Classroom communication on mobile phones – first experiences with web-based 'clicker' system

Shun Leung Lam
Kevin Wong
Centre for Learning Enhancement And Research
The Chinese University of Hong Kong

Joseph Mohan
Division of Commerce
Commercial College of City University of Hong Kong

Dongyan Xu
Department of Mechanical and Automation Engineering
The Chinese University of Hong Kong

Paul Lam
Centre for Learning Enhancement And Research
The Chinese University of Hong Kong

Thanks to the advancement in technology, web-based classroom response system is available in leveraging mobile phones to perform function in similar to that of traditional 'clickers. Mobile phones can be used to enrich communication in classroom. Teachers do not need to hand over the clicker devices to students anymore. Individual students can respond to teachers' questions right on their mobile devices. The paper reports two pilot cases in which teachers at two universities in Hong Kong adopted the web-based classroom response system. The primary objective of the study was to evaluate the feasibility of such practice in real classroom situation. However, the results have not been all promising. The success of web-based classroom response system was dependent on the possession of high-end mobile devices and skills to maneuver these devices.

Keywords: Clicker, mobile phone, interaction, audience response, student response

Classroom interactions

The use of clickers enhances teaching and learning in a classroom through enriching 'interaction'. Moore (1993)

suggested that there were three types of interactions, namely: learner-content interaction, learner-instructor interaction and learner-learner interaction. The interaction between learners and instructors is of particular importance. Chickering and Gamson (1987) suggested that good practice of teaching should contained seven components in which one of them was about 'giving prompt feedback' as students need to know what they have learnt and what can be improved. Besides, Lizzio, Wilson and Simons (2002) mentioned that an interactive learning environment should possess both the element of "giving (clear and useful explanation, helpful feedback) and seeking (interest in students' opinions and difficulties) of information" (p. 40).

Conventional practice of questioning in class allows only a limited number of students to answer a question. It is unlikely to attain a high level of interactivity between teachers and students. Furthermore, such practice does not result in meaningful interaction because some students may not be willing to respond (e.g. due to shyness) or they may simply respond by following the majority (Ayu, Taylor & Mantoro, 2009; Mula & Kavanagh, 2009). Therefore, teachers are not able to know the number of students who have actually got the answer right, and that who have got the answer wrong. In other words, teachers are unable to track individual responses (Ayu, Taylor & Mantoro, 2009) and subsequently, offer additional support to students, who are less academically capable.

A typical clicker is a small device with number keypad similar in size to that of a small TV remote control. It is equipped with a radio signal emitter, which transmits signals generated from the device to a dedicated signal receiver. The receiver is connected to a personal computer, which is installed with dedicated software. The combination of an emitter, a receiver and a computer permits answers to be input into the number pad, gathered at the receiver and then displayed via an output device (e.g. a projector screen). Apart from displaying results collected from the emitter, a large projector screen is often used to display questions in classrooms. This set of equipment is also collectively known as Audience Response Systems (ARS). The application of this system is not limited to the education field. For example, it can also be found in TV game shows such as "Who wants to be a Millionaire" in which the audience is asked to cast their vote via a number pad lying on the handle of their seats. ARS has been extensively adopted in other fields, which evolved in various appellations including: Personal Response Systems (PRS), Classroom Response System (CRS), and Student Response Systems (SRS), etc (Mula and Kavanagh, 2009). Clicker in classrooms allows students to give responses without disclosing these responses to the rest of class, therefore, it is expected that students will be more willing to answer questions in class. As a result, teachers will be able to collect responses from the whole class (Freeman, Bell, Comerton,-Forde, Pickering & Blayney, 2007). Subsequently, teachers will know how individual students think, and s/he will be able to identify common mistakes that students make, and address these problems immediately in class.

