MobiQiyas: A Mobile Learning Standardized Test Preparation for Saudi Arabian Students

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Abstract:

A mobile learning system, called MobiQiyas, for preparing Saudi Arabian students for one of the standardized tests, given by the National Center for Assessment in Higher Education (NCAHE), has been developed, using ready-made commercial products and tools. The learning material of MobiQiyas consists of practice questions with their answers, both provided by NCAHE, to be loaded by the students into their own mobile phones; after installation, the students can interact with MobiQiyas any number of times, as desired, without incurring any additional cost, other than the initial airtime cost for downloading. From all the students taken the test, 20,000 students were randomly selected to use it and information was collected from them to measure their readiness and reaction of MobiQiyas. It was found that 36.1% of students had actually downloaded MobiQiyas. Furthermore, a telephone survey was conducted, after the test period, on a class of 40 students in a secondary school in Riyadh, taking the same test to measure their acceptance of MobiQiyas, using a 9-item questionnaire based on a 5-point Likert scale. The responses of the 40 students reflected high acceptance and satisfaction levels of MobiQiyas as a test prep tool.

1 Introduction

The “anytime, anywhere, on the move” paradigm, resulted from the lowering cost of mobile devices and the availability of wireless infrastructures, offers powerful features and functions such as mobility, reachability, localization, flexibility, and motivational effects due to self controlling and better use of spare time. Mobile-based applications are radically transforming the way people access and utilize information resources; they were first employed within gaming, movies, or other sectors of the entertainment industry, taking about 12-18 months for adoption into mainstream industry [5]. They have established a new dimension for providing services such as mobile commerce (mCommerce), mobile banking (mBanking), mobile health (mHealth), etc. The creation of the Wholesale Applications Community (WAC)¹, on Feb., 2010, by some of the world’s leading telecommunications operators and device manufacturers, fully supported by the GSM Association (GSMA), will definitely increase the overall market for mobile-based applications.

There are opportunities for mobile-based applications in the learning environment, with of course some challenges and questions, creating “mobile learning,” m-learning or mLearning

¹ WAC (http://www.wholesaleappcommunity.com/default.aspx), a not-for-profit open global alliance, aims to establish an open ecosystem to spur the creation of mobile-based applications, regardless of device, operating system (OS), or operator, by encouraging open standardized technologies, driving scaled deployment of those technologies, and providing complimentary commercial models, allowing the developers to be paid for the applications which are then sold through any associated application store.
for short, with expected benefits to be reflected in more efficient and improved learning results. Mobile learning, however, has raised various issues, particularly user-interface related, due to weaknesses of the mobile devices such as very small screen displays, low resolution, low processing power, restricted input capabilities of some of these devices, and limited storage capability, thus making the viability of mobile technology in learning questionable. These issues play an important role toward the implementation of mLearning. Therefore, it is critical to study the learner adoption and acceptance of mLearning for some special application or applications.

Test preparation (i.e., test prep), in particular standardized tests, is a very important application to almost all students; a standradized test is any test in which the same test is given in the same manner to all test takers such as the TOEFL® (Test of English as a Foreign Language™) test, provided by the Educational Testing Service® (ETS), the SAT® (Scholastic Aptitude Test™) test, provided by the College Board®, and ACT® (American College Testing®), provided by ACT, Inc. (http://www.act.org/). In general, test preparation is an activity, where the students normally study in isolation, without the immediate supportive environment, and become aware of non-understood aspects or concepts, thus the willingness of the students to accept and afford the extra charges, occurring with mLearning. Furthermore, the motivation aspect and self-paced learning of mLearning is fully pronounced in test prep, allowing the students to utilize their spare time effectively.

In this research, an mLearning-based test prep system, called MobiQiyas, is designed and developed, using ready-made commercial products and tools, for one of the standardized tests given by the National Center for Assessment in Higher Education (NCAHE), on the period of 7-14 May, 2009. After MobiQiyas is downloaded and installed into the student's mobile phone, the student can practice solving questions that were given in previous tests of NCAHE, any number of times, as desired by the student, without incurring any additional cost on the student, other than, of course, the initial airtime cost for downloading. For the purpose of this initial trial of MobiQiyas, 20,000 students of the total number of students taking the test were randomly selected to use it. Information was collected from the 20,000 randomly-selected students and 40 students, belonging to a class of a secondary school in Riyadh to measure their readiness, reaction, and acceptance of MobiQiyas.

