

# M-Learning Support Environment

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*Abstract:* - This paper is a comprehensive presentation of our efforts to support mobile learning. We are using SMS to support info mobility and motivate our students. At the same time we are developing the Intelligent Mobile Learning System which provides adaptive course and assessment material to our students. We see assessment as a key issue to the educational process because not only it provides feedback on whether the course and learning objectives have been achieved to satisfactory level but also it provides the necessary information to improve future educational experiences.

*Key-Words:* - Mobile Learning, Learning Support Unit, Adaptive Assessment

## 1 Introduction

We see mobile learning in the context of life-long learning. The stress is on communication and on human-center system design. Our existing research work concerning m-learning support systems are mainly focused on the following projects: a) We have developed a system that is on time, convenient and personal that sends SMS from lecturers and administrative staff to students registered to the service, about their schedule, changes in it, examinations dates and places, student's marks. The implemented system is not for learning but for managing learning activities in order to guide, prompt, and support the students in their learning b) Another effort concerning m-learning is a long time project that aims at creating an intelligent mobile learning environment for wireless technologies by developing course materials for a range of mobile devices. It is an effort from e-learning to m-learning where assessment is one of the challenging issues.

## 2 Mobile Learning Support

Mobile Learning can be defined as any form of learning that occurs in a mobile environment and may be considered as an integral part of any form of educational process. Our assumptions based on different research results is that m-learning better applies to processes where specific knowledge should be retrieved in a certain moment, where data is collected or utilized on the field and where context-information is strongly related to the learning content. Our mobile learning efforts are

expressed through the SMS Learning Support Unit (LSU) and the Intelligent Mobile Learning System (IMLS) (fig. 1).

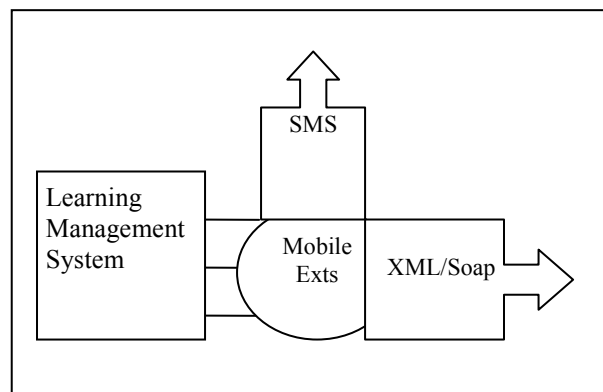


Fig. 1 : A schema of our Architecture

### 2.1 SMS Learning Support Unit

Nowadays, our college and probably other institutions face an accelerated need to provide students' with immediate information about timetable changes, assessment deadlines, feedback from tutors and other administrative issues. Recently we have decided to use our students' communications devices to communicate with them and inform them about urgent, sudden and important academic changes.

The SMS Learning Support Unit (LSU) was developed to be used, mainly, for a) the provision of necessary resources and guidance, and b) motivation of the "at-risk" students.

### 2.1.1 Provision of the Necessary Resources

Provision of the necessary resources and infrastructural guidance and information to support students. Up to this point email was used. However this was not the ideal solution as not all students would check their college mail accounts on a regular basis and email was not appropriate for conveying important information at short notice. We are using LSU

- To notify students about changes in their timetable.
- To notify students about changes regarding room allocations for lectures.
- To remind students of mid-semester exam times, dates and venues.
- To remind students of deadlines for submission of course work.
- To notify students when their test results have been made available on the department notice boards.
- To make students aware of time/date/venue LSU support sessions.
- To inform students of lecturer absence and/or cancelled classes.
- To tell students about important events in the college.

### 2.1.2 Motivation of the 'At-Risk' Students

We identify students as being 'at-risk' and we are sending them encouraging and motivating SMS messages for keeping them into the college and provide them support, attention and encouragement to work harder, more efficiently, more effectively in order to succeed. We organized the 'weak' students into groups based on their weight of weakness and the course they face difficulties. Then, we carefully selected 'strong' students willing to guide and support the weak groups. The whole effort is changing the internal culture of our institution. Speed and directness, SMS characteristics, have been proved essential tools in reducing the drop-out rates. The personal touch of a message on a mobile phone has made the difference. The top two most influential messages are a) "you are not alone in this effort", and b) "we will miss you". The situation has been remarkably improved but to make useful conclusions we want the system operate for three years and see the results get matured and stabilized before we make any official announcements.

