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We are going to the ZOO! Virtual Badges in Formal out-of-school 1:1 Learning Journey with Smartphones

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Abstract: This paper presents experiences from a seamless mobile learning project in Singapore. Although the project included a variety of seamless mobile learning designs, this paper focuses on only one, and that is a mobile learning application SamEx in support of a specific learning scenario – an outdoor ZOO field trip. The paper describes SamEx design by focusing on virtual badges gathered by the students during their ZOO trip. The trip was structured by the teachers and scaffolded by SamEx system contextually triggered questions and prompts. The paper describes experiences from the ZOO trip done with SamEx, gives an elaborate example of a student's learning experience during the trip, and concludes by examining different types of student profiles according to their badge usage and SamEx social engagement.

Keywords: virtual badges, 1:1 mobile learning, out-of-school learning, field trips

1. Introduction

This study presents and examines SamEx, a mobile learning system used by 350 students in a variety of formal and informal learning scenarios in a primary school in Singapore. Students use SamEx to capture media such as pictures, video clips and audio recordings and share them with their peers through discussions.

Although SamEx has been used in a variety of formal and informal learning designs in the project, the focus of this paper is its usage during a mobile learning field trip to Singapore ZOO (Figure 1). 350 students equipped with smartphones and SamEx system embarked on this journey to learn as designed by their teachers. Prior to the trip, scaffolds were set by the teachers and researchers in the form of contextually triggered questions and prompts. By moving through the ZOO, students were prompted to engage in a variety of tasks, collect photos, videos and audios and share them with their peers through SamEx.

As the trip progressed, students were collecting points in return for their digital content submission, question answers, mobility and social interaction. These points were materialized in the form of virtual badges, depicted in one of the SamEx screens.

2. Virtual Badges in Technology Enhanced Learning

2.1 Theoretical Background

Coming from the computer gaming world, badges are earned to indicate the achievement of certain level of skills, acquisition of knowledge, or participation in an activity (Young, 2012). As one implementation option, badges indicate the achieved competence level as defined by the issuer. For example, the integration of badges into existing software is supported by the Mozilla Open Badge Infrastructure (Mozilla, 2013). In the social media context they have five social psychological functions: goal setting, instruction, reputation, status/affirmation, and group identification (Antin &

Churchill, 2011). Thus, they have proven useful in applications which traditionally lack credit systems, such as web sites like Huffington Post and TripAdvisor reward community effort content moderation via digital badges.

Badges are nowadays integrated into numerous educational learning tools (Moore, 2013; Sharples et al., 2013), including Khan Academy, BuzzMath and CodeAcademy. However, there are still doubts on whether and how badge scores contribute to the overall student grade in online learning environments (Hakulinen, Auvinen, & Korhonen, 2013). One study shows that ability and motivation of learners have to be considered when choosing the right kind of badges to be used and the kinds of effect they could have on critical learner motivations (Abramovich, Schunn, & Higashi, 2013). TRAKLA2 confirms that and states more research is needed in balancing the badge achievement criteria so that they maximize beneficial learning practices while minimizing harmful side effects; and to understand why the same set of badges had different effects on different populations (Hakulinen et al., 2013).

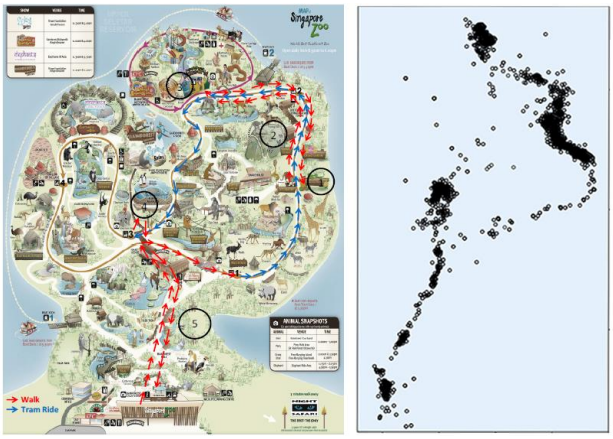

Figure 1. Route of the ZOO trip (left) and students' contributions (right)

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3.2 SamEx Mobile Learning Application

SamEx was designed to support self-directed and collaborative learning activities and provides a participatory platform for students to contribute, share, and give feedback. Students can use it to take a picture to collect data or post information they found to be useful for their learning. These postings are shared with other students who can review, give comments and evaluate by giving "Likes" to the contribution.