Empirical evidence from past research suggested that the use of clickers could bring along other learning benefits. Mula and Kavanagh (2009) for example reported a study conducted in an Australian university, which involved a cohort of 61 students in using clicker as a learning tool in classroom and another two cohorts of students (59 in total) without clickers. The result showed that most of the students who used clickers (96%) enjoyed the opportunities to answer the questions. Moreover, more than 90% of these students remarked that the quizzes had conducted (using clickers) effectively and had enabled them to understand the course materials; whereas among those who did the same quizzes without clickers, such figure dropped significantly to 60% and 80% respectively. Furthermore, lecturers and tutors reported that students who used clickers were more willing to respond to questions. It was also easier for instructors to identify difficult areas when clickers were used. Similar findings have also been seen in Buskes, Shen and Shallcross (2010). In this case, clickers were handed to about 600 students who took the lectures of an Engineering Systems Design course in an Australian university. 80% of the students in the course agreed that clicker was useful because it allowed them to obtain immediate feedback.

Mobile phones in classroom response system

The actual technology of ARS had undergone significant changes over years, which became how it is today. Juson and Sawada (2002) reported cases in 1960s where knobs, buttons or telephone number pads were adopted as tools for presenting individual answers to a particular question in class. These tools were mounted on the handle of students' seats and were connected to hard-wired response systems. Teachers reviewed these answers by using a voltmeter gauge to record the frequency of each answer in percentage.

With the advancement in wire-less technology in later years, clickers were usually made of either the infra-red or the radio signal technologies, which facilitated communication between clickers and the central unit. However, there were two problems with radio-frequency/ infra-red based clickers, which hampered the adoption of clickers in classrooms (Jones, Marsden & Gruijters, 2006), they were (a) the cost of the clickers; and (b) timely procedures required to distribute and collect clickers to and back from students.

There was recently an alternative approach to collect responses from students: by using mobile phones instead of clickers, which addressed the two problems as mentioned above. If mobile phones were used in replacement of clickers, there would be no need to purchase any specific equipment (Habel, 2011; Maier, 2009) nor to distribute and collect clickers (Banky, 2010; Maier, 2009). Radio or infra-red clickers required teachers to detect the level of batteries as well to identify if there was any problem from time to time whereas clickers in mobile phones do not require any commitment from teachers.

Mobile phone version of clickers usually employs three different strategies to send and receive signals (Ayu, Taylor & Mantoro, 2009): (1) vote by dialing; (2) vote by sending SMS; (3) vote online by accessing to a survey website. That is, students can respond to a question by dialing numbers that corresponds to their answers, sending their answers to the collection unit through the SMS number, or accessing the website and answer the questions as if they were completing an online survey respectively. After that, the software specific to each of these strategies will display students' responses visually, usually in graphs.

There are a number of common solutions available in the market, with each adopting one or more of the above approaches. There are, for example, Votapedia (http://www.urvoting.com/) (Banky, 2010) or Survnvote (http://www.survnvote.net/wiki/Main_Page) (using methods 1 and 3; i.e. dialing and web-based) (Mantoro, Ayu, Habul & Khasanah, 2010) and Poll Everywhere (http://www.polleverywhere.com/) (method 2; i.e. sending SMS) (Tremblay, 2010). Each of these solutions is equipped with a web platform so that teachers could post their questions online and then assign a phone number (Votapedia and Survnvote) or an SMS number (Poll Everywhere) to each answer of a question.

Different from the solutions above, which support either input via phone number or input via SMS, TurningPoint 2008 is an interesting hybrid solution. It makes use of method 3 (i.e. web-based, accessible through mobile devices) and is at the same time capable of reading input from the traditional clicker devices. The software itself is free to be downloaded and adopted. Nevertheless, users are required to buy dedicated online licenses for mobile devices, clickers and the receiver from TurningPoint Technologies in order to use them in class. The system has the ability to perform instant calculation on various responses, and to generate different graphs in reflecting the distribution of these responses. Furthermore, the system is capable of collecting feedback from both clickers and mobile devices simultaneously. Therefore, for students who do not have the right mobile phone for this exercise, they can still participate by using traditional clickers. Moreover, web-based platforms allow students to key in text into the system, and thus responses are not limited to multiple choices but can accommodate word-based answers as well.