## 2.2 Intelligent Mobile Learning Project

The nature of mobile devices with their small screens and poor input capabilities leads to the assumption that they can not replace the standard desktop computers or laptops. However, the same properties can make them efficient in learning domain, if certain constraints are kept [5], [4], [9], [3] :

1. Short modules: Users should be able to use their waiting time for learning activities, like reading (or listening) small pieces of data, participating to forums chatting for finding answers to specific questions.
2. Context-based content: Mobility affects the content delivered. The content is relative to
  - location context : The system should know the location where the learner resides and adjusts to it.
  - Temporal context: The system should be aware of time dependent data.
  - Behavioral context: the system should monitor the activities performed by the learner and responds to them adjusting its behavior.
  - Interest specific context: the system modifies its behavior according to the user's preferences.

One of our main efforts is the one concerning the assessment strategy that is used. One of the primary assessment goals is to provide feedback on whether the course and its learning objectives have been satisfied; this feedback is used to improve aspects of the educational process. So, it is important that the assessment data are accurate. Kellough et al [6] identifies seven purposes of assessment:

- a) To assist students' learning.
- b) To identify students' strengths and weaknesses.
- c) To assess the effectiveness of a particular instructional strategy.
- d) To assess and improve the effectiveness of curriculum programs.
- e) To assess and improve teaching effectiveness.
- f) To provide data that assist in decision making.
- g) To communicate with students and involve, if necessary, their families.

In line with many researchers we distinguish three types of assessment:

1. **Diagnostic Assessment:** Although some authors delineate diagnostic assessment as a component of formative assessment, most of them consider it a distinct form of measurement [6], [7]. In practice, the purpose of diagnostic assessment is to ascertain, prior to instruction, each student's strengths, weaknesses, knowledge, and skills. Establishing these permits the instructor to remediate students and adjust the curriculum to meet each student's unique needs. It provides an indicator of a learner's aptitude for a program of study and identifies possible learning problems.
2. **Formative Assessment:** It is designed to provide users with feedback on progress and informs development but does not contribute to a student's final grades. According to the National Centre for Fair and Open Testing (NCFOT) [10] formative assessment "occurs when teachers feed information back to the students in ways that enable the student to learn better, or when students can engage in a similar, self-reflective process". Formative tests are not graded and are used as an ongoing diagnostic tool; hence, the instructor employs the results of formative assessment solely to modify and adjust his or her teaching practices to reflect the needs and progress of his or her students. A formative computer-based test is described as one where the results of the test do not contribute to a student's final grades. Instead, the student's scores are used to assist in improving the student's learning, often by identifying weaknesses in the student's knowledge and understanding of a given area or by helping them to identify and correct misconceptions. In a similar way, lecturers can also make use of the results obtained to help them improve their teaching by identifying areas that students have found difficult to understand.
3. **Summative Assessment:** Summative assessment provides a measure of achievement or failure made in respect of a learner's performance in relation to the intended learning outcomes of the programme of study. "When the cook tastes the soup, that's formative assessment; when the customer tastes the soup, that's summative assessment" (Black, as cited by Brookhart, [1]).

To maximize the efficacy of summative (and formative) assessment, the following dimensions have been considered: authenticity [1], [6], variety [6], [8], volume [6], [10], validity [1], [6], and reliability [6].

Some of the available forms of assessment strategies included in our system are:

- True/false.
- Multiple-answer questionnaire: the candidate has to select one or more correct answers from a list of options.
- Drag and drop question type: the student selects a number of items from a list (first selection) and then move them to their correct positions (second selection).
- Image hot spot: A hot spot question allows students to click on an image to answer a question. This type of question can be used in identifying certain types of parts in images. Hot Spot questions aren't accessible to students with disabilities. Blind students, for example, won't know where on the image to click and students with mobility issues may not be able to move the mouse with the precision necessary to click in the right spot. So, when we choose to use Hot Spot questions, we make two different versions—one version with clickable Hot Spot questions and one with no images. In the no image version, we just rewrite our original Hot Spot question as a Multiple Choice, True/False, Essay, or some other text-based question. That way we guarantee every student will be able to participate in our assessments or surveys.
- Text writing: test development based on weighted keywords.