For the purpose of this study, activities were designed for primary school students who used SamEx throughout a 1-year period. In addition to collecting, storing and accessing multimedia artifacts (Figure 1), SamEx can store contextual users' information for potential educational use. Depending on the current time and users' location, the system allows question prompts (Figure 3) to be displayed on students' smartphones potentially facilitating or scaffolding learning tasks. Students can therefore be guided in outdoor mobile learning trails or just prompted periodically in connection with their homework observations or other work they are recommended or required to pursue outside school.

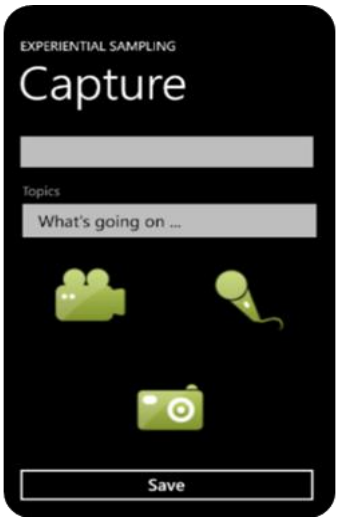

Figure 1. Media capture in SamEx

Figure 2. Digital badges in SamEx

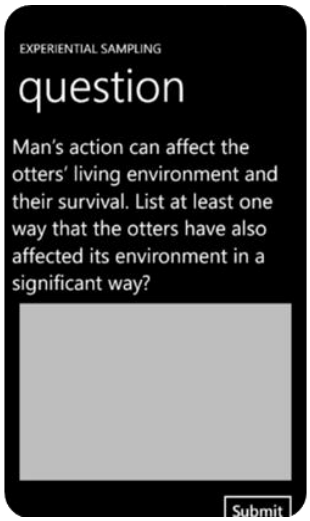

Figure 3. A location-aware question prompt

To reward students' activity, SamEx leverages on its own badge system, an extrinsic motivational tool (Figure 2**Error! Reference source not found.**). By collecting media, answering location-aware questions, providing comments to other students' questions and liking other students' work, students take part in a game to accumulate points leading to the earning of badges.

4. The Analysis Framework for the Study

Throughout our studies, we discovered our students belong to the four fundamental groups according to badge system usage: (1) Badge Hunters, (2) Sharers, (3) Dodgers and (4) Explorers. The students were classified in one of the four groups by performing qualitative and quantitative analysis of their media artifacts, answers, comments and likes. We based our decision by closely observing the behaviour patterns for each student in our data sample (introduced in the following chapter). It is important to mention that there were some borderline cases where a particular student could be placed in two different categories.

5. A Primary School Mobile Learning ZOO Trip

We focus on a whole grade level of primary grade students who are equipped with smartphones with unlimited internet data plans. There are more than 350 students who were given a mobile device with SamEx mobile application preinstalled and preconfigured for use in and out of school. The study employs Design-Based Research (DBR) to develop a deeper understanding of the processes involved in implementing seamless mobile learning. With iterative cycles of studying the processes and outcomes

of interventions in building teacher capacity, lesson and technology design, we can refine the processes to develop a program for designing technology enhanced learning environments and develop strategies in and out of the classroom (Phillips, 2006). The phases of the DBR approach along with the initial observation and findings are listed in Table 1.

Table 1. Use of SamEx though five main phases of Design-Based Research

Phase	**Research/activity design**
Phase1A (Pilot phase in the end 2012)	Study a naturalistic process of using SamEx.
This Phase 1B (Pilot phase in the end 2012)	Study a naturalistic process of using SamEx.
Phase 2 (Jan 2013)	Study a naturalistic process of using SamEx. Incorporated badges in SamEx but did not inform the students.
Phase 3 **(Feb 2013)**	**320 Primary 3 students used SamEx in a combination of indoor and outdoor environment in the Zoo to learn about animals and plants.**
Phase 4 (Feb-May 2013)	Study a naturalistic process of using SamEx to document students' self-directed use of SamEx
Phase 5 (June 2013)	Over a 4-week holiday, the students were assigned a task to grow a seed-