There are indications that clickers in mobile phones (in particular the dialing and SMS solutions) can be effective in facilitating classroom communication. Maier (2009) reported a case in which students' responses were collected via the dial method during the course of a lesson under Environmental and Mining Engineering in an Australian university. Besides, Banky (2010) reported another study in relation to clickers via dial in Australia in which 87 students were required to complete quizzes at the end of all lectures. Votapedia was adopted as the tool to summarize results obtained from clickers in mobile phones. Results from this study indicated that 64.4% of the students agreed that participating in Votapedia had encouraged them to attempt those quizzes. On the other hand, the study conducted by Habel (2011) revealed that with the adoption of clickers with Votapedia in a Pre-Enrolment Programme at a university in Australia, students became more attentive to the interaction between instructors and themselves. The adoption of such had helped students to understand teaching better and had encouraged shy students to answer questions and to enjoy the lesson more.

In comparison with web-based clickers, clickers via dial and clickers via SMS are less demanding in terms of hardware and skills. The feasibility of web-based clickers is dependent on whether a mobile phone has access to the web-based interface. Therefore, devices dedicated to clickers exercise should possess an in-built browser, together with web-surfing externalities such as 3G or Wi-Fi connectivity. Besides, users should possess the skill to utilize these externalities in accessing the internet. Few empirical studies so far have focused on web-based classroom response system.

According to a report released in mid-2010 by a research company, which focused on development of mobile networks (Taylor Nelson Sofres Limited, 2010), 48% of the respondents in Hong Kong (561 Hong Kong consumers aged 16–60) owned a smart phone. While the age of average university students fell in between the range of the above, it is a reasonable assumption that the ownership of smart phones by university students can be quite impressive. Free secured Wi-Fi services are available in nearly every classrooms and lecture halls at the two universities in the present study: the City University of Hong Kong (CityU) and The Chinese University of Hong Kong (CUHK) (City University of Hong Kong, 2011; The Chinese University of Hong Kong, 2010). The presence of both hardware in university and that possessed by students made researchers believe that it was possible to adopt web-based mobile phone ARS in real courses at both universities.

Study

The paper reports two cases in which web-based ARS were adopted in both teaching and learning at CityU and CUHK respectively. The support and evaluation was provided by the Mobile Learning Project at CUHK (http://www.cuhk.edu.hk/mlearning), which was an initiative to provide teachers and students with practical guidelines, resources and sustainable technical solutions to various mobile learning strategies.

It was expected that some students were not in possession of the right device for web-based ARS. Therefore, TurningPoint, a hybrid system was adopted in the study to provide an alternative for students to participate in class by enabling reception of responses via traditional clickers.

Cases in the following were contributed by two teachers in two respective courses. Case 1 involved a teacher from Faculty of Commerce in CityU (Teacher A), while the second case was about a teacher from Faculty of Mechanical and Automation Engineering in CUHK (Teacher B). They were teachers who approached the project for mobile learning support and they found the idea of mobile phone clickers relevant to their needs: engaging all students in class activities. They regarded that students' active engagement in tasks is a much more effective way to learn than merely passively listening to teaching in a lecture.

Both teachers were given a brief training on how to use the system and how to prepare questions compatible with PowerPoint slides beforehand. Teacher A used the system to assess the level of understanding among students regularly in class and especially right after difficult concepts were explained. Teacher B adopted the system to conduct short quizzes normally at the end of each lesson. These quizzes served as summaries to assist students in reviewing key points quickly before they left. Clickers in these cases were used for three and four times during the semester respectively.

The primary goal of the study was to evaluate the feasibility of clickers in adopting web-based mobile phone at tertiary institution. The procedure of evaluation consisted of paper surveys with questions arranged in the format of 5-point Likert-scale questions. In addition to these, there was also an open-ended question at the end of the survey to inquire if students have any other comments in relation to the system. The surveys administered in both cases were similar, except that in Case 2 a question was added for students to indicate whether they had used mobile phones or traditional clickers in making responses. Apart from conducting surveys, researchers invited both teachers to participate in a short meeting in which they were asked to comment both the degree of feasibility and usefulness of clickers in mobile phones. Last but not least, while teachers had made valuable comment about the system, Teachers' communications with the researchers during the various stages of planning and using the strategy were also considered as another source of information. As noted, the main purpose of the study was to evaluate the practicality of this new technology at present time in real teaching and learning settings.

