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Real-time Interactive Learning Through Smart Mobile Devices

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Abstract— Smart phones and tablet PCs are very popular nowadays. Many schools use these new tools for teaching and learning. The e-Learning Technology Development Laboratory of the EEE Department had developed a mobile application called iClass. This tool can facilitate teachers to conduct interactive classes through different mobile devices. Students can share their ideas and express their views by drawing pictures or entering keywords. The students' works can be instantly sent to the lecture screen through the WiFi. Students can then learn from their peers through the peer review function. The iClass system also supports an editable e-book for assignment submission and 2D barcode to facilitate field trip or technical visit. Examples on how teachers can use iClass for in-class interactive teaching are carefully considered. Lastly, innovative pedagogy models are also being evolved to cope with many possible new changes.

Index Terms— e-Learning Technologies, Interactive Classrooms, Peer Reviews, Smart Mobile Devices.

I. INTRODUCTION

The e-Learning Technology Development Laboratory of the Department of Electrical and Electronic Engineering of the University of Hong Kong had developed an mobile application for Interactive Class using Tablet PCs and Smartphones called "iClass". The system [1] aims to provide a convenient, user-friendly and efficient platform for everyday interaction of different disciplines and different educational institutions. It makes real-time communication and knowledge sharing between teachers and students and among students of the same class more handy and interesting.

Fig. 1 shows the architecture of the iClass system. With mobile devices such as iPhone, iPad and Android smart-phones, teachers can post up questions or assignment in class and students can respond immediately. Moreover, teachers can review students' work as soon as they submit it. Students can view peers' work and share their works via the cloud network. There are many innovative and useful modules in iClass: Drawing, Keywords, MC Questions, Peer Review, QR Code and Web Browser, a wide variety of in-class activities can be conducted with timely response. Even extra-curriculum activities or groups such as Mobile Quiz Game or debate team can be well facilitated by iClass system.

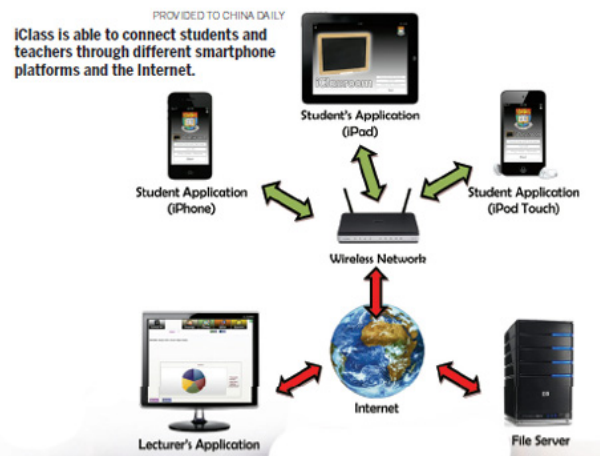


Fig. 1. The architecture of the iClass system

II. POSSIBLE USES OF OUR E-LEARNING SYSTEM

- Case 1: Encouraging interactive discussions

The iClass system is particularly useful for enhancing collective learning and problem-solving of complex, highly interdisciplinary environmental issues which do not have obvious, definite model answers. Most environmental issues, e.g. air pollution, are highly context-specific, their resolutions are highly controversial, dependent on the collective inputs of different stakeholders in the society and the consensus they reached ultimately. To build the students' capacity in tackling environmental challenges through collective learning and consensus building, iClass was introduced to a special lecture series titled "Technology, Society and the Environment" in the Master of Science in Environmental Management.

Two lectures had been delivered to our MSc students to help them understand the relationship between technology, society and the environment. The first lecture focused on the key (positive and negative) impacts that technology will bring on the society and the environment, and vice versa; whereas the second lecture brought forth the idea of transition management and ways to steer low-carbon energy and transport transitions in practice. Both lectures had been preceded by the iClass system. The basic philosophy is to raise students' interests in the subjects to be presented, engaging them in real-time and

interactive discussions and debating through visual aids, and to raise their awareness on the wide array and complexity of issues that an environmental challenge will need to address, and the variety of possible promising solutions that can be offered to tackle such challenges.

During the first lecture, before delivering the lecture, students were asked to share their views as how new technologies can solve the highly complex and interrelated social-environmental challenges in connection with climate change using iClass. Four to five students were invited to form a group to discuss about how they think the climate change challenge can be tackled technologically. They were invited to draw pictures to express their ideas using the iClass system installed in the iPad. With this interactive and innovative enabling technology, students can immediately retrieve the mushrooms of ideas and suggestions put forward by different groups of students. It is fascinated to see the great variations in terms of solutions to climate change that different groups displayed, ranging from renewable energy technologies to carbon capture and sequestration, from individual innovation such as generation of biofuels to systemic and integrated innovation. A group of students suggested that an integrated green energy and transport technological system can offer a good strategy to combat the climate change problem. On the one hand, green energy technologies such as solar and wind technologies can generate electricity and reduce carbon emissions. Furthermore, replacing car-driving by biking will significantly reduce emissions while adapting individual lifestyles to more sustainable and healthy living (see Fig. 1). The iClass system creates an innovative methodology to stimulate idea generation, sharing, refinement and consolidation.

other group of students, which speeds up the process of knowledge sharing and facilitates debates and discussions among students as well as the lecturers. Third, the interactive, engaging and collective learning process will sharpen the students' critical thinking and strengthen their capabilities to understand and appreciate the views of others, through which further refinement of ideas and consensus-building can be made possible. Such process is particularly important for handling highly complex and interdisciplinary environmental issues such as climate change, as many different types of innovative solutions to solving a complex environmental problem can come up through the collective inputs of different groups of students.