We are developing the Intelligent Mobile Learning System which learns by experience, changes its knowledge base on the basis of student's feedback and follows the student's progress. The computerized adaptive testing has been applied to diagnostic, formative and summative assessment. The system is based on recent web technologies and specifications. Questions are exchanged by means of an XSL engine and they are directly transformed in html tests and java objects [2].

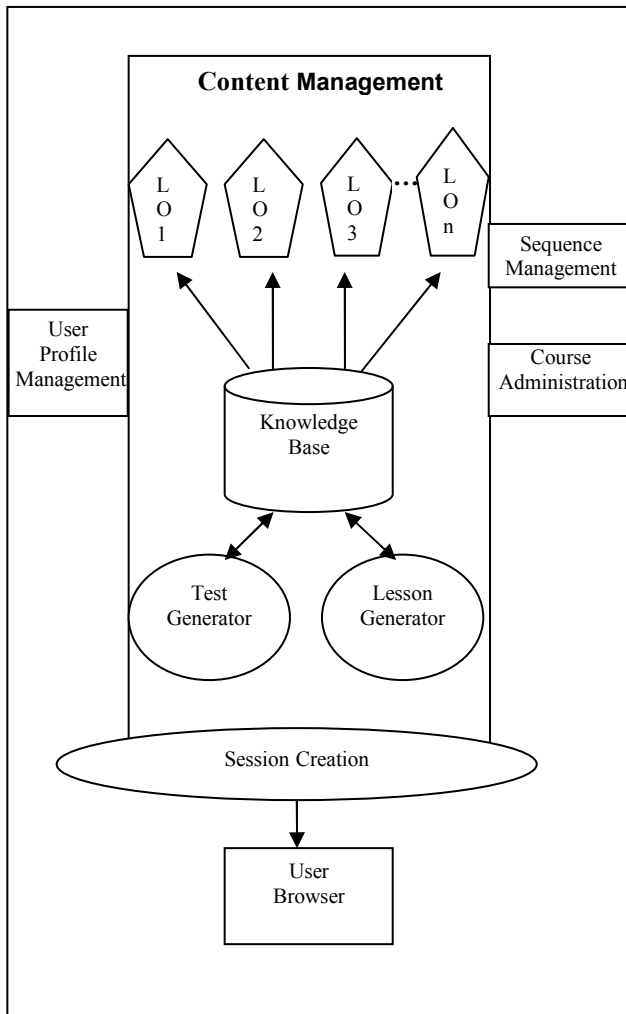


Fig. 2. The Intelligent Mobile Learning System

The knowledge base contains :

- Course structures expressed as related topics.
- History data concerning students' assessment (topic-based or not).
- Mechanism for locating distributed Learning Objects (LO).

This architecture allows

- Insertion or deletion of new learning objects without changing a course structure.
- Creation of new courses by reusing learning objects without any effect on history data or other learning objects.

The history data module is updated by the data received from the assessment results. Useful conclusions can be made based on the history data concerning a student's progress, effort, motivation, instructor's efficiency, course modification. The

history data are used to formulate a customised assessment session. First year students with empty history base participate in a diagnostic assessment in order to enrich the history base and define an approximate student level.

The system records all significant actions of a student (lessons chosen, number of self tests taken, test difficulties, results taken, test time, progress level). When a student finishes a lesson, besides the indirect assessment data, the system conducts a direct assessment session in order to confirm that the material has been actually understood. The test corrector module takes answers as input and produces a score and feedback. The corrector knows the correct solutions and records a student's performance. The total score evaluated is normalized in order to obtain a human-understandable mark. The test corrector module can be either on the server (all the answers are posted to the server and the correction is performed by the server) or on the client (answers posted to the server but correction is performed by the client).

### 3 Conclusion

Mobile Learning is a field that combines mobile computing and e-learning. In order to support m-learning we have developed a system that sends SMS to students not for learning but for managing learning activities - to guide, prompt, support, encourage, and motivate students. At the same time we see m-learning as a long time project aiming at creating a learning environment for wireless technologies by developing adaptive course and assessment material for a range of mobile devices; adaptive material improve educational experiences because it provides feedback on whether the learning objectives have been achieved to a satisfactory level.

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