Findings

Case 1

Teacher A learnt how to incorporate questions for polling into their PowerPoint slides, and how to start the system for polling with the help of software that accompanied the TurningPoint system in roughly 30 minutes. During the course of training, he remarked the software was user-friendly and yet as he started to really work on his own questions he had forgotten a number of steps already. Teacher A inquired the project for clarifications from time to time. Most queries were done over the phone. Furthermore, he sent the project team his PowerPoint slides so that the team could double check whether everything was done correctly before they were used in classroom.

During his first attempt with clickers in class, teacher A did not bring in any traditional clicker as he presumed that many of his students were in possession of the right device to participate in the session. Even if some of them might not have the appropriate devices, they could share with those who had them and participated the session in pairs or in groups. However, falling short of his expectation, only a few of his students had internet-ready devices. Therefore, he had to cancel the activity.

In response, teacher A brought in traditional clickers in his second attempt with web-based clickers. In addition, one of the project team members was there to provide technical support if needed. However, the session did not start smoothly due to a failure in network: misconnection between the notebook of teacher A and the server of TurningPoint. At the end, the research team member overcame the problem by reinstalling the software. Once the problem was resolved, the teacher created a web-based clicker session for 5 to 6 students who had internet-ready mobile phones, and simultaneously distributed traditional clickers to the rest of class. Nevertheless, 15 to 20 minutes were spent before the session actually began. The delay was due to a lack of knowledge in connecting mobile phones with the campus Wi-Fi. Initially, teacher A inquired students whether they were using 3G phone plans that had a data-transfer component – best allowing unlimited access to the internet. Yet none of his students had such a plan in their mobile phones. Students then were suggested to use the campus Wi-Fi service. Some of the students did not know how to connect their devices to the campus Wi-Fi as they rarely used them during their study at the university. Both the teacher and the project team member had to assist these students one by one in connecting their devices to the Wi-Fi service.

In his third attempt (and the last attempt), the teacher was able to administer the session all by himself. He reported that the whole activity was carried out smoothly. He did not experience any technical problem with the software. On the other hand, students did not require much help from him as they had previous experience in connecting their devices to the website.

The end-of-course questionnaires were administered to evaluate the experience that students had towards the use of clickers in class. The degree of positivity was defined in respect of five themes. Table 1 describes a list of questions, corresponding to each of these themes and their respective mean scores as collected from the questionnaire. 36 of the 61 students responded, and the response rate was 59%. On the basis of a 5-point Likert scale with ‘5’ being ‘strongly agree’, the mean scores ranged from 2.93 to 3.61, which indicated that students were only mildly positive with their experiences in adopting clickers in class. Please note that the results in Case 1 did not distinguish the ratings among students who used mobile phones and those who used traditional clickers.

Table 1: Students' responses in survey (Case 1)

Main themes	Question items	Mean scores (n=36)
Process of use	Participation with clickers increased my interaction with the instructor.	3.89
	Using clickers improves the class participation.	3.64
	Using clickers can keep the students engaged.	3.64
Learning	Using clickers during lectures helps me clarify whether I understand course concepts.	3.69
	I believed I learned more in this class due to the use of the clickers.	3.00
	Using clickers gave me immediate feedback about my understanding of a concept.	3.69
	Using clickers helped me to apply the concepts during class.	3.61
	I do more thinking during clicker sessions than in regular lecture sessions.	3.61
Attitudes	Using clickers increased my feeling of belonging in this course.	3.14
	I enjoyed participation with clickers.	3.50
	Clickers keep me interested in the lecture.	3.39
Overall comments	I would recommend using clickers again in this course.	3.53
	Clickers make class more interesting and fun.	3.56
	I would prefer that my others courses also use clickers.	3.43
Challenges in use	I experience technical problems with the clickers during class.	2.97
	The instructor experienced technical problems with the clickers during class.	3.17

	The instructor used a long period of time to distribute the clicker devices to students during class.	3.14
	It was difficult to see if my clicker was working or not.	3.08

Students agreed that clickers enhanced teacher-students interactions in class (mean = 3.89). Besides, they were mildly positive towards learning benefits attributable to these clicker exercises: more thinking (3.61) and more chances to apply knowledge (3.61). They remarked clicker activities to be enjoyable (3.50) and interesting/fun too (3.56). With regard to technical challenges, students reported that teachers had difficulties in administering clickers in class (3.17). Besides, some of them perceived that it was rather time-consuming for teachers to prepare for these activities (3.14).

