Proposal of mLearning System for Written Exams

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Abstract — Anyone who has gone to a college or a high school in the last decade (or more) probably knows what the eLearning is. With the rise of the Internet and affordable Internet-capable devices, lots of universities and schools provide even more eLearning materials than the classic ones. With the rise of smartphones and tablets the trend has gone mobile. Therefore, several millions pages of educational material can be stored on a smartphone, or easily accessed on the online repository. However, exam part of the curriculum is not very well adapted to this new technology. This paper proposes a mLearning system that will utilize smartphones and make them useful for student on exams without the risk of student cheating.

Keywords — mLearning; smartphone; education; exam;

I. INTRODUCTION

eLearning is a process where a person that is studying (later on referred as Student), uses digital materials such as eBooks, videos, soundtracks, programs, etc. Those materials are provided by the person who wants to spread his/her knowledge and expertise (later on referred as Teacher). First implementations of eLearning systems date back to 1980s, but only recently have Internet and low-cost computers unleashed the full potential of it. A very good overview of the general eLearning and mLearning paradigms can be seen in [1] and [2]. Nowadays, a great majority of studying materials is provided in digital form and online. Furthermore, Student-Teacher communication is done via e-mails and webcasts, Students scores and grades are entirely online and often the examination itself is also done through various web forms. The digitalization era definitely provides ease-of-access to information. As the technology advanced, computers became increasingly smaller and now we can hold in our hand a device that has enormous computing and informative power. The small devices portability and durability combined with the eLearning concept produced mLearning – a new approach to knowledge distribution and training enhancement. mLearning goes beyond eLearning original purpose in the ways of Students interaction with the learning material, result tracking, Student cooperation, environment interaction, etc. Therefore, mLearning is one of the key aspects for a modern Student. Juggling between lectures, laboratory exercises, using public transport and utilizing as much free time as possible, Student’s time must be well organized. This is where mLearning does a lot of impact – Student has everything on his smartphone or notebook. As a consequence, less time is spent in the library, driving with a bus does not have to be futile time waste because everything is just a couple of keystrokes away. Comparison of mLearning and eLearning is shown in Table I and described in [3].

<table>
<thead>
<tr>
<th>Feature</th>
<th>eLearning</th>
<th>mLearning</th>
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<tbody>
<tr>
<td>Protocol</td>
<td>Web-based</td>
<td>WAP-based</td>
</tr>
<tr>
<td>Accessibility</td>
<td>Anywhere</td>
<td>Anywhere and anytime</td>
</tr>
<tr>
<td>Network</td>
<td>Wired/Wireless</td>
<td>Wireless</td>
</tr>
<tr>
<td>Connectivity</td>
<td>Internet</td>
<td>Internet, GSM, GPRS, CDMA, UMTS</td>
</tr>
<tr>
<td>Device size</td>
<td>PC or laptop</td>
<td>Smartphone, tablet, netbook, notebook, PDA</td>
</tr>
<tr>
<td>Screen size</td>
<td>15+ inches</td>
<td>4-10 inches</td>
</tr>
</tbody>
</table>

Some of the key mLearning advantages, as described in [2], are:

- **Seamless access to learning resources and freedom of a choice** – Study anywhere and anytime. Student can dictate his own tempo of learning, which in a turn boosts organizational and self-control skills.
- **Organization** – mLearning enables entire repository of learning materials to be organized and available on a single device.
- **Flexibility and portability** – Students can choose their own learning environment and schedules, without thinking about the book sizes and which ones to take with them.

There are also other mLearning possibilities such as solving exams via smartphones. However, this is often dismissed as an option in most college courses due to the (mathematical) complexity of the exams, which makes them hard to be conducted digitally. Also, considerable amount of Teachers are still against such type of an examination.

This work proposes an approach to connect mLearning possibilities with the classic written exam procedure. Rough architectural idea of the system is given, and solutions for some of the related problems are discussed. Also, a questionnaire has been conducted among the students about their usage of mobile devices regarding their college duties. Results are presented and correlated with the potential usefulness of the system.

