SMS for Question-Answering in the m-Learning Scenario

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Abstract: Emerging technologies are leading to the development of several new opportunities to guide and enhance learning that were unimaginable a few years ago. The move towards adopting mobile learning technologies is fast growing in both academic and industrial sectors. Mobile learning uses portable devices linked to a commercial public network, including different types of mobile phones and handheld computers. For mobile users, as well in all mobile applications, SMS messaging is found to be the most useful and convenient way of communication technology. In case of mobile learning, there are only limited forms for conducting tests using true/false method, multiple choice selection method etc. Answering short questions is a better way of testing the students to get more details about a particular entity. The practice of messaging can be thought of highly useful for answering such short-answer questions. The case where answers are to be given as short messages to the assessors, evaluating them may not be that much easier when compared to other simple types of tests. This paper focuses on using SMS for answering 'short words-answers' types of questions and evaluating them using simple matching process, providing enough feedback.

Key words: SMS, m-learning, mobile devices, question answering, assessment

m-Learning: Technology in the recent years has opened up a lot of possibilities for various levels of commercial, industrial, personal applications. These technologies have totally changed the way in which people do business activities, communicate with each other, share information and use any necessary accessories. In this context, technologies are becoming boon for educational sectors also. Both instructors and learners have wide variety of options provided to them to perform content delivery, assess students, access course materials, etc. Both the institutes and industries are enjoying the facilities offered by technologies to a greater extent through the concept of e-Learning. e-Learning is the form of defining learning and teaching activities with the help of information and communication technologies. One form of e-Learning is the use of mobile technologies where by portable devices are linked to commercial public networks, including different types of mobile phones and handheld computers. The mobile devices help both the learners and instructors to achieve their goals in 'any time', 'anywhere', 'anything' fashion.

Mobile technologies define two types of distance education technologies[1] namely information media in terms of text, audio, video, images, graphics and communication media for defining interactions among various members of the system through different types of interaction modes like audio conferencing, video conferencing etc. With the advent of mobile devices such as portable handheld computers that are normal in current day business activities, the impact is seen in educational environment also. Using m-learning environment, teachers eliminate the need to write assignments on the chalkboard because they can "beam" instructions to students' handheld devices[2]. Educators understand that mobile handheld computers and wireless connectivity at schools can enrich the learning experience of students.

Advantages of mobile devices: Most mobile devices are useful in education as administrational, organizational and instructional teaching aids for practitioners and also as learning support tools for learners[3]. Some of the main benefits are:
* Learners can interact with other students and teachers.
* Portability feature makes the devices to be used everywhere with ease.
* Sharing and collaboration can be done easily
* Due to the sophistication in the technology, young people can have more interest in learning the subjects.

SMS: SMS, text messaging, is the simplest of all the technologies available in the mobile environment and various interactive learning activities can be devised with very basic equipment linking a variety of people including learners, instructors, administrators etc. All mobile phones, including the most basic models, can send and receive text messages, so this is by far the most widespread of the technologies. The significance of SMS instant messaging represents a number of

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Table 1:   Questions with other details needed for evaluation

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1. Question:"Expand DBMS"	Answer: Data Base Management System
	Keywords: {Data, Base, Management, System}
	Significance Level: {1,2,3,4}
2. Question: What are Objects?	Answer: Objects are Real time entities.
	Keywords: {Real, Time, Entities}
	Significance Level: {2,3,1}
3. Question: What is a Compiler?	Answer: Software to translate the source code to object code
	Keywords: {Software, translate, source, object, code}
	Significance Level: {1,2, 3,4,5}
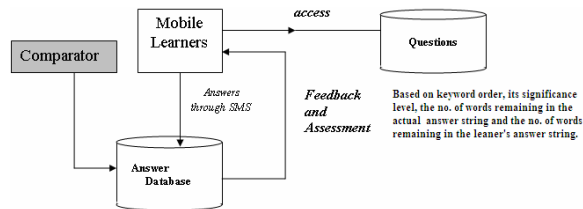
Fig. 1:   Short Answer Questions Model in Mobile learning

opportunities for educational activities. Initially, SMS technology has been mainly used between teachers and parents of students rather than between teachers and students or between student communities[3-6]. But, now the move towards the use of SMS between all levels is highly increasing. i.e. both teachers and students can use handheld devices for their academic communications. In this line, SMS is highly useful in an m-Learning scenario[7] for dealing with variety of activities such as asking questions, providing answers, information delivery, providing feedback, grading etc.

Short answer question model: Most of the e-Learning and m-Learning systems provide only few common types of tests namely True/False, Multiple Options, Ranking, Matching, Text Editing, Fill in the blanks, Image selection etc[8]. Conducting tests based on the 'short words' answer types of questions and evaluating them is not a common practice in most of these learning systems. In this paper, we consider the situation of asking questions to learners and expecting the short answers through SMS messaging. When such answers are given by the learners, they will not be unique. For example, if the question is 'How many bits a byte has?', each learner can send an answer in his/her preferred way having more or less similarity with the actual answer. Some of the answers will be more oriented towards the correct answer like, "8 bits one byte", "One byte has 8 bits", "There are 8 bits in a byte" and some of them may be like, "I think it is 8 bits for a byte", "Is it 8 bits per byte?" etc. which are more diversified in nature. For proper evaluation, we consider the following parameters associated with the actual answer and the answers given by the learners.

    a.   Keywords: Important words expected in the answer string.

    b.   Order: The order of occurrence of these keywords.

    c.   Significance Level: In answer string, each word has a significance level i.e. the expected level of importance of the keyword.

    d.   Matching Keywords of learners with the actual answer.

    e.   Number of words remaining in the actual answer as well as in the learner's answer.

Prepositions, articles are not considered for comparison.

Simple matching algorithm: We define a simple algorithm to match the learners' answer message with that of the original answer string.

a. Let a_i be the answer string for the question q_i.

b. Let m_j, be the answer string messaged by j^{th} learner.

c. Let $\{k_{i1}, k_{i2}, \dots k_{in}\}$ be the important expected keywords in the answer string for the question q_i.
Let $\{s1, s2, \dots sn\}$ be the significance levels of each of these keywords. (The highest level starts from 1).

d. Extract each word from m_j, from the beginning of the string,
Search the word in the answer string a_i.
If found then increment the count CW.
If the order and significance levels of words in m_j match with the actual answer string then declare 'Correct'.

e. Count the no. of remaining words in the learner message (LRW).
Count the no. of remaining words in the answer string a_i (ARW).

f. Use CW,LRW,ARW, the significance level, order to differentiate the learners and for declaring the grades.

Some example questions and related details are shown in the Table 1. The entire process model related to messaging and evaluation is shown in the Fig. 1.

Questions are accessible from the Questions Database by the mobile learners. Answers sent by the learners through SMS are stored in the answer database. The comparator process compares the answers of learners with that of the actual answers. The differences and similarities are considered for evaluation. Every learner is provided with proper feedback and assessment.

CONCLUSION

The move towards m-Learning is fast approaching. In this context, SMS, text messaging, the simplest of all the technologies available in the mobile environment, is thought of as an aid for answering 'short answer' types of questions. In this paper, a simple matching algorithm facilitates the learners to get necessary feedback and assessment.

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