

# A Mobile-Based Group Quiz System to Promote Collaborative Learning and Facilitate Instant Feedback

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## Abstract

In this paper we develop and evaluate a mobile-based questioning-answering system (MQAS) that complements traditional learning which can be used as a tool to encourage teachers to give their students mobile-based weekly group quizzes. These quizzes can provide teachers with valid information about the progress of their students and can also motivate students to work in a collaborative manner in order to facilitate the integration of their knowledge. We describe the architecture and experiences with the system.

## Keywords

Mobile learning, m-learning, mobile quiz, group quizzes.

## 1. INTRODUCTION

Modern communication technologies and mobile devices are revolutionizing our lives and business practices [1]. Wireless networks and mobile technologies allow the instant exchange of data anywhere in the world. Data includes text, voice, video and animated images. Undeniably, each generation of technology can mould educational development in its own image [2]. Consequently, the use of such technology plays a crucial role in the learning process. The prolific mobile phone can be indispensable in supporting mobile learning potential [3]. A Portio Research report found the overall, the mobile phone penetration rate will be 75 per cent by 2011 as a direct result of increasing mobile phone users, which may reach around 1.5 billion. Additionally, 65 per cent of these 1.5 billion new consumers will come from the Asia Pacific Region [1]. Life is rapidly changing, people adapt to this rapid change of lifestyle in different ways. Meeting the requirements of daily life can pose significant obstacles to seeking classic education. Seeking further education can be expensive, even unaffordable. Disengagement from education has risen considerably. This may correlate with an increase in illiteracy. This complex issue can impact entire communities. Therefore, great effort is required to counteract and control this important phenomenon. Potential solutions to this issue must consider the mobility and personal characteristics of potential education seekers. Increasing availability of educational options may not be constrained by physical boundaries [3]. That is, education can easily take place provided the learner is eager to learn [4]. A study conducted by Vavoula on everyday adult learning episodes found that, from a total of 161 learning episodes, 51 per cent took place in an environment familiar to the

Learner such as the home or workplace. Other findings in Vavoula's study showed that:

- Two per cent took place at a friend's house
- Five per cent took place outdoors
- Six per cent took place at place of leisure
- 21 per cent took place in the workplace but were separate from the immediate work area
- 14 per cent took place in other locations such as places of worship, the doctor's surgery, cafes, hobby stores and inside cars.

Fascinatingly, one per cent of the self-reported learning took place on transport. This highlights the possibility of using transport, such as trains or buses, as portable learning environments in which students can use commuter time to study. This environment may present real-life episodes that stimulate learning and encourage an expanded perception of how to deliver and receive education [1] [2]. M-Learning allows students to use their unproductive time to pursue extra education. It can also be applied to specific formal and informal educational situations to increase the learning experience. M-Learning is an influential technique that engages students in an environment familiar to them. It is particularly effective for non-traditional learners or large groups who are unable to participate in classroom-based learning. Indeed, M-Learning plays a crucial role in opening new possibilities to extend educational opportunities. Mobile assessment can be also a great option which can be used to encourage students to work together regardless of their physical locations [5].

The focus of this paper will be on using the mobile phone for offering a mobile-based weekly group quiz to provide both the instructor and student with instant feedback, to encourage teachers to give their students mobile-based weekly group quizzes and to encourage students to work in a collaborative manner. Instant feedback is a powerful method to help the students immediately measure their understanding of a given class. Moreover, the instructor can also benefit from instant feedback as it indicates whether the concepts of a given class have been understood by students or not. From another point of view, learning in a collaborative manner allows students to benefit from each other's strengths. In this research, the researcher designs and builds a

Mobile Questioning Answering System (MQAS) to facilitate the transmission of instant feedback and to facilitate collaborative learning.