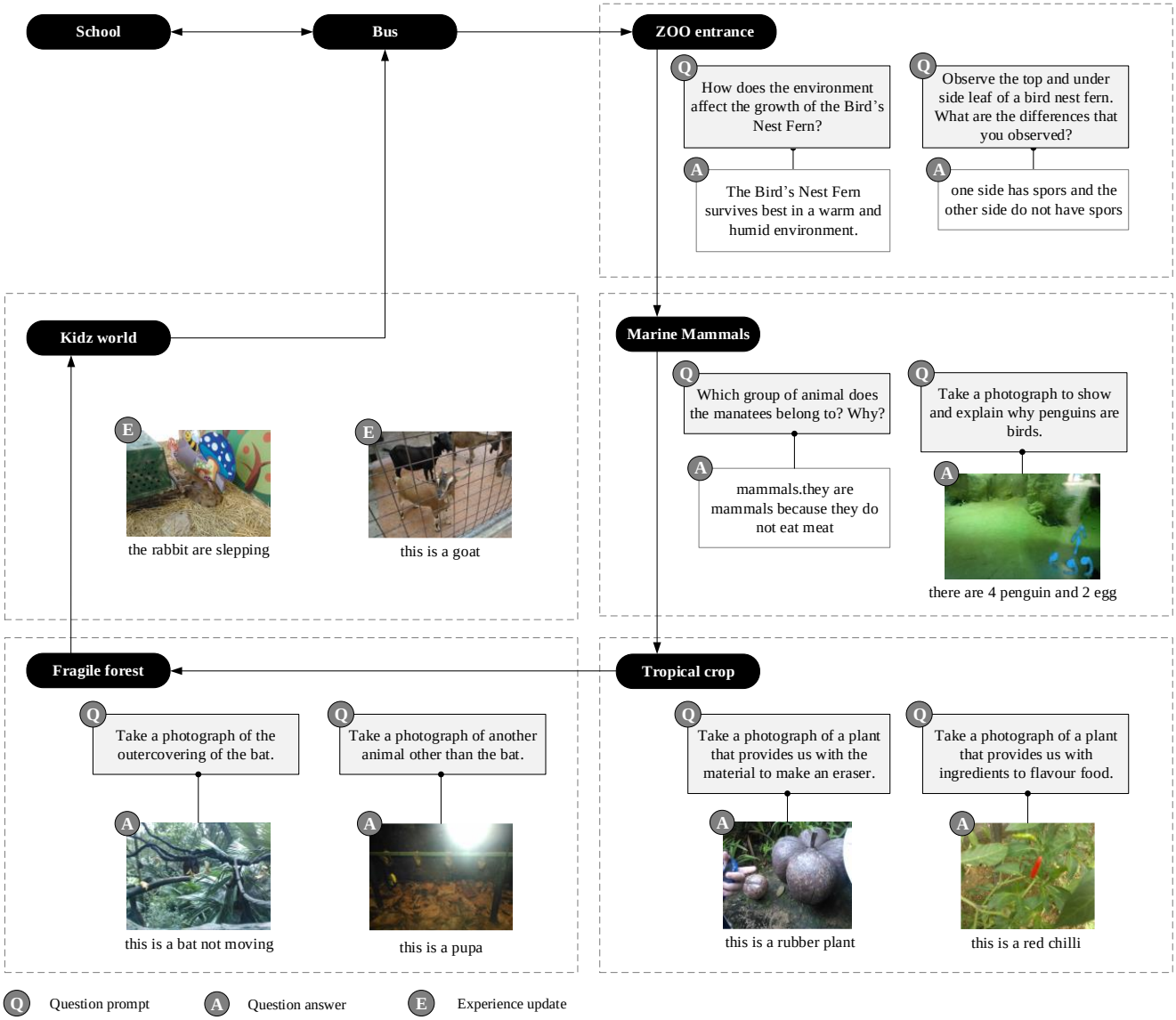

Figure 4. SamEx used in a ZOO trip: a sample of contributions and answers by one student

6. Reflections and Conclusions

Badge Hunters were identified by very a large amount of low quality data over a short period of time. They are only interested in attaining high levels of badges and they only respond to extrinsic motivation and do not care about quality of contributions. Sharers are on the other hand interested in sharing with their peers while earning their badges and their participation consists of higher quality contributions. They make meaningful contributions and ask good questions. Dodgers are not interested in earning badges at all.

Table 2. Percentage of students in each category for class P3A

Category	%
Sharers	42.86
Dodgers	35.71
Badge hunters	16.67
Explorers	4.76

Unfortunately, a very low percentage of students (Table 2) was placed in the ideal category of Explorers. They actively participate in SamEx by generating high quality contributions, sharing their observations, initiating conversations with other students and are trying to gain knowledge collaboratively from their peers.

This means badges can currently only encourage the first two groups of students to participate. However, Badge Hunters will stop participating once they achieve their desired level of badges. Both Badge Hunters and Sharers are not interested in learning collaboratively since there is no observable learning with their peers.

Nevertheless, it is important to mention that some of the students who were identified as Sharers have a good potential of becoming Explorers. They usually try to learn collaboratively, only to be discouraged by the lack of feedback from their classmates. To help them bridge that gap between Shares and Explorers, all students need to be encouraged to participate more actively, especially in the tasks which involve interaction with their peers.

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