their respective findings; this allowed them to learn from the explanation of the fellow team mates who were better with a particular task and /or subject area. However, not all students were optimistic about collaborative efforts, Tiffany recounted that, "some teams are not very receptive to ideas… don't disturb us…go away…we are doing our work …". Some teams conceived of inter-group collaboration as a form of interference; delaying their work processes. Another reservation about collaborative learning lies in the issue of *reciprocity* where students perceived that they could be short-changed by another group, "some of my silly group members go and give them the answers...and some groups also, they have nothing to say". We attribute this to the gap in belief and actual practices. That is, although students believe in the benefits of collective cognition, in practice, they are more attuned to individual display of effort and performance.

3.1.2 Technological Mediation and Student Autonomy

The availability of the feedback and comment functions in the web-based platform enabled the immediacy of facilitation and asynchronous collaboration. Isaac related their team's experience with feedback and comments from other teams and how it gave them some form of 'directions' to re-attempt task questions and re-work through their own work processes: "there's was one point we got stuck then we resort to getting inspiration from other teams…we try to understand how they got the answer and then incorporate it …". Likewise, the provision of feedback allows students a second chance to rethink through their findings amid the rich physical affordances. Lucas recalled, "let's say you make any mistake, the teacher will send you a message". The 'alert' function cum instant feedback from teachers permitted a review of work processes. Immediacy of teacher facilitation enlarges students' independent learning space and thereby increases students' capacity to take control of their own learning journey in a mobile learning environment. Students are given more autonomy to re-evaluate their initial findings and re-negotiate meaning.

3.2 Teachers' Narratives

3.2.1 Activity Design Shapes Inquiry-based Learning Processes

At the cognitive level in relation to greater student autonomy in inquiry-based learning, the collaborating teachers spoke on the significance of 'situated learning' experiences to foster autonomous learning and inquiry-based discourse. Mr. Loh explained, "Ground experiences can never be replicated… important to view the authentic documents at the site rather than online – to develop empathy and multiple perspectives; giving space to the internal voice, queries, hypotheses..." Ms. Lee further added, "the mobile device also increased the proximity of the learners to the object of inquiry". This allows the students an up close and personal encounter in the course of their inquiries. Mr. Seah commented that "the use of iPad allows students' mobility and accessibility to any work tools and at the same time, enables students to communicate and collaborate, in turn, teachers were also able to capture their learning process".

On the notion of mobile learning and inquiry-driven curriculum, Ms. Lee felt that "mobile learning on its own, cannot be a stand-alone instructional tool. The basics should be done in class ..., pre-trail lessons…and after that trail, post-trail". Further, Mr. Loh stressed that it is needful to strengthen that link to "review how this trail fits into the larger picture of things, i.e., the entire curriculum". Hence, for students to take on an inquiry-driven learning trajectory on the day of trail, teachers rendered preparatory work as a necessary phase to equip and empower students to fully benefit from the mobile learning scenario, taking charge of their own learning.

3.2.2 Technological Mediation and Facilitation as a Means to Enhance Student Autonomy

One of the means of increasing student autonomy and appropriating teacher involvement was the provision of technological cognitive tools. Ms. Ang observed that the web-based platform was "a good communication platform for teachers to be engaged in the whole collaboration - heighten interactions, give instant feedback and able to gauge students' progress, difficulties". To which, Mr. Yeh concurred, "technology makes possible a virtual facilitator, which made possible for students to receive guidance and on the spot to re-look at their options. Mr. Yeh continued, "the broadcast feature helped them stay on the right track when they are pre-occupied or intentionally go off tangent". Another teacher commented that "interaction between groups made possible and between teachers and students". Ms. Lee shared that "the web-based platform has made it very viable for learning, and enables interaction and the immediacy of facilitation. Layout also enabled

teachers to participate in the trail, and I was able to monitor all their responses from where I was, without moving around."

Teachers felt that the design of the inquiry-driven trail, the provision of technological tools and online facilitation make it possible for teachers to "take a step back, observe how kids work and give them a chance to maneuver their way through and reach the destination – give them more ownership of their own learning. Students take pride in their work", remarked Ms. Teh. On the self-same note, Ms. Lee felt that there was "less front loading and transmitting of content - more self-directed learning. This experience changed our roles as practitioners in the classroom – even seeing their responses (if incorrect) and even if they fail it doesn't make me anxious." The teachers felt that letting go of control and the expectation for correctness and performance would liberate that space for greater student autonomy in learning.