Students' answers to the open-ended questions in general showed they were mildly positive towards the adoption of clickers. There were comments such as "a good idea for using the clickers in the class", "interesting", "keep going", and "good for my study". Yet there were negative aspects too. For example, one student talked about the novelty effect of the strategy: "it is great for the first time, but after that, it isn't that great". Another student commented that too much time was spent on preparing the system before the session could begin. Despite its effect in facilitating interaction between teachers and students, the issue of technical problem, in particular, should be addressed probably as it has negatively affected the perceptions of some of the students towards the adoption of this strategy. In addition, in order to foster a more positive feeling towards the strategy among students, it is perhaps necessary to further review the quality of questions asked in the exercise, which in turn, informed students implicitly that these exercises were real learning opportunities rather than something merely for novelty and fun.

Case 2

In consistent with Case 1, teacher B in Case 2 spent approximately 30 minutes to learn from our team the basic operations of the system. During the course of training, she perceived the system to be rather user-friendly. Similar to Case 1, teacher B also sought clarifications from team members of the project regularly in order to prepare questions for her classes. It was quite certain that continual support was needed before teachers could internalize technical skills. As simple and straightforward as it seemed, the results of both cases suggested that the process to master the use of the clicker software required a constant support and training that couldn't be accomplished in a one-off workshop.

The teacher planned to install the clicker software in the lecture room computer. However, during her first use of the clicker system in the classroom, she found that the system worked strangely in the lecture room computer: the web session could not be run and she needed to restart the computer, etc. The research team member who accompanied the teacher thought that it was due to some access right and permission settings of the lecture room computer which were too restrictive. Apart from technical problems, similar to Case 1, only a small number of students were in possession of internet-ready mobile devices, which enabled access to the clicker system. Initially, the teacher expected there should be at least one in every ten student to be in possession of such device and yet only 5 to 6 of them had the right device for the system. Furthermore, students in Case 2 were again unfamiliar with the steps in connecting their devices with the campus Wi-Fi, which later required assistance

from both the teacher and the project team member.

In her second attempt, rather than using the desktop computer in the lecture room, teacher B decided to implement the session with her own notebook by installing related programmes beforehand. In addition, she brought in a number of traditional clickers so that more of her students could participate in the clicker session. However, in the absence of technical staff from the project team, the session had to be cancelled due to a failure in connecting her notebook computer with the system. After this lesson, the teacher had to spare extra time with one of the project team members to revisit the lecture room so as to reconfigure her notebook computer in fulfillment with the networking requirement.

The implementation of clickers in last two sessions gave rise to significant improvement. In her last two attempts, there were no problems with connecting her notebook computer with the system at the lecture room. As a strategy to facilitate participation, students who did not have internet-ready mobile phones are invited to work with those who have such devices. Traditional clickers were distributed to groups with no internet-ready mobile phones at all. The teacher had the impression that the students in general enjoyed working on the clicker question in the class. Personally, she regarded that the system could be used more often now she had learnt the gist of it. She also found the clickers helpful in fostering class interactions and she would definitely use clickers in the next term.

With regard to feedback, teacher B believed students to have in general, enjoyed working out problems with clickers in class. She reported to have mastered the steps required to operate clickers in class. In addition, she perceived clickers were helpful in fostering interactions. Therefore, she claimed that she would use the system more often in next term.

A questionnaire in similar to that in Case 1 was administered at the end of course to evaluate the experience that students had towards the use of clickers in class. It was distributed to the 20 group leaders in the course (total class size being 76). 16 students responded to the survey but only 11 of them indicated the response device used. Seven used traditional clickers and four of them used mobile devices as clickers. Table 2 summarizes responses to the survey questions of these two groups of students.