The structure of the rest of this paper is as follows. Section 2 defines and describes mLearning, whereas Section 3 discusses the use of mLearning for test prep. The description of MobiQiyas is given in Section 4 followed by its trial and analysis of the results to measure the readiness, reaction, and acceptance of the students in Section 5. Finally, the concluding remarks are provided in Section 6.

2 Mobile Learning

Mobile learning can be defined as any service or facility for knowledge transfer of events, content, tools, and applications to the learner [2], regardless of location and time [7], thus resulting in learner's alteration in behaviour [5], where mobile handheld devices are used, while the learner and/or the learning material providers could be on the move. The behaviourist desribitor indicates that learning is not deemed without the learner's alteration in

\[ ^2 \text{ETS (http://ets.org/) is a non-profit organization that develops, administers, and scores more than 50 million standardized tests annually in more than 180 countries, at over 9,000 locations worldwide; the tests include the TOEFL® test, and TOEIC® (Test of English for International Communication™) test, the GRE® (Graduate Record Examination) General and Subject tests, and The Praxis Series™ assessments.} \]

\[ ^3 \text{The College Board (http://www.collegeboard.com/), founded in 1900, is a non-profit membership association of more than 5,700 schools, colleges, universities and other educational organizations, providing standardized tests for more 7 million students annually; the tests include the SAT test, founded in 1926 [4], the PSAT/NMSQT® test, and the Advanced Placement Program® (AP®) test.} \]

\[ ^4 \text{In 1959, Everett Franklin Lindquist, an education professor at the University of Iowa, developed the ACT; he later pioneered the first generation of optical scanners and the development of the GED test [4].} \]
behaviour [5]. Furthermore, the use mobile handheld devices, possibly on the move, excludes the use of labtops from mLearning. Mobile learning is on the intersection of mobile computing and e-learning [8, 10], conveying e-learning through mobile devices using wireless connectivity; this intersection includes the use of desktop as well as labtops. Mobile learning can provide access, context, and collaboration, and supply additional facilitation measures for facilitators [5].

Learning activity is a dynamic activity that can be closely linked to the concept of mobility with respect to space, time, and topic areas [11], making a perfect match with mLearning - learning occurs at different places (e.g., learning institutes, workplaces, homes, and even places of leisure), at different times (e.g., working days, weekends, or holidays), and between different topic areas of life (e.g., education, work, self-improvement, or leisure) [11]. The diversity of space for adults’ daily self-learning was shown in [12], thus opening more opportunity for mLearning to support learning during the growing amounts of time that people spend on the go.

According to a report from Ambient Insight, the mLearning market in the US reached US$538 million in 2007 and it will continue to grow by a 5-year compound annual growth rate (CAGR) of 18.3%, where revenues will reach US$1.4 billion by 2014 [1].

3 Standardized Test Prep Based on mLearning

3.1 Standardized Tests

Students all over the world are taking more standardized tests than ever before, and at ages long before entering colleges. Standardized tests have become one of the largest determining factors in the college-admissions process, particularly for élite schools.

A standardized test is a test that is administered and scored in a consistent manner, thus allowing more reliable comparison of outcomes across all test takers [13]. Standardized tests are designed in such a way that the questions, conditions for administering, scoring procedures, and interpretations are consistent and are administered and scored in a predetermined, standard manner [13]. Standardized tests are often time-limited tests composed of multiple-choice and true-false questions because they can be given and scored inexpensively. However, standardized tests can nearly use any other form of assessment such as essay questions and fill-in-the-blank analogies (e.g., blue:sky::____:grass), thus requiring human evaluators to determine the grade to be given to a response.

Grading was at first done manually, an arduous task that undermined standardized testing’s goal of speedy mass assessment. The IBM 805 Test Scoring Machine was developed in 1938 to be the first automatic test scanner [6], where electrical current was used to detect marks made by special pencils (e.g., simple No. 2 pencils) on the answer sheets, giving rise to the bubbling-in of answers [4].

