



# WIP: Design, Development and Implementation of a “Web Technologies” Android Application for Higher Education

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**Abstract.** New technologies have been developing rapidly during the last few years affecting all aspects of everyday life. Mobile devices have been spread among higher education students altering the nature of communication and interaction between them. In this work in progress, we design and propose the implementation of an educational application for the android operating system. The application’s context will be created according to the content of the course “Web Technologies”, of the first year of studies, in the Department of Informatics of the University of Piraeus. After this application is completed, it will be evaluated and through this process we aim to find out whether such a mobile application can be intriguing for students and in addition whether it can enhance their learning experience.

**Keywords:** Education · Smartphones · Android applications

## 1 Introduction

The integration of “smart” devices in everyday life is paramount, leading to the appearance of numerous applications for educational and entertainment purposes. Moreover, the increased ubiquity of mobile computing devices in college campuses has the potential to create new options for higher education students, since mobile devices provide learners with opportunities to collaborate, discuss content with classmates and instructors, and create new meaning and understanding [1]. It is well-documented that mobile device applications can be used to support the students study, anytime and anywhere [3]. In parallel, the integration of mobile devices in education also dovetails with the broad goals of STEM (science, technology, engineering, mathematics) education and the more recent STEAM education, which includes the visual and performing arts [2]. The proper design of the technologies leads to a more effective m-Learning (mobile learning) and to the transformation of knowledge in the modern world [6]. Nowadays, smartphones may be used for texting, web surfing, emailing, downloading and listening to music, playing games and engaging in social networking. It is obvious that if students have clear and concise directions on how to use smartphones for educational purposes, this technology can reinforce the learning objectives and it can work as an instructional aide inside and outside of the classroom [7].

Even though mobile technologies have seen a high penetration in all aspects of people's lives, their usage as an educational platform has been very slow. The development of m-Learning in higher education, in particular, is still in very early stages [4]. There are still several barriers to the adoption of an m-Learning platform, especially by institutions of higher learning [9]. So far, many universities provide free applications, but their content is primarily non-instructional [5].

In this paper, we design and propose the implementation of an educational application for android mobile platforms in higher education, under the name "WebTech app". The aim is to introduce university students in web technologies through a more interactive learning experience which exploits the benefits of mobile technologies and comes to full terms with the course "Web Technologies" of the first year of studies in the Department of Informatics of the University of Piraeus. By this way, we focus in the instructional way of use of an application and of smartphone devices within and also outside of a course, which is an area that needs further exploration.

In order to achieve the above, initially we researched for existing applications for the android operating system regarding the subject "web technologies". This step was essential in order to make decisions for the design and development of the mentioned application. Also, the final decisions were influenced by the selection of a proper pedagogical model for supporting and framing educational applications. So, after fully developing the application, the next step will include its evaluation by the students. Through the evaluation process we expect to find out whether mobile applications for educational purposes can be intriguing and interesting for students and whether they can actually enhance learning. This research also attempts to promote a different approach in the nature of teaching in universities.

## 2 Theoretical Foundations

### 2.1 Mobile Devices in Higher Education

Mobile devices, and especially smartphones, have become so widespread affecting the field of education as learning by using mobile devices is considered to be particularly effective [8]. By being wireless and portable they enable users to communicate while on the move. The popularity of these devices is therefore a consequence of their ability to function at multiple levels [6]. While m-Learning has the potential to support all forms of education, higher education is a particularly appropriate venue for the integration of student-centered m-Learning because mobile devices have become ubiquitous in college campuses [5]. So, mobile apps are very popular in higher education [14], while serious games are generally considered to induce positive effects in the areas of learning motivation and learning gains [13].

But the creation of new didactic sequences and educational activities that can be used to connect formal and informal learning settings into a congruent whole is required. As a result one major challenge for mobile research in higher education is to combine the teaching of university courses with the use of mobile devices [10].

## 2.2 The m-Learning Framework

By definition, m-Learning is learning through wireless devices that can be used wherever the learner’s device can receive unbroken transmission signals [12]. The idea of m-Learning, a relatively new concept, became interesting by the way it blends the notion of mobility into the already popular electronic learning context [9]. The theory which seems to be more suitable for m-Learning is the Activity theory [15]. Its key point is the concept of activity which consists of a subject and an object mediated by a tool [16]. The activity theory offers an appropriate framework for designing and implementing software applications for mobile learning with emphasis to its context.

A framework that is also relevant, and is designed to describe the minimal requirements for supporting learning in formal education, is the “conversational framework” by Laurillard [19]. According to this framework, through questions the theory of the learning objective is described and the learner forms an initial perception. If the learner answers incorrectly new knowledge is produced through the repetition of the process. So, feedback is given until the concept is fully understood and the learner during the entire process revises his knowledge by answering the questions of an activity. This leads to a continuous interaction between the student and the educational application.

Additionally, learning must be continuous and it must come as a natural activity. Informal learning provides this type of learning, having a self-motivated learner “under the radar” of a tutor, individually or in a group, intentionally or tacitly, in response to an immediate or recent situation, perceived need, or serendipitously with the learner mostly being (meta-cognitively) unaware of what is being learnt [17]. What is interesting about this type of learning is that it is possible to continue happening inside and outside formal education settings. The ubiquity of mobile devices supports this type of learning, as well.

