A Mobile Learning App for Driving Lessons

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***Abstract*—Mobile learning, or m-learning, is a new step in e-learning that offers novel opportunities for learning beyond traditional classrooms and computer-based tools, thanks to the use of mobile devices. The mobility of digital technologies may be applied to change the nature of the relationships among teachers, students and learning objects. In this paper, we propose a mobile application, called Planning2Drive, as an m-learning example that shows the potential of smartphones in the learning process, mainly because they can be used anywhere, any time.**

***Keywords*-Mobile learning; m-learning; education; mobile devices; outdoor learning.**

I. INTRODUCTION

Mobile learning can be defined as the use of wireless mobile technology for e-learning [1]. M-learning is a subset of e-learning through mobile computational devices. It allows the access to a learning environment from anywhere, at any time. Therefore, learners can use wireless mobile technology both for formal and informal learning, so that they can get additional and personalized learning materials from the Internet and/or from the host organization.

Most research on e-learning and m-learning is focused on theoretical learning. In particular, in the literature we can find different proposals on how to generate contents, exercises, activities, etc., for e/m-learning platforms. However, in general the practical part of the lessons is what provides a richer education and promotes lifelong learning.

A practice environment is defined as a situation where students apply their knowledge to practice, learn key skills and achieve the required competencies. Thus, it can be seen as a way to reinforce learning. Despite the great progress in mobile devices and their growing influence in our society, they have not yet been proposed as a learning tool in a practice environment. In this paper, we show an example of how e-learning based on mobile technology can be used in the teaching/learning process, through a learning case study and the analysis of its educational potential.

Practical lessons, like those followed by students who are preparing for the driving license test, do not allow students to keep track of their progress and subsequently to fix the points where mistakes were made. These aspects are very important in any teaching process, not only to ensure that teachers have reached the learning goals but also to give students the necessary trust to face the practical driving test.

In this paper, we present a mobile application called Planning2drive, which allows students to create learning sequences from their own experience as well as from the output generated by other students. It creates a collaborative environment where not only students learn from their own mistakes, but also from the mistakes of other students. In addition, students can track their progress as well as compare them with other students who are preparing or have taken the test. This work is focused on the practical driving test in UK for being a fairly easy system due to its properly regulated assessment model.

This paper is organized as follows. Section II describes related research about e-learning and m-learning. Requirements and explanation of the proposed application are included in Section III. In Section IV the potential of this new technology as tool for teaching and learning is analysed. Finally, Section V includes conclusions and future work.

II. BACKGROUND

Nowadays, information technologies, such as email and instant messaging, are widely used to facilitate communication and collaboration. In [2], the authors state that technology can be effective in the learning process only when it meets specific educational needs. This happens when the activities that learners perform are active, constructive, intentional, authentic, and cooperative. In addition, access to multimedia technology has previously been shown in [3] to improve cognitive engagement and cognitive absorption in users. On the other hand, Ellison et al. [4] states that instructors should investigate which are the software implementations that best support the pedagogical goals and needs of students in advance.

Many papers study the influence of m-learning in the teaching-learning process. For instance Hardless et al. [5] presents a research project on training, education and sharing of experiences among mobile people in a professional environment. That work shows the need for new forms of education in which students can participate where and when they choose, and evidences how third generation cellular can provide them. In [6] the author presents a study of

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the mobile media revolution on instructional design and learning effectiveness in nursing education. In [7], Alexander proposes the use of iPhones to take attendance. In particular, according to that proposal, as students enter the classroom, instead of writing their name on a sheet, they simply enter their ID number and a specific class number into an iPhone application. In order to prevent students from logging in from home or outside class, the application uses GPS location data and checks which router the students have logged in to.

Finally, Traxler [8] presents a preliminary attempt to address the issue of definition and conceptualisation of m-learning, and draws on recent research examining case studies from the UK and elsewhere. Such a research shows how mobile learning can transform the delivery of education and training.

III. Research approach

A. Understanding the Official DSA car practical test

The Driving Standards Agency (DSA) is an executive agency within the UK Department for Transport. Its mission and primary aim is to promote road safety by influencing driver and rider behaviour. It delivers tests from around 400 driving test centres and 140 theory test centres. The DSA provides the possibility that students book the practical test online, so that they can check whether their preferred date and time is available and book it by phone or through email. On average, those who pass the test have taken around 45 professional lessons and 20 hours of private practice.