In Saudi Arabia, the National Center for Assessment in Higher Education (NCAHE), known as Qiyas, (http://www.qeyas.com/Qiyas/Info/English.aspx), subsidiary of the Ministry of

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5 It was found that the daily self-learning episodes for adults took place 51% at the learner’s usual environment (i.e., learner’s home or office), 21% in the workplace outside the office, 14% in other locations (such as places of worship, the doctor’s office, cafes, hobby stores, and cars), 6% at places of leisure, 5% outdoors, 2% in a friend’s house, and 1% on transport [12].

6 The earliest record of standardized testing comes from China, taking by applicants for government jobs [4] in the imperial examinations and it was institutionalized during the sixth century CE, under the Sui Dynasty [13]. On the contrary, examiners in the Western world favored essays, a tradition stemming from the ancient Greeks' affinity for the Socratic methodology [4]. During and after the Industrial Revolution, standardized tests had emerged as an easy way to test large numbers of students quickly [4]. In 1905, French psychologist Alfred Binet had developing a standardized test of intelligence that would eventually be incorporated into a version of the modern IQ test, dubbed the Stanford-Binet Intelligence Test [4]. By World War I, standardized testing was a common practice in the Western World.
Higher Education, is responsible for preparing, administering, and giving standardized tests. The tests include 9 educational tests and 3 vocational and licensing tests.

### 3.2 Mobile Learning Test Prep Systems

As of 2009, the traditional US academic classroom-based test preparation industry is a US$3.1 billion industry, excluding exam preparation revenues related to State-mandated K-12 testing, where the two largest suppliers are the Princeton Review and Kaplan (http://www.kaptest.com/), owned by the Washington Post; both accounting for 45% of all revenues so far [Ambient]. However, the revenues for classroom-based test prep are now in decline and they are trying to move to learning technology-based product which is growing, for test prep, compliance assurance, skills assessment, and NCLB-related testing, by 20-22%, due to consumer, corporate, government, and academic demand [3].

A collaborative mLearning system was designed and developed at University of Cape Town (UCT) in South Africa, called the Dynamic Frequently Asked Questions (DFAQ); DFAQ, a seamless web-based application with an SMS (Short Message Service) interface, is an anonymous consultation tool, where the students can post questions anonymously, from their own personal study environments, using SMS message, and receive responses, through SMS message from anonymous sources (i.e., peers, educators, and/or tutors) unless otherwise stated, thus building trust between students and educators and giving confidence to students to reach out and ask for help [9]. During examination preparation time, when students were mostly off-campus, the use of the SMS feature of the DFAQ environment had increased by almost 200% as compared during regular class time [9].

In the US, smsPREP (http://smsprep.com/), from smsPREP, Inc., combines test prep with text messaging by supplying its subscribers, for US$19.99 per month, with practice questions, flashcards, and test-taking strategies, for the PSAT, SAT, ACT tests, using SMS messages. The subscriber of smsPREP chooses the subject (i.e., math, critical reading, writing, or strategies) and the time, then as SMS will sent to the subscriber's specified telephone number; for practice questions, the answers and their explanations are then sent to the subscriber by SMS, after the subscriber answers the question through SMS.

The limitations of SMS message on the size (i.e., 160 characters per message) and the type of information (i.e., only text) make it suitable for text-only information. Therefore, most test mLearning test prep systems use wireless application protocol (WAP) and Java-based applications. These applications can be simply bought from mobile application stores such as iPhone, iTunes, etc.

In addition, some standardized test providers are supplying mLearning test prep systems. For example, the Educational Testing Service (ETS), on December 16, 2008, joined with Nokia to launch English learning courses, designed by ETS teaching and testing experts, for Nokia phone users in China [4]. The courses can be downloaded using Nokia’s Mobiledu (http://www.mobiledu.cn/en/index.html), where the available courses include TOEFL-type practice questions and TOEIC-type practice questions.