So interest rises in the potential of mobile learning to bridge pedagogically designed learning contexts, and to facilitate learner generated contexts, and content (both personal and collaborative), while providing personalization and ubiquitous social connectedness, that sets it apart from more traditional learning environments [8]. So why remain traditionalists where we can be revolutionary? Traditional teaching is the past and m-Learning is the future.

In this context, the differences in the learning approach, through our suggested application, and the innovations that derive from the implementation of m-Learning in the teaching process are:

- Using mobile phones in formal and informal educational settings, promoting continuous learning.
- Exploiting devices that the students already know how to use, by being their owners.
- Approaching a course’s curriculum in a different and more playful character.

### 3 Suggested Application

#### 3.1 Web Technologies Course Curriculum

The course “Web Technologies” is being taught in the first year of studies at the Department of Informatics of the University of Piraeus. The course’s curriculum focuses on introductory topics of Internet Technologies such as: basic principles and Internet functions, Internet services, the World Wide Web and the Client - Server model, programming on the Internet from the client and from the server side, design and implementation of web applications, interactive websites using scripting languages and advanced application development [18]. It lasts one semester and includes four hours of theory and a two hour laboratory work per week. The laboratories focus on using HTML, CSS, JavaScript and PHP technologies for webpage development, and support the practical application of the theory taught.

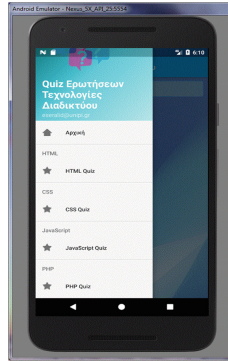
The application we present in this work so far covers the four above mentioned technologies; in the form of four different multiple questions quiz games that focus on each module of the workshops parts of the curriculum.

#### 3.2 The WebTech Application

The development of an educational application can provide a strong and creative pedagogical tool. In this study, an educational application is designed as a supporting tool for better understanding and teaching of the course “Web Technologies”, under the name “WebTech App”. The final software is addressed to university students, in their first year of studies, and aims at providing a useful supporting tool for learning and understanding the course’s context.

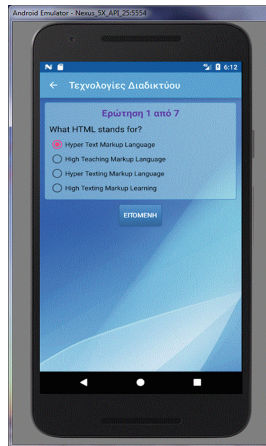
Given that there are no pre-existing applications in the University of Piraeus for the support of the “Web Technologies” lesson, we decided to create one that will fully meet the objectives of the course. Before proceeding to the application’s design, we performed a research on the existing applications, under the subject of “web technologies”. The findings offered significant help in the design of our application [20, 21]. The initial development of the application comes in the Greek language and for the android operating system. The application is in the form of a questions quiz which supports four deferent categories, following the workshops curriculum of the lesson “Web Technologies”, so far. The context of the application is not fully developed yet. We are at the process of writing and it is going to consist of original questions, which will be written from scratch in order to avoid mistakes and make sure that they follow the course’s context.

So far, the basic functions of the application have been developed. So, when initializing the “WebTech” app a menu is available to the user, in order to select the category of the curriculum he/she desires (Fig. 1).



**Fig. 1.** WebTech game menu (in Greek)

After selecting a specific category, the application loads the selected module's questions from the database, prepares the user interface and the questions game starts (Fig. 2). The idea is for the user to be able to answer as many questions possible during a specific set of time.

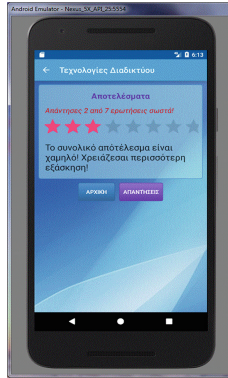


**Fig. 2.** WebTech game - multiple choice question

After completing the set of questions, the user can witness the results of his efforts by receiving a total rank (Fig. 3).

The user also has the ability to see, for each question, his answer in red letters and the correct one in green letters (Fig. 4).

From the results screen the user has the ability to start a new game, selecting a different module from the initial screen or proceed in the game's termination.



**Fig. 3.** WebTech results screen (in Greek)



**Fig. 4.** WebTech single question result

## 4 Conclusions and Future Steps

Nowadays students are familiar with the use of smartphones and own, at least, one mobile device. While mobile technologies are not yet widely and routinely used in education, they have the potential to be used in a multitude of pedagogical and other contexts in higher education [11]. By implementing the adequate mobile device software, learning evolves in something new through a more flexible and easy process.

Although our work is still at an early stage we argue that it is really important for m-Learning implementation in higher education, because it can be used as a beneficial way to support teaching and learning. At the time of the writing we continue to work on fully developing the mobile application technically and add more specifications. Some of the features that we consider implementing are:

- Initialization of timer for each module.
- Randomly selected questions and answers.
- Multilanguage support.

Some other features that can be implemented in the future are multiplayer experience, extra graphics, multimedia etc. Also, an expansion of the application in order to support different lessons and curriculums is something that we will take under consideration.

Of course all the above won't be important if the context is not properly adjusted and implemented. So, the originality and difficulty of this application lays in the proper

delivery of the lesson’s content in order for it to work as a supporting tool for enhancing the learning process. As this application becomes available it will be tested and evaluated by students and teachers in higher education in Greece. The upcoming benefits, advantages or disadvantages of the suggested application are of great scientific interest.

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