When students get to the test, they are asked if they want to be accompanied by their driving instructor or another person during the test, and after it for the result and feedback. The test lasts from 28 to 40 minutes. During it, students drive in various road and traffic conditions and are asked to drive independently for approximately ten minutes, by following either traffic signs or a series of verbal directions, or a combination of both. They can also be asked to complete certain test manoeuvres such as turning in the road, parallel parking, reversing around a corner, or doing a controlled stop. If students commit more than 15 driving faults or a serious or dangerous fault at any time, they fail the test.

B. Planing2Drive Architecture

Planning2drive is a mobile phone application whose goal is to monitor students during the teaching-learning process and the preparation for the driving test. A Beta version is already available for both iPhone and Android platforms. In addition, the application allows to maintain student-teacher communication. In the teaching-learning process two main roles are distinguished within the application's functionality:

- **The teacher**, who monitors and supports students throughout the learning process. He/She is responsible for signalling mistakes during practices, using the Planning2Drive platform.
- **The student**, who can receive professional and private practices. Besides, he/she can check all the mistakes committed in the practices that have been marked by the teachers using the website or a mobile phone.

Planning2drive app allows students to be best prepared for the driving test so that they can find it less difficult. Moreover, through its use, students can reduce the number of lessons, and consequently save money.

In this section, we outline several use cases of the proposed application, suited for teachers and students.

1) Planing2Drive Website: The website [9] allows to create a virtual classroom where all the professionals of driving training can be registered. This will be the meeting point between teachers and students. In order to ensure the e-learning platform, in addition to registering, the professionals have to prove their ability to teach driving practices. Once the website administrator has checked the data, the website shows the contact details of the teachers to the students, so that they can book lessons with them. Each teacher has a calendar that is administered by him/herself, indicating the available hours. Students registered in the system can select the teacher they want and ask for a lesson using the timetable set by the teacher.

In addition, each teacher shows on the website a set of practices performed with his/her students, including the committed mistakes. The teacher is free to publish all, some, or none of the practices, but the recommendation is that the teacher only publish the practices that can help students in the learning process. In any case, student identifications are never shown with the published practices.

On the other hand, teachers also publish their students' exam practices, both the passed ones and the failed ones. In this way, students can see the most common faults in practice exams and learn from them. In addition, it will help them not to get nervous if they make a mistake because they would have seen how other students have passed the exam even with some errors.

Students who register in the system, in addition to book lessons with teachers, can keep track of all the practices they have done with each teacher. In this way, they can strengthen their learning, not only when they make a mistake and the teacher indicates it, but also when they achieve observational learning through reviewing their lessons and mistakes.

2) Planing2Drive App for Professional Lessons and Exams: Once the student/teacher relationship is set, the teacher can begin the process of tracking practices of each student. The application is very intuitive and easy to use so, the teachers have no problem with it, and the corresponding learning curve indicates a quick progress in learning.

When the teacher logs in at the application, he/she is shown a list of students who have booked a practice with him/her that day (see Figure 1A). As shown in Figure 1B, once the teacher selects a student, he/she can see the student's contact information, like phone number and email.

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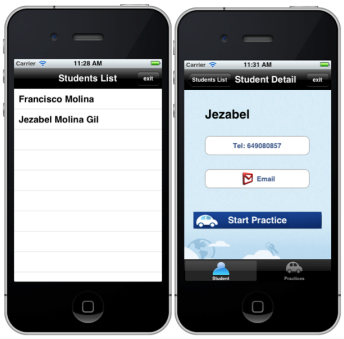

Figure 1. Teacher Interface: Students List and Students Details

	Junction: observation, speed
	Respect the stop
	Improper turning right
	Respect the give-way
	Respect pederatrian crossings
	Improper overtaking
	Incorrect following distance
	Signals necessary
	Respect cycling lane
	Jump red light

Figure 2. Common Error Table

Figure 3. Errors in a Practice

The first step for a practice lesson is that the student and the teacher agree a meeting place, because there is no school or classroom. The proposed application facilitates contact between the student and the teacher in case of unexpected change of plans, such as delay, cancellation, etc. It also provides an interface that allows the teacher to start a practice and mark possible faults committed by the students. In order to mark the mistakes during the practices, the DSA Driving Test Report provides a list containing the most common mistakes, but teachers are also permitted to create and introduce new mistakes. When the practice lesson starts, the teacher pushes the correspondent button, and in that moment the app shows the map with the current location and a list of possible errors nearby. Each time a student commits a mistake, the teacher pushes the icon corresponding to the mistake and that mistake is shown on the map. Figure 2 summarizes some mistakes that the application contains and the corresponding icons that represent them. Locating the mistakes on the map is beneficial for the student because in this way he/she can pay more attention to avoid repeating the same mistakes in the same places, especially when the student is carrying out a test in the area. The application contains a field that allows distinguishing between the two types of practices: training and test. This not only allows improving the student's knowledge but also allows sharing with other students' information about the possible mistakes during the exams and about the usual exam routes.