### 4 MobiQiyas

MobiQiyas is a mobile learning system for preparing the students for the tests given by Qiyas. It was designed and developed using ready-made commercial products and tools. MobiQiyas provides “anytime, anywhere, and the move” resources with rich interaction for effective

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7 Qiyas is an Arabic word, meaning measurement.
8 President George W. Bush's 2001 No Child Left Behind education reform demanded the use of state-mandated standardized testing as a means of assessing school performance [4].
9 This has led to conciseness in messages, producing a discursive type of SMS lingo. SMS lingo has become an acceptable SMS language among mobile phone users and there are several SMS lingo dictionaries [14].
learning and performance-based assessment. In addition, it is designed to produce support, motivation, introductions, tips, revision, and study guides. MobiQiyas was motivated by the fact that all students taking the tests of Qiyas own or have access to mobile phones. Upon receiving an SMS message, sent automatically by a local SMS provider, on the student's mobile phone. The student then simply clicks on the link provided by the SMS to access MobiQiyas as shown in Fig. 1. The learning material of MobiQiyas is structured into modules, where each module pertains to one of the tests provided by Qiyas; there could be more than one module related to one single test. Each module consists of questions, provided by Qiyas along with their answers; the questions were asked in previous tests of Qiyas. The fact that the questions and their answers were provided by Qiyas and the questions were used in previous tests of Qiyas enhances the credibility of MobiQiyas in the eyes of students. Each module is an application based on Java ME (Java Platform, Micro Edition), making it portable across almost all mobile phones as well embedded devices such as personal digital assistants (PDAs), TV set-top boxes, etc. It was developed using the Learning Mobile Authoring (LMA), from Hot Lava Software. The LMA enables the creation, customization, review, and update of rich interactive content, containing text, images, audio, and/or video. For MobiQiyas, the content contains neither audio nor video. However, images are used for the inclusion of mathematical equations, special symbols, figures, tables, chemical compounds, etc., providing MobiQiyas with high quality display, thus imitating the real paper-based tests. The questions are true-false or multiple-choice questions but MobiQiyas has the capability to provide blank filling questions which were never used in Qiyas's tests. For the multiple-choice questions, the correct answers are automatically fed back to the student after two unsuccessful trials; the number of trails is a system variable and could be changed accordingly by the system designer. Each module is equipped with a table of content, as shown in Fig. 2, and navigational capabilities, using user-friendly icons such as “home,” “next,” etc. Figure 3 shows snap shot of some questions of MobiQiyas. MobiQiyas has the capability to provide not only the correct answers but also the solution of the question and references for further reading. In addition, it can also supply introductory material, review, and study guides.

After the student downloads the desired module into his/her mobile phone and the module is installed, the student can interact with the questions any number of times, as desired, without incurring any additional cost on the student, other than, of course, the initial airtime cost for downloading the desired module.
5 MobiQiyas in Action

MobiQiyas was launched on 30 April, 2009, lasted until 14 May, 2009, to prepare the students for The General Capabilities Test (GCT), given by Qiyas on the period 7-14 May, 2009. GCT, containing verbal and quantitative sections, is mandatory for all high school graduates to
attend higher education, vocational, or military institutes. MobiQiyas for the GCT test contained 50 practice Questions. Furthermore, for the purpose of this initial trial of MobiQiyas, 20,000 students were selected randomly, across Saudi Arabia, from the total number of students, who were taking this particular GCT test, to measure their responses to MobiQiyas.

Each of the 20,000 selected students received an SMS message, sent automatically by a local SMS provider on 30 April, 2009. The report produced by the SMS provider indicated that the message delivery failure ratio was 2.2%, thus the number of students who actually received the SMS message was 19560. The SMS message, shown in Fig. 4, indicated that the student was selected for MobiQiyas trial and it provided information for the student for setting his/her mobile for Internet connection, as required by his/her carrier, and the estimated carrier's airtime-cost for downloading the test preparation module; the carrier's airtime-cost was about 1.5 Saudi Riyal (US$ 0.40). Furthermore, the SMS message supplies a link to be clicked, if the student desires to continue with the trial.

Upon simply clicking on the link provided by the SMS message, MobiQiyas is accessed, as shown in Fig. 1; this is part of the Mobile Delivery and Tracking System (MDTS), from Hot Lava Software. The MDTS is a WAP-based environment, used to track and record students' responses and for the delivery and management of the test preparation modules.

For the purpose of this initial testing of MobiQiyas, the readiness, reaction, and acceptance of the students are measured. The information for the students' readiness and reaction are collected automatically using MDTS; this is can be viewed as the online mode of MobiQiyas, where the students were interacting online with MobiQiyas, whereas the interaction of the students with the questions of module, after downloading and installing the module, can be considered as the offline mode of MobiQiyas. In the offline mode, the student has the liberty to interact with test prep module any number of times, as desired by the student, without incurring any additional cost, other than, of course, the initial airtime cost.