3.2.3 Impact of Teacher Presence on Student Motivation and Autonomous Learning

On the significance of teacher presence, be it virtual or physical, Mr. Yeh observed that "broadcast messages create the kind of atmosphere for students – motivate them as they know there's someone out there responding to them unlike cyberspace". Likewise, Mr. Seah observed that the high level of engagement from the students had to do with the manageability of tasks and the awareness that teachers are "present" (virtual and face-to-face) to assist them should they stumble in the course of accomplishing their set goals. This explains their eagerness and motivation moving from one learning station to another. Mr. Yeh noticed another interesting phenomenon, "they do not ask for answers through the platform, physically yes, if they meet you, they ask for clues." He felt that virtual facilitation renders a different form of teacher involvement, "If answers seem general, try to find out whether they understood task requirements, try to elicit more from them and then guide them." Overall, teachers were positive that students obtained a greater sense of ownership of their work processes in the learning trail experience. However, teachers expressed the need for more concrete measures to be taken in order to increase student autonomy and learning effectiveness, namely, soft skills in collective undertaking of tasks and, questioning and inferential skills in engaging their counterparts during the collaboration process.

4. Discussion and Conclusion

As exemplified from the findings, the measure of teachers' presence and participation ought to be weighed in the context of the learning situation, the prevailing socio-cultural practices and the profile of the participants. In sum, student readiness to assume more autonomy in inquiry-based mobile learning hinges on a variety of contextual factors. First, the relevance of the learning activities ought to align with the desired learning outcomes, as well as, the students' profile and capacity for autonomous learning in such situated learning contexts. And of significance would be to see the one-day learning trail as a continuum of the entire curriculum- teacher support and scaffolds to increase student capacity at autonomous learning commences at the very stage of the larger curriculum design. For students to be able to benefit from autonomous learning in a mobile learning context, autonomy support begins with the day-to-day instructional program. Students' confidence and comfort level to initiate and pursue inquiries, to make informed decisions, and to conduct constructive interaction discourse is a gradual developmental process, orchestrated by the teacher. Second, the vicarious presence of the teacher – virtual and face-to-face still has its rightful place. Students still need the endorsement of an

authoritative figure - the teacher. As Ellis (1993 as cited in [8]) puts forth, "The teacher thus has the role of a group member that has the option to qualify the dialogue through questions" (p. 22). And importantly, in an outdoor learning situation, students commence at different levels of understanding in the collective meaning-making process before converging at a common shared understanding. In the research study, the appropriation of the measure of assistance and scaffolding was made possible based on the kind of answers and feedback students pose on the web-based platform. And further, the teacher's presence as a participant and a collaborator serves as a form of facilitating and regulating the exercise of autonomous learning on the part of the students. Third, student autonomy also rests largely on the presence of the collective body of their fellow workmates and the collaborative learning space. As evident in the narratives, students (esp. the high ability group) felt that they were not very comfortable with the idea of collaborative efforts as some still held on to the notion of individual merit and performance. Conversely, mixed ability group was more open to sharing of ideas and findings. This inadvertently implied that the socio-techno learning space to a considerable measure dictates student readiness to become agents of their own learning.

To conclude, the analysis and synthesis of the data findings surface significant implications pertinent to the design of the learning situation, the agent of the teacher in shaping student autonomy in such situated learning contexts. The artful balance of teacher agency and student autonomy requires a sound understanding of the content and context of learning, and the appropriation of relevant technological mediated tools and facilitation.

Acknowledgements

References

[1] Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher, 18*(1), 33-42.
[2] Brown, J. S., & Duguid, P. (1993). Stolen knowledge. *Educational Technology, 33*(3), 10-15.
[3] Choi, J.I. & Hannafin, M. (1995). Situated cognition and learning environments: Roles, structures, and implications for design. *Educational Technology Research & Development, 43* (2), 53-59.
[4] Dillenbourg, P. (1999). What do you mean by collaborative learning? In P. Dillenbourg (Ed) *Collaborative learning: Cognitive and computational approaches* (pp.1-19). Oxford: Elsevier.
[5] Jonasson, M. (2011). Framing learning conditions in Geography excursions. *International Education Studies,* 4 (1), 21 - 29.
[6] Sharples, M., Taylor, J. & Vavoula, G. (2005, October). *Towards a theory of mobile learning.* Paper presented at 4th World conference on mLearning, Cape Town, Africa.
[7] Stefanou, C. R., Perencevich, K. C., Dicintio, M. & Turner, J. C. (2004). Supporting autonomy in the classroom: Ways teachers encourage student decision making and ownership. *Educational Psychologist, 39*(2), 97–110.
[8] Uden, L. (2007). Activity theory for designing mobile learning. *International Journal, Mobile Learning and Organisation, 1*(1), 81-102.