TABLE I. eLEARNING AND mLEARNING DIFFERENCE
Rest of the work is organized as follows. In Section II motivation for development and usage of mLearning system during exams is described. Section III presents rough system design and addresses some usage problems that could arise. Conclusions and our future work plans are given in Section IV.

II. MOTIVATION

In the several years old work presented in [4], author gave a vision of a perfect mobile device in terms of mLearning. It is obvious that today’s smartphones greatly surpass the possibilities stated there. This is not just a case with smartphones, but also with other portable devices as well. Today, there is a great variety of mobile devices in terms of size, shape, manufacturer, operating system, etc. However, they all share similar usage and design principles. Therefore, nowadays is the ideal time to develop such system and implement it in larger mLearning systems. Detailed mLearning system architecture is also thoroughly elaborated in [5] and system proposed here could only be a module of a larger-scale system like described there. In [5], numerous advantages of mLearning over eLearning and classic learning are also given.

A. Practical Motives

There are several reasons for introducing a new technology into the current examination system. First is the global rise of technology that penetrates in all aspects of our lives. Since the great majority of studying materials is already in a digital form, most of the Student–college interaction is done electronically. Therefore, we believe that usage of the mLearning system would grant even more possibilities in the learning process, and would facilitate the examination parts both for the Student and the Teacher.

Providing the exam materials in a digital form while still being able to physically and digitally supervise the Students has the following benefits:

- With the digitally enhanced supervision, Teacher has more control over the exam flow and malicious Student activities.
- Teacher can provide and alter the exam materials digitally directly during the exam.
- Teacher can provide only parts of the exam (or even whole exam) to be solved digitally.
- Students still maintain the flexibility of writing the nonverbal parts of the exam physically on paper.
- There is no need to print the exam materials, both for Students and Teachers.

Ability to digitally supervise the Students during examination is important part of the proposed system. Ability to modify the materials during the exam could be very useful in practice and could be done without disrupting the Students unnecessarily. With the variety of online learning management systems such as Moodle, most essay or multiple choice exams have become digital. Proposed system should not disregard that, and should provide the ability to carry out part of the exam directly on the device should be implemented.

The main functionality of the system is to provide the exam materials to the Students during the written exam. With the materials provided digitally, there are two main advantages. First, Student cannot alter the materials and misuse them with other Students. Second, which is maybe the biggest one, there is no need to print or copy the materials. Average exam questions can be fitted in the one sheet of the paper. Usually, there are several pages of official exam materials that every Student is allowed to have during the exam, and there are two or more exams per course (e.g. midterms, finals, etc.). If those numbers are multiplied with the number of Students in each course and number of courses overall, it can be seen that quite a big savings in the paper consumption could be achieved.

B. User Motivation

As it was mentioned in the Introduction, a questionnaire has been conducted among the students about their current usage of technology in the learning process, as well as their desire to use it on exams. The questionnaire and related graphs were made using Google documents tools. Several questions were asked, and the most revealing answer statistics are presented here. In Fig. 1 answers to the question “Do you use your devices to help you study?” are presented. Devices stand for smartphones, tablets, netbooks and notebooks, as was presented to the participants. It is clear that more than 69% of students rely heavily on their devices while studying, and as the time passes, that number is expected to grow even more. This is also a good indicator of how much have the mLearning possibilities and paradigm penetrated into the academic community.

However, that amount of familiarization with the technology has its unfortunate side effect which is its misusage during exams. Since the questionnaire was anonymous, students were asked to sincerely answer the question “Do you use some of your devices to cheat during an exam?” for which the distribution of answers can be seen in Fig. 2. The 76% of students answered that they are cheating on exams and 37% students are using digital devices for cheating.