5.1 Students' Readiness and Reactions

A survey was conducted on the students of two parts: the first part was before downloading the test prep module, which is a questionnaire of two questions, and the second one was after the download, consisting of one question. The survey measured the students' readiness for this application and their reactions. The responses of the students were tracked and recorded by the MDTS as given in Table 1. Furthermore, accessing MobiQiyas and the download of the module was automatically tracked and recorded by the MDTS, as depicted in Fig. 5. As shown in Fig. 5, the number of students who actually accessed and downloaded MobiQiyas is 7060 students, representing 7060/19560 = 36.1% of the students who received the SMS message.
Even though, the survey is limited to only three questions, there is a discrepancy between the data in Table 1 and Fig. 5. For example, the answers of the 3rd question in Table 1, given by the students, are not consistent with the results automatically recorded by the MDTS. It seems that some of the students were confused between downloading and installation, even though there was a message after the download, indicating that the download was successful.

Furthermore, the data in Table 1 reflects, in general, the tendency of the students, in particular high school students, to participate non-positively in surveys, in non-controlled environment. This suggests using another method to measure the students' acceptance as will be explained in the next subsection.

### Table 1: Responses of Students

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Skipped</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Have you ever accessed the Internet through your mobile phone?</td>
<td>55%</td>
<td>40%</td>
<td>5%</td>
</tr>
<tr>
<td>2 Do you want to download the test prep module?</td>
<td>94%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>3 Did you download the test prep module successfully?</td>
<td>65%</td>
<td>31%</td>
<td>4%</td>
</tr>
</tbody>
</table>

![Create users](image)

**Figure 5:** The number of students accessed and downloaded MobiQiyas as recorded by the MDTS.

5.2 Students' Acceptance

After the period of the test was over, another survey was conducted on a class of 40 students belonging to one class of a secondary school in the city of Riyadh, where the students had taken the same test as the 20,000 randomly selected students. This is a telephone survey performed by one of the 40 students. The telephone was used to conduct the survey because most of the students were in vacation and telephone was the best way to reach them. Furthermore, using telephone provides a level of seriousness, which is mostly needed in that particular age of the students.

The survey consists of a 9-item questionnaire, based on a 5-point Likert scale, ranging from “Strongly Disagree” to “Strongly Agree.” The response that indicates the lowest approval (i.e., “Strongly Disagree”) received a score of 1, with an increase of 1 point for each response (i.e., 2 points for “Disagree,” 3 points for “Neutral,” 4 points for “Agree,”) until the response that indicates the greatest approval (i.e., “Strongly Agree”) received a score of 5. Therefore, the maximum score of this instrument is 5*9=45 and the minimum score is 9.

Data gathered on this questionnaire were coded in SPSS for analysis purposes. The responses of the students to the questionnaires are summarized in Table 2. As it is clearly shown in the table, the learners' acceptance of MobiQiyas is very high, where most responses score more than 4, implying “Agree” response.

There was only one question with a score of 3.11, regarding whether the student learned new concepts from MobiQiyas. This score is very reasonable, considering that MobiQiyas in this trial only supplies practice questions. In general, the students' responses reflect high acceptance and satisfaction levels for MobiQiyas as a test preparation tool.
### 6 Conclusion

The mLearning-based test prep, called MobiQiyas, for preparing students for one of the standardized tests given by Qiya in Saudi Arabia, with learning material, consisting of practice questions with their answers. MobiQiyas is to be loaded to the student's mobile phones, allowing the students to interact with it any number of times, as desired by the student, without incurring any additional cost, other than the initial airtime cost for download. MobiQiyas was put into action with 20,000 students, selected randomly from the students taken the test, where 36.1% of students had actually accessed and downloaded it. After the test period, a telephone survey was conducted on only 40 students to measure their acceptance of MobiQiyas using a 9-item questionnaire based on a 5-point Likert scale, ranging from “Strongly Disagree” to “Strongly Agree.” The students' responses reflect high acceptance and satisfaction levels of MobiQiyas as a test preparation tool.

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