Integration of Blended Learning in Teaching Computer Science in Moroccan High Schools

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Abstract

ICT is indispensable for the successful completion of studies. In Moroccan high schools, computing is taught for one year. Unfortunately, students have to wait until post high school if they want to continue their studies in computer science. In order to cope with the discontinuity of this training, we hereby propose a solution based on blended learning. The blended learning allows more effective use of classroom time and more flexibility for students. The principal aim of this paper is to adapt this method of teaching to the Moroccan education system. The online portion of our course can provide students with multimedia-rich content at any time of the day, from anywhere with internet access. Our proposition can reduce classroom time by 50% and can be used to engage students in advanced interactive activities. In this way, we can integrate ICT and teach computer science throughout the three years of secondary school.

Keywords: blended learning, computer science, online learning, face to face learning, ICT, high school, Morocco.

1. Introduction

In today’s society, ICT plays a fundamental role in the daily lives of citizens, as well as the economy and education. Ministry of National Education shows great volition to success the integration of ICT in education, due to the importance of this integration in improving the quality of teaching and learning [1]. Currently, many researchers in Morocco are studying the possibility of effective integration of ICT in the Moroccan educational system. In [2], authors presented the policy of ICT integration in the Moroccan education system. This policy aims the generalization of ICT in education. In [3], others stressed the importance of teacher continuing training in pedagogical sciences for optimal use of ICT in teaching. In [4], Droui and Kaaouachi studied the impact of the ICT integration in the science teaching at the University Mohammed Premier. However, ICT in Morocco is rarely incorporated in our teaching [5], as the discipline of computer science is taught only for one year in the course of Middle School and High School. Because of this discontinuity, the low level in this discipline is an immediate outcome.

According to official statistics from the Ministry of Education, 87% of Moroccan high schools have a multimedia room (at least twenty computers) connected to the internet [6]. However, a single room cannot cover the need of all high school students. Therefore, Computer Science is taught only to first year students, and the rest will have to wait until after graduation if they want to continue exploring the discipline in university. In order to cope with the discontinuity and provide an effective training, we propose a solution based on blended learning, which is education that combines classroom methods and computer-mediated activities [7]. In this perspective, students use their activities asynchronously to perform their learning and participate in synchronous sessions face to face to deepen their knowledge.

Here we present our approach in brief: For the first year of secondary school, students join their teachers every two weeks for two hours. Thanks to the online portion of blended learning, classroom time can be reduced by 50%: from 69 hours [8] to 34 hours per school year. For students of the second and third year of secondary school (who have already experienced ICT learning in their first year), the meetings with their teachers will be less frequent and the online part will account for the biggest share of their learning. In this way, we can teach Computer Science to all three levels of secondary education.

The rest of the paper is organized as follows. Section 2