Table 2: Students' responses in survey (Case 2)

		Clicker	**Mobile phone**
Main themes	**Question items**	**Mean scores (n=7)**	**Mean scores (n=4)**
Process of use	Participation with clickers increased my interaction with the instructor.	4	4.25

	Using clickers improves the class participation.	3.57	4.25
	Using clickers can keep the students engaged.	3.71	4
Understanding of lecture content	Using clickers during lectures helps me clarify whether I understand course concepts.	4	4.25
	I believed I learned more in this class due to the use of the clickers.	3.14	3.25
	Using clickers gave me immediate feedback about my understanding of a concept.	3.86	3.75
	Using clickers helped me to apply the concepts during class.	3.57	4
	I do more thinking during clicker sessions than in regular lecture sessions.	3.86	3.5
Attitude	Using clickers increased my feeling of belonging in this course.	3.43	4
	I enjoyed participation with clickers.	3.57	3.75
	Clickers keep me interested in the lecture.	3.71	4
Overall comment	I would recommend using clickers again in this course.	3.86	4.25
	Clickers make class more interesting and fun.	3.86	4
	I would prefer that my others courses also use clickers.	3.57	3.75
Challenges in use	I experience technical problems with the clickers during class.	1.71	2.5

	The instructor experienced technical problems with the clickers during class.	2.57	2.75
	The instructor used a long period of time to distribute the clicker devices to students during class.	2.43	2.75
	It was difficult to see if my clicker was working or not.	2.57	3

The feedback from students in Case 2 was comparable with that in Case 1 in many ways – Both groups were mildly positive towards each of the criteria above. Students in Case 2 reported most positively in two of the criteria: "participation with clickers increased my interaction with the instructor" (4 for traditional clicker users and 4.25 for mobile phone users) and "using clickers during lectures helps me clarify whether I understand course concepts" (also 4 for traditional clicker users and 4.25 for mobile phone users).

It is interesting to note that students who participated via mobile phones tended to report more positively than those participated via traditional clickers (the score from mobile phone users was higher than those from traditional clickers in 12 out of the first 14 items asked in the questionnaire - excluding questions under the theme "challenges in use"). Therefore, it is reasonable to conclude that participation via mobile phones is likely to generate a better learning experience.

However, students who participated via mobile phones also rated more "positively" in questions under the theme "challenges in use". In other words, they perceived mobile phones as more challenging to use in comparison with traditional clickers. Such result was reasonable – as students had to take care of a few more steps (such as connecting to Wi-Fi and getting into the TurningPoint platform) if they were to participate with mobile phones instead of the traditional clickers.

In the open-ended section of the survey, one student disliked the fact that all questions were MC questions: "Why do we have MC questions when there are none in the mid term/ final?" It is a very valid point and it is also exactly where mobile phone has an advantage over traditional clicker as a response device. A greater variety of question types can be asked and richer interaction can be fostered. It is also an area we now think both teachers A and B have not used the new technology to its full advantage.

Discussion

The results of our effort in promoting the use of web-based ARS at CUHK have not been very promising. The use of mobile phones as a classroom response device has found to be more successful if students respond through dialing or SMS, technologies that are less demanding in the type of hardware and in the level of skills to put these technologies in practice. However, the venture in using web-based clickers at CUHK revealed that students do not seem to be ready for this more demanding strategy.

The process to make the strategy feasible involves considerations in areas of the following: compatibility of hardware, attainment of essential skills, change of habits as well as the willingness to change on the sides of both teachers and students.

Hardware-wise, in contrast with the initial inference as deduced from the report of Taylor Nelson Sofres where there was a much higher percentage of smartphone ownership (nearly 50%) among people in Hong Kong, the ownership of mobile phones with web functions remains uncommon (approximately 10%) among students in both cases. Apparently, ownership of these devices may be higher among the people at work but not among students. A higher penetration rate of the better mobile phones may be the first requisite if web-based clickers were to be implemented at university.