- Case 2: Demonstrating and sharing of students' innovation

In a summer program ENGG1901 Engineering the Climate Change, students are required to design and build a solar water distiller using some simple raw materials such as aluminum foil, plastic board and glass. The objective of this exercise is to train the students' creativity and inspire them how solar energy can be applied. Students form groups and they first design and then build the structure. When their solar water distillers were produced, their products were tested under the sun light and the effectiveness of their designs was measured. After this practical session, students went back to a classroom and the debrief session began and iClass was used. Each group was required to use the iClass Drawing module to draw their design on an iPad. They were very series and had applied many features in the Drawing module such as line, text and shape and produced some innovative and inspiring drawings.

When these drawings popped up on the screen, the lecturer Dr. Wilton Fok then asked a representative from each group to present their design. With their drawings being posted on the screen in real-time, students could share their ideas and inventions with their classmates in a more effective way. After the presentation, they use the "Peer Review" function to view the designs of other groups, rate and add comments to their works. Students could learn the merits from one another and avoid following the same trap.

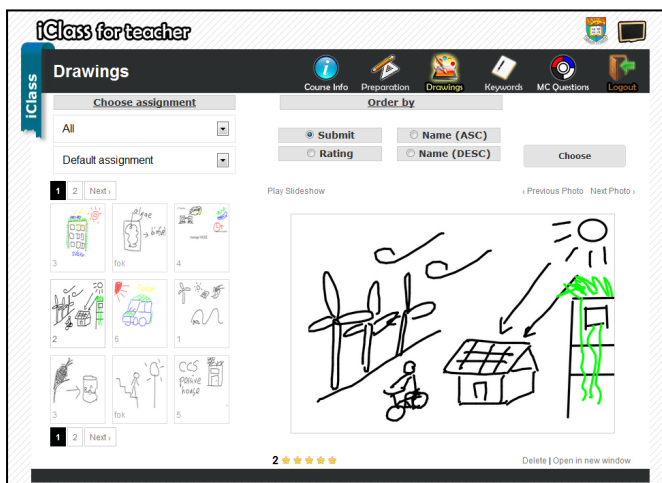


Fig. 2. The drawing function of the iClass system for idea brainstorming during the classes

First, students are able to explain their ideas and concepts through drawings. Second, the technology allows students to provide real-time, instantaneous feedback to ideas posed by



Fig. 3. A group of students using the iClass system to discuss and share ideas during the classes

In this summer course, there were many overseas students from US, UK, Australia, Italy, Korea and so on joined the course. It was their first time when many of them use iClass for interactive teaching and learning. Comments from the students were in general very positive. Mr. Aaron Morellini, third year Italian student from the University of Technology of Sydney: "I am so excited about it. It is such an incredible way to learn... it turns lectures into game shows". Another overseas student from the United Kingdom Mr. Robert Deans commented "The app is more convenient because students can do the work using a mobile device such as an iPhone." Ms. Hayley Lau, a first year HKU student: "It is amazing to see our drawings on the screen right after we click the submit button. Without iClass, lectures can be very boring. We just sit there, look at the slide presentations and listen to the lecturer talk for hours. Now I can stay active with a gadget to express my ideas. Every course should use it."

III. CONCLUSIONS

In this paper, we consider the iClass system as an innovative tool that facilitate teachers to conduct interactive classes. With the advancement of mobile technologies and the popularity of smartphone and tablet PC, this new application enables in-class application of e-learning technologies. Undoubtedly, e-Learning will no longer be only a supportive tools that supplement teaching and learning after classes. It will also be used to facilitate daily teaching and to enrich in-class activities. A series of pedagogy models are being evolved to

cope with the diverse and new demands on mobile and in-class applications.

There are many interesting directions for further investigations. The possible integration of smart cameras and sophisticated image processing techniques for 2D or even 3D background / scene analysis may facilitate students' learning during the field trips [1, 2] or site visits [3, 4]. Besides, the possible uses of augmented reality (AR) to promote students' learning interests in the iClass system is worth investigation. An example is using the AR function [5] to help students in recognizing or familiarizing with the equipment/devices in the laboratories. Lastly, the innovative uses and pedagogical impacts of the iClass system in different fields of studies are definitely very interesting for further exploration.

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REFERENCES

- [1] Chan, L.H. (2009). A Smart Learning System for School Field Trips. A Final-Year Project Report 2008-09, Department of E.E.E., The University of Hong Kong, Revised: March 10, 2009, project website available at http://i.cs.hku.hk/~lhchan/fyp/web/qr_code.html.
- [2] The Blogger development team. (2009). The Blogger : Create your free blog Official Site. Retrieved: June 15, 2009, from <https://www.blogger.com/start>.
- [3] The Cloud Computing team. (2009). Cloud Computing – Wikipedia, the free encyclopedia. Retrieved: June 11, 2009, from http://en.wikipedia.org/wiki/Cloud_Computing
- [4] The Facebook development team. (2009). The Facebook website. Retrieved: June 15, 2009, from <http://www.facebook.com/>.
- [5] The Mashable development team. (2012). "10 Amazing Augmented Reality iPhone Apps". Retrieved: September 1, 2012, from <http://mashable.com/2009/12/05/augmented-reality-iphone/>.
- [6] The YouTube development team. (2009). The YouTube – Broadcast Yourself Official Site. Retrieved: June 15, 2009, from <http://www.youtube.com/>.
- [7] The Wikipedia development team. (2009). Web 2.0 – Wikipedia, the free encyclopedia. Retrieved: June 10, 2009, from http://en.wikipedia.org/wiki/Web_2.0.
- [8] W.W.T. Fok, "The New Era of e-Learning - Mobile Learning & Interactive Class for the New Curriculum", The University of Hong Kong, ISBN: 978-988-15045-3-1, 2011.