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Description of the project

Overview

Technological advances in consumer devices have provided a much larger community unprecedented access to powerful computational tools with a wide suite of integrated sensors. While mobile technologies offer opportunities to transform teaching and learning practices (Karnad, 2014; Kukulska-Hulme, 2010; Laurillard, 2007), relatively few mobile projects have been designed that could facilitate social learning and user-generated content (Frohberg et al, 2009).

Thanks to a 2014 Learning Enhancement Grant, we have developed open-source Android-based mobile applications to streamline the data collection and analysis workflow, and support face-to-face collaborative activities in first-year physics laboratory (the project is called "Lablet" for short).

We plan to learn how students and teaching assistants perceive their laboratory experience, refine the educational design of the activities, iteratively develop the mobile applications and identify the pedagogic forms specific to science learning that can be enriched by mobile technologies[1].

Goals specific to student-learning

1. use video analysis and other sensor tools to bridge abstract representations of physical phenomena and real-life experience,
2. liberate students from excessive task repetitions and release time for reflective learning and interactions through integrated workflow,
3. reduce cognitive burden through the use of familiar technology, and
4. promote peer learning and reconceptualise learning space through location-independent group activities.

As the project proceeded, we realised that Lablet-based learning facilitated a fundamental change in the workflow of our Stage One laboratories, largely replacing paper-based lab reports, and therefore enabling instructors to focus on student learning, rather than administration.

Current status

A video analysis mobile application has been developed and implemented in the Stage 1 Physics Laboratory. A frequency analysis app and an accelerometer app are in the testing phase; the accompanying lab activities are yet to be developed. In the future, we can explore interfacing with external sensors via Bluetooth.

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[1] "Most ideas you can do pretty darn well with a stick in the sand." – Alan Kay.

The suite of mobile applications is currently available on Google Play (link). In addition, the source code and the developer documentation can be found here.

Similar project effort is seen with New York Hall of Science's iOS app development (article) and we are in initial contact.

Expected assistance from CLeaR staff

(1) Project development

We are most likely tracing some footsteps of the Coursebuilder's development journey unknowingly: we may be reinventing the wheel at times and need advice on navigating the organisation effectively.

(2) Educational research design, content / thematic analysis

Expertise on education research design and feedback interpretation would enable the findings from this project to contribute to the new field of mobile learning. In particular, student and TA perception of the learning experience, design framework, development studies and effectiveness research. Moreover, this could make practical contribution to spark reconsideration of learning in the 21st century as well as fostering public interest in science, engineering and technology.

* This may reshape the human ethics application we are working on. We currently have minor revisions to do before resubmission. (Submission deadlines + UAHPEC meeting dates, academic dates)

(3) Designing user workflow and interface

We currently have one dedicated developer who is an expert in Java. Having external assistance on the interface and workflow design would invigorate the user experience. Developer documentation can be found here: http://lablet.auckland.ac.nz/lablet-physics-experiments-on-the-tablet/developers/. Sample videos and screencasts of the mobile application in action are available if interested.

* Kate from the Faculty of Science Marketing and Communications has suggested us to contact the Digital Experience for design advice. We initially contacted Julian Wootton (Manager, Digital Experience BI and Applications, ITS). We were then referred to Chris Phillips (Digital Producer, Group Applications - Information Technology Services, ITS). Chris, Clemens and I had the initial meeting on Wed 11 March, 2015. Clemens has subsequently sent Chris the screenshots for design advice. We need to follow up the response or find a better way to fit in the university operations.

(4) Embedding learning analytics

We are considering using learning analytics to support personalised learning, inform the design of learning activities and refine the application in the long run. However, we have no prior experience in this area.

(5) Advice on value and feasibility of ideas

Below are some ideas that need to be evaluated for their value and feasibility.

- If students can save individual work when completing lab activities on Lablets, an electronic lab book is compiled in the LMS automatically as they progress through the semester;
- If students can share, organise and comment on some of their work easily, this helps create a collective knowledge map and foster a knowledge-building community.

Proposed timeframe

12-18 months, including design, development, testing, refinement and initial reporting of findings.

Some conferences where this work may fit

ASCILITE | http://ascilite.org/conference/2014-conference/ , http://www.2015conference.ascilite.org/#1

+ Typically papers and posters are due in June / July; the conference is held in late November or early December.

ACM conference on Computer-Supported Cooperative Work and Social Computing | http://cscw.acm.org/2015/

+ Typically papers and posters are due in June - November; the conference would be held in March.

International Conference on Human-Computer Interaction | http://2015.hci.international/

+ Papers and posters due in November-February; the conference is held in August.

IEEE International Conference on Advanced Learning Technologies | http://ask4research.info/icalt/2015/

+ Papers and posters due in Jan / Feb; the conference would be held in July.

Potential funding to support the project?

Ako Aotearoa | https://akoaotearoa.ac.nz/national-project-fund

+ Draft proposal due in June.

+ Expression of interest due in July.

+ Full proposal due in October.

VC's Strategic Development Fund | https://www.staff.auckland.ac.nz/en/how-the-university-works/mission-goals-and-strategies/vice-chancellors-strategic-development-fund.html

+ Applications are due in July.

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