Skill-wise, students need to be able to use the more advanced mobile functions. In our case studies, we have seen students who owned a smartphone but yet did not know how to connect to the internet as they had not been using their phones much for that purpose. Moreover, some students did not seem to understand the different connectivity methods (e.g. 3G, GPRS, and Wi-Fi). Students should have the knowledge whether their cellular plan included a sufficiently large data plan or not. Then students should decide whether they can use the cellular plan to get access to the internet or rather they should connect to the Wi-Fi service instead. Apart from connectivity, students should also be familiar with the operations and procedures required for activating the web browser on the mobile device and surfing the web.

Teachers should also possess similar skills for the web-base strategy to work. They have to be prepared that they need to assist students in making the web connection on their mobile phones as well as using the other web functions as it is inevitable that some of the students will not have the habit of using these mobile functions. Other than that, teachers need the skills in operating the web-based ARS. Experiences told us these skills are not difficult to acquire but teachers need regular consultations and support.

Lastly, concerning the motivation to change, it is still a question why students would welcome such a change if the additional trouble in setting up their mobile phones for the tasks does not end up as some better learning experiences. The findings in Case 2 seem to suggest that using mobile phones in itself can be a more satisfying experience (perhaps because of novelty?). However, for the additional effort to be worthwhile in the long run, it is better to make students realize that mobile phone can facilitate much enriched and meaningful class interactions than what the traditional clickers can possibly achieve. More meaningful activity designs are called for.

In comparison with students, it is expected that less effort is needed to encourage the use of clickers among teachers. Mobile phone clicker serves as a more convenient option to traditional clickers as teachers are not required to spend extra in purchasing neither the clickers nor the receiver. Moreover, web-based clickers allow teachers to save the time to inspect respective devices essential to produce responses in class (such as checking the level of battery from time to time). Besides, more time can be saved if students were to respond with their own mobile phones as there is no longer a need to distribute traditional clickers to students in class. It is believed that teachers who are motivated to adopt clickers are more likely to come up with meaningful activities, which result in better learning outcomes.

Conclusion

The paper reports two pilot cases in which the web-based classroom response system were adopted in the course of teaching and learning at two universities in Hong Kong, CityU and CUHK respectively. The success of web-based classroom response system was dependent on the possession of high-end mobile devices and skills to maneuver these devices. The primary objective of this study was to evaluate the feasibility of such practice in real classroom settings.

Rather than adopting a system that was purely web-based, a hybrid system, which allowed reception from both mobile phones and traditional clickers, was adopted to ensure a higher degree of participation among students. In contrary to the initial expectations of the researchers that the majority of university students should be in possession of the right mobile phones for clickers, only a minority of them had these devices. Moreover, many of these students were unaware of the steps to connect their devices to the internet. As for the teachers, they were yet not fully competent in operating the respective devices in the absence of technical staff. All in all, the experience we had informed us that much is still missing before a pure web-based ARS can be feasible in the real context. The missing parts relate to improvement in areas including hardware, skills, habits and motivation.

Regardless whether web-based or traditional clickers were used, however, the present study found that students on the whole welcomed the idea of a student responding system in general. Students appreciated that such a practice promotes teacher-student interaction and enables them to think and apply knowledge in solving problems.

The experiences served well in assisting us to reflect upon the support we need to give teachers in the future in relation to the use of web-based clickers. We now regard that the training of both teachers and students are equally important. Both should acquire basic knowledge of using the mobile devices and using them to connect to the internet. Support should also be continuous rather than one-off. We may also supply a laptop to teachers with the right settings and software installed as to avoid technical problems caused by using classroom computers. Moreover, we may need to explore other possibilities and systems to further enhance the types of interactions: not merely multiple-choices, but text or even images can be exchanged in the classroom.

Lastly, we should be aware of the fact that our study was limited in many aspects. Findings in our two studies were preliminary and indicative but yet revealing. The two cases were small-scale first-time endeavour of the teachers in attempting the new teaching strategy. More exploration is needed before we have a wider picture of issue at hand.

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Author contact details:
Shun Leung Lam

Centre for Learning Enhancement And Research
The Chinese University of Hong Kong
Rm 302, Academic Building No. 1
The Chinese University of Hong Kong
Shatin, Hong Kong

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