## 2. CONCERNS

Two concerns motivate our approach:

- A. Due to individual differences between students in their level of understanding, some students may not be able to clearly understand the concepts imparted in a given class. So, students need a flexible method to help them work collaboratively in order to gain benefit from the knowledge of others in order to increase their understanding.
- B. Teachers need to confirm whether the student has met the planned objectives of the given lesson. The instructor can achieve this by following a strategy of weekly quizzes. However, in a traditionally-based assessment forum, that being paper-based, the teacher's intent may be impeded by obstacles such as the process, being time consuming and inaccurate, and involving a huge effort in the case of a large class and the absence of instant results.

## 3. THEORETICAL BACKGROUND

### 3.1 Feedback

When it comes to education, feedback is a crucial part of the learning process as it provides both teachers and students with valid information about their performance. In this research, the emphasis is on the mobile-based weekly group quizzes as a method to provide feedback in term of marks which are facilitated by MQAS. Both teachers and students can benefit from the results of these weekly quizzes. These mobile-based weekly quizzes focus on the objectives of each lecture, meaning that learning objectives of each class will be converted to the form of questions to be given to students as a quiz. So, these mobile-based weekly quizzes cover the necessary learning objectives that students have to meet in order to understand the content of a specific class. Teachers can use them as valid measurements to assess and evaluate the quality of their teaching. Also, weekly quizzes can be seen as a guide for teachers, providing them with information on how and why students understand or misunderstand the concepts imparted in any given lesson. Moreover, quizzes play a vital role in identifying the parts of the lesson which should be explained again, or given extra emphasis. Instant feedback also helps teachers to develop suitable academic strategies to deal with students who have academic problems.

Students also may benefit from instant feedback provided by MQAS. These quizzes can be viewed as a guide to help students understand their weaknesses and help them assess their understanding of a given class. Also, quizzes can assist the student to early recognize the objectives of given class as it will be covered in the given quiz which is given at the end of each lecture.

Traditional paper-based quizzes may be more difficult to implement, being time-consuming, inaccurate, requiring an

enormous effort in the case of large classes and lacking in instant results. However, the MQAS can address these drawbacks. The reason is that MQAS easily allow teachers to construct these weekly quizzes and send them to their students' mobiles. Most importantly, teachers do not have to bother themselves with correcting these mobile-based weekly quizzes. Teachers simply have to wait for the results of the quiz which will be automatically produced by MQAS. The most significant feature of MQAS is that it allows students to do the quiz using their mobiles, so there is no restriction at all, meaning that students do not have to sit in front of computer for a specific time to answer questions on a given quiz. Furthermore, students do not have to wait for weeks to obtain their results as the result of their quiz is sent to them instantly upon the completion.

### 3.2 Collaborative Learning

Working together in groups defines collaborative learning, its major attributes including the supply of common problems or suitable tasks for the group to work on, facilitation of small group learning, developing cooperation, interdependence and individual responsibility as well as fostering responsibility between group members [6]. Here, social interaction is encouraged to allow students to learn from each other's strengths. The group activity aims to support friendship, brotherhood and team work. In a collaborative environment, the teacher will only serve as a facilitator who provides support and guidance but does not necessarily interfere directly with the learner's natural setting. This role of the teacher, which is to help the participants or learners develop appropriate cooperative behavior, should encourage learning outcomes. In fact, social interaction through collaboration is essential in developing an effective learning environment as it supports high-level critical thinking skills, as well as individual and group responsibility. The MQAS aims to facilitate collaborative learning as it involves mobile-based weekly group quizzes for students, where the students will be asked by teachers to form groups in order to do the quiz, using their mobiles in a collaborative manner. The quiz will only be sent to the leader of each group, meaning that, the quiz will be running only on the leaders' mobiles. Sending quizzes to leaders could be an effective tactic to increase the connectivity and interactivity of groups as leaders will need to relay the questions of a given quiz to the members of their group. Therefore, students are required to talk in order to answer the quiz, so that answering the quiz questions becomes the central aim of this particular group activity. In contrast, if the quiz is sent to all group members, the interaction between members could be greatly reduced because each one will be able to easily read the quiz directly from their own mobile. MQAS could be an effective way to encourage students to work together. Three reasons support this view. First, students use their mobiles to do the quiz, meaning that students will be able to do the quiz at any time, in any place. Second, the quiz which is a task with which students are very familiar can be considered as a transformation from individual to group work. Third, it is well known that a quiz is a graded task which affects students' academic path. In the case of the mobile-based group quiz, any