3) Planing2Drive App for Private Practices: The best way to learn is through the combination of professional lessons and private practices. Currently, the students try to get as much experience on the road as they can. One of the problems they face is that they only receive feedback during the lessons or when they finish them and speak with the teacher. The proposed application provides a tool that not only allows obtaining information about the mistakes the students commit, but also reviewing such feedback from anywhere, including from home. Students can get information about the place where the mistakes were committed and afterwards repeat the same route as many times as they want either in professional lessons or private practices.

Each student who has installed the application can use it for two purposes. On the one hand, the student can record the private practices following the same process that a professional teacher. In this case, the person responsible for overseeing these private lessons, is responsible for following the teacher's role specified in section III-B2. On the other hand, the student has access to data about all types of practices (professional or private) that have been recorded, so therefore he/she can check the committed mistakes during them. Figure 3 shows an example of a recorded practice that a student can visualize. In that example the student has committed three faults, two of them involving driving faults while the other is a serious fault. The first corresponds to a manoeuvre that had not been properly signalled. If the teacher used the tool correctly, the mistakes appear in the exact place where they were committed. As can be seen in the image, the second fault occurred while the student was driving on a highway, where the student exceeded the limit speed, which in this case was set at 70km/h. This would mean a failing in the test. Finally, there is a signal indicating that the student has not respected the safety distance with the vehicle ahead.

Besides, the students have a section in the website where they can share experiences in their practices. The most important aspect is the possibility to establish cooperation

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among students. Students can explain their experience with the tool during the teaching/learning process, and they can also share with other students which teachers they have liked most and why. They may also indicate which practices have been more useful for them. It provides a cooperative environment where students can share their experiences.

IV. Pedagogical Value

The purpose of this study is to investigate the pedagogical value of the Planning2Drive application by identifying its relationship with factors that may have the potential for improving learner outcomes. For the purpose of this study, the pedagogical value has been defined on constructivist principles in the learning process, by retaining and using information about committed mistakes.

An important aspect for the learning process is that students have opportunities to receive feedback, especially to correct faults, and to incorporate that information into their further understanding and/or performance. Constructive criticism, performed effectively, is a productive educational activity. However, in the proposed application, the public nature of feedback, particularly criticism, can complicate its effectiveness as a form of pedagogy. Thus, possible defensiveness and embarrassment of students have to be avoided by providing complete anonymity in the data offered to other students. Planning2Drive reaches this goal by showing practices and exam examples without showing the students' names. On the other hand, the students can review their own practices, in a private way.

Chickering et al. [10] identifies seven principles that are types of teaching and learning activities needed to improve learning outcomes. Some of those principles are met in Planning2Driver. First, in order to state a good teaching procedure, it promotes reciprocity and cooperation among students. This is accomplished through the web platform that offers students the opportunity to share their experiences. Another proposed principle is encouragement of active learning. In the proposed tool, students are able to see the immediate results of their professional practices and create their own practices. Students can also ask teachers to perform some of the practices that other students have categorized as difficult in order to analyze and compare their own results. Furthermore, as recommended, a prompt feedback is give throught he proposed application. In particular, during the practices, the teacher indicates what the student has done well and wrong so that after the student finishes the practice, he/she can immediately visualize the commited mistakes in his/her mobile phone and review them with or without the teacher. One of the most important aspects of the used technology is that it allows to respect diverse ways of learning. Students can fix their pace of learning by doing less or more professional practices depending on their own needs.

V. Conclusion and future research

Planning2Drive is an m-learning tool that allows tracking driving lessons. This study has demonstrated that the proposed tool presents an important educational content and shows once again the importance and potential of mobile technology in the teaching/learning process. Planning2Drive is a tool yet under development. In particular, a Beta version is already available which will be put into operation soon in UK, so wide data and feedback about its usefulness will be obtained from teachers and students. The anaysis of such results and consequent improvements of the tool are part of the future research.

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