Finally, there was a question “Would you use your devices on the exam, as a part of the official materials?”. It can be seen in Fig. 3 that the vast majority of students answered “Yes” to that question. Considering how facilitated with the smartphones students are nowadays, enabling their usage on exams would likely induce a relaxing effect and maybe even boost the exam results. From the presented questionnaire results, we conclude that development and implementation of such system would not be a time and resource waste, but that it could be applauded and used by the university and high school communities.

Results of even more detailed survey are presented in [6], where authors connected the influence of the social software to Students’ everyday learning obligations. Similar to the results of this survey, it is shown that there is great familiarity between Students and the eLearning and mLearning processes. Furthermore, their survey also shows that the demand for digitalization in the academic curriculum is very large.
III. SYSTEM DESIGN

The system design is based on a client-server model. It is a well-established architectural model and fits to this system the best because of the data centralization and the way users interact with the system. The main concept idea is to have a centralized device that would provide the necessary data on-demand. There are two types of client access, one for Students, and one for Teachers, each with its specialized user interfaces, abilities and usage protocols. In [5], a detailed, web service oriented design of a mLearning system is given. The system proposed here could be built following those guidelines. It could also be integrated into an existing eLearning system, to improve its functionality.

Usage of the system should be simplified as much as possible, especially on the Students’ side, and there should be a comprehensive, real-time, information flow about system usage provided on the Teachers’ side. Here are main functionality requirements:

- There are two ways to interact with the system, Student and Teacher ones.
- Exams and corresponding materials can be added to and removed from server.
- Teacher should have the real-time status of connected Student shown in his/her application during exam.
- Students can choose from the offered exams, and connect to one.
- During the exam, Student should not have the access to other device functionalities, or that usage should be reported to the Teacher.

The server side of the system is responsible for managing exams and corresponding material between the Teacher and the Student. Besides its basic file transfer capabilities, real-time connection between Student and Teacher has to be maintained through this part of the system. Functionalities of that connection are explained later on. The client side needs to have custom built applications that would be responsible for the given or additional requirements. In the following subsections, activity diagrams of those applications are given, as well as the ways to control the Student from misusing the device. Activity diagrams were made with an open-source UML tool StarUML [7].

A. Teachers’ Application

In Fig. 4, an activity diagram of the Teachers’ application is shown. As it can be seen, the process of creating the exam and uploading the materials is quite simple. After logging in, Teacher makes a new instance of the exam, adds new materials to it, and makes them accessible to the Students. After that, the Teacher can supervise its materials in the terms of who is connected to them and in which way. The suspicious activity is reported directly to the Teacher. If Students attempt to use its device in a prohibited way, Teacher will be informed instantly and will be able to stop him/her.
B. Students’ Application

Students’ application has the similar activity diagram, but additionally Student can choose on which exam will he/she apply. After choosing the materials, they are presented to the Student in the same way as if they were written on the paper. This application should have the mechanisms to report suspicious activity. There are several ways to implement this side of the system. Registration and materials could be provided through a web application or a native platform application. However, implementation details are not discussed in this paper. Activity diagram of Student application is shown in Fig 5.

IV. CONCLUSIONS

Although widely implemented, eLearning and mLearning are still in a heavy development. New possibilities and solutions emerge every day. Most of the today’s academic curriculum is computer based, especially in the engineering. It is almost impossible to imagine academic life without access to Internet or a computer due to data distribution and student–university interaction. As it can be seen from the provided surveys, the academic community has adapted very well to the digitalization and the accompanying paradigms, and they crave even greater unification of the technology and the academic life. One way to bolster that connection even more is proposed in this paper. From the conducted questionnaire, it can be concluded that development of a mLearning system, which would be usable during the exam, would be of mutual benefit to both Students and Teachers. Students would benefit from a new way to use their devices, and Teachers would have less to worry about exam materials distribution, cheating and controlling the exam flow. It was also suggested that the ecological and environmental savings that would accompany the implementation of the system would be considerable.

REFERENCES