member of the group will have the same mark as the group's mark, meaning that the mark will be shared by group members. Sharing the same mark is a critical point which can play a major role in increasing the level of interactivity and the responsibility among each group. The level of difficulty of the quiz should be appropriate to suit group activity. Indeed, with the presence of the teacher as facilitator to guide the learners in the process of performing the learning activities and with the help of peer collaboration, it is likely that learning will occur. In the study of Sthapornnanon and Theeraroungchaisri, it is emphasized that students learn best when they actively construct their own understanding through social interaction with peers [7]. From here, they are encouraged about self-discovery in terms of solutions and ideas. MQAS intends to encourage collaborative learning through the implementation of group activities.

#### 4. THE CONCEPT OF MQAS

MQAS is generally made up of two different parts interacting with each other to facilitate the mobile-based group weekly quizzes. The first part is the client-side mobile-based application which runs on students' mobiles. The client-side is programmed by using a special version of Java called Java micro edition or Java ME for short. The main purpose of having this application and making it run on students' mobiles is to benefit from the mobility of students, in which case, they can easily interact with it regardless of their physical location. The second part of MQAS is the server-side which is a web-based application programmed using VB.NET with ASP.Net 3.5 technology to build the website. The server-side plays a key role in providing teachers with an easy way to remotely set up the quizzes and monitor the performance of their students. Most importantly, the server-side is responsible for automatically correcting the questions and providing instant results without any intervention from teachers.

#### 5. THE CONNECTIVITY BETWEEN THE PARTS OF MQAS

MQAS relies heavily on SMS protocol that is used by both side the client and the server to communicate with each other, especially for students to send answers. In fact, in this system, the SMS protocol is purposefully chosen as a stable way of exchanging information between the two parts of the system. In this regard, the expected question to be asked is why the SMS is preferred over other ways such as using the Internet. The reasons behind this are as follows:

First, SMS is provided by telecommunication companies as an essential service. So it does not have to be ordered separately as in the case of the Internet services in some countries. Second, it is supported by any kind of mobile device; also it is a relatively inexpensive service. Third, its network is highly reliable; also it does not suffer from frequent disconnections. Most importantly,

SMS messages can be addressed to a specific port, so that different applications can communicate on dedicated ports.

Indeed, MQAS aims at minimizing the use of the Internet to avoid any connectivity faults which cannot be predicted which may play a major role in causing many disturbances during the quiz. Most importantly, the quiz has a limited time to be done, meaning that students have to start at a specific time and end at a specific time so any connectivity faults are not acceptable and may prevent other students from completing the quiz. However, MQAS makes use of the Internet for one purpose, which is to download the XML file which contains the quiz from the server-side of MQAS using the Internet. Downloading the quiz from the server-side of MQAS using the Internet will not take a long time because the size of the quiz file is very small. From practical experience, the client-side collaborative quiz requires only five seconds to download the XML file. After downloading the quiz, the Internet connectivity is not needed any more. The rest of the communications will be via SMS text messages which are more stable than the Internet. We use the Internet in order to overcome the limitation on the number of characters that can be sent in each SMS text message. Each SMS messages can consist of up to 160 characters at most which is compressed into 140 bytes which is not enough for a long quiz. Even in the case of concatenated SMS, giving a long quiz is not a practical method to be followed as this method has to be supported by the cellular network industry and mobile phones, in order to function in a proper way, making it very costly and limited.

#### 6. HOW MQAS IS USED

We explain below how MQAS is used:

1. In the beginning, students have to be divided by the teacher into groups. Each group has to have a leader who can be elected by students or assigned directly by the teacher. Figure 1 illustrates the class division.

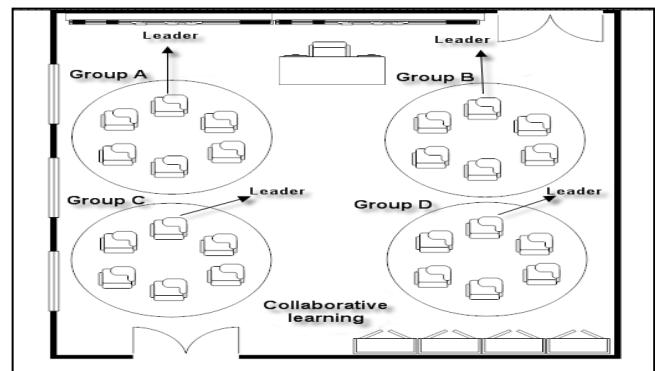


Figure 1: the division of class

2. The client-side collaborative quiz has to be preloaded to the group leaders' mobiles before doing the quiz. A specific text message will be sent to their mobiles by the teachers which contains the URL which leads to the place of XML file.
3. Upon receiving the SMS message, the client-side of MQAS will automatically trigger the client-side and trigger loading of the

XML file which is saved on the server-side of MQAS using Internet connectivity.

4. Upon downloading the quiz, each group is required to start answering the quiz in a collaborative manner.
5. After finishing answering the questions as a group, the leader of each group will send group's answers in the form of an ordinary SMS message to the server-side using the client-side of MQAS.
6. Answers will be corrected in the server side.
7. Feedback is sent in the form of percentage as text message to each leader of group.
8. Quiz's questions and answers are emailed to each groups' leader along with groups' answers.

## 7. EVALUATION

### 7.1 The Context Of The Study

This study was conducted at La Trobe University in Australia. For the purpose of this study, the subject, Mobile Pervasive Computing (CSE4MPC), was chosen. A part of this subject involves mobile technologies and designing an application that can be used on mobile devices. The reason for choosing this particular subject is that students involved in this subject are more likely to be familiar with the applications of mobile devices. This familiarity on the student-side helped in overcoming the time limitation problem, as this study had to be conducted over a very short period of time.

### 7.2 Participants

For the purpose of this study, two groups of postgraduate students participated; all of them hold Bachelor of computer Science. Each group consisted of three members including the leader. Students involved in this study participated voluntarily. The two leaders were elected by the students involved in this study. Each student joined their preferred group.

### 7.3 The Procedure

For the purpose of using the MQAS to answer the paper questions, the researcher followed the steps outlined in point number 6. The three quizzes were given in this study were written by the teacher of the subject. The nature of every quiz question was linked to the objectives of every lecture. In other words, the objectives of a given lecture were converted into a question form to be given to the students in the quizzes. Most importantly, all three given quizzes were given outside of the assigned class for the chosen course; one of them was done in the main library. The purpose of doing this is to increase the freedom of both teachers and students.

### 7.4 Instruments

Two interviews were used at the end of this study. One was used with students, and the other was used with the subject's teacher. Also, observation was used in this study. The researcher attended the three classes in order to observe the process of how students used the MQAS.

### 7.5 The Study Findings

The qualitative analysis of the sources of data resulted in answers to three questions:

1. Does the mobile-based questioning-answering system facilitate the implementation of the collaborative learning theory?
2. What are the benefits of using a mobile-based questioning-answering system to provide students with instant feedback?
3. Does the mobile-based questioning-answering system help teachers construct weekly quizzes in a convenient way?

Questions 1 and 2 were answered by the students' responses to the interview questions. The interview consisted of six questions: two related to collaborative learning and one related to the benefits of instant feedback provided by MQAS. The remainder investigated the benefits of this approach.

Question 3 was answered by the teacher's responses to the interview questions directed to him. My own reflections (gleaned from the observation sessions) will be used to support the answers to the paper questions.

### 7.6 Students' Reflections

Based on the students' responses to the interview questions concerning the first question, the first problem was, to some extent, solved by using the MQAS as it encouraged students to work collaboratively to gain benefits from each other's knowledge. A noteworthy finding is that students liked the mechanism of sending the questions to the leader of the group, as it compelled them to talk objectively with each other in order to answer the questions in the quiz. This important feature of MQAS helped increase the interactivity and connectivity among the groups.

The second paper question was included to determine the value of instant feedback provided by MQAS, this question was answered by students. Based on the students' responses to the interview questions concerning the second question, it can be seen that students obtained huge benefits from the instant feedback facilitated by MQAS, as it helped them realize the points in a given class that they have or have not understood.

### 7.7 Teacher's Reflections

The last question was added in order to determine the benefits that the teacher obtained from using the MQAS. Based on his responses to the interview question, it is clear that he was pleased about this system as it helped him manage the weekly group quizzes and monitor students' performance with fast feedback.

### 7.8 Researcher's Reflections

I (the researcher) attended all three trials of MQAS in order to observe the performance of students. In order to increase the seriousness of these quizzes, the winner was promised to be rewarded. The points that I observed during the trials are as follows:

First, students seriously discussed the questions with each other in order to ensure their answers were right to be competitive against other groups. Second, Mobile-based group quizzes encouraged them to talk, to participate and to discuss and elicit their ideas, the mechanism of sending the quiz to one mobile (leader's mobile) was successful as it encouraged students to talk objectively with each other. Third, one of the participants could not attend the lecture, but he told me at the end of the quiz that these mobile-based group weekly quizzes helped him better understand the concept that was relayed in the class that he could not attend. Fourth, one of the participants, after receiving feedback which was sent as a text message, told me that he would consider this mark as a wakeup call, because previously, he had no idea that he was not on the right track.

## 8. RELATED WORK

Currently, handheld devices are being widely used in education as an instruction tool for learning. Many researchers have proposed different ways of using handheld devices in education. For instance, wireless access to online resources allows students to obtain information from the Internet using their mobile. Also, it has been used to increase the interactivity of the ordinary classroom, to increase the level of thinking of the student by using educational games, and to obtain situational information such as what can be noticed in fieldwork studies. Furthermore, handheld devices have been used to serve many purposes such as language learning, music education, student reminders and personal timetabling, work-based training and lifelong learning. All of these approaches are based on a different kind of technology of handheld devices.

In this paper however, we focus on the systems that provide quizzes to motivate learners to obtain benefit from the mobility of the mobile devices and also on the systems which follow the question answer kind of relationship. For instance, in [8], the mobile quiz system aims to facilitate information-sharing through quiz challenges posted on the 3G mobile phones of pre-registered users. Also, in [9], users are provided with lessons to enhance the reading comprehensions for students and at the end of each lesson, there will be a group of questions that should be answered to proceed to another level. Moreover, in [10], the developed mobile application is used by students to access to the server to download the tests which are about many subjects and also these tests have three levels of difficulties. The application has two modes being single and group mode, the player can play until he finishes the available test; the feedback is provided with some funny faces. Also, in [11] learners can send an empty mobile email to the server side along with the subject name in order to request the test to be email to his/her mobile. After receiving the test as an email, student will answer the given test, and then they should replay to the email by typing the answers and sending them back to be corrected and to get the feedback. However, they do not facilitate group quizzes in the same way as we do here. In which case, the MQAS is only running on leaders' mobiles to

maximize the positive participations and to facilitate the human interaction between students as mentioned before.

## 9. CONCLUSION

In conclusion, although the present study may have some limitations, it provides useful insights into the benefits of MQAS as a quiz platform; it gives a general picture of the results of using this system as a tool to encourage students to work collaboratively; and it illustrates the benefits of providing students with instant feedback and a weekly mobile-based group quiz, as well as feedback to teachers regarding students' understanding of lectures. The convenience and usefulness of issuing frequent and regular quizzes via the mobile phone channel cannot be underestimated. Of course, more extensive research could be done, based on the present study, with the goal of promoting the use of mobile devices for educational purposes on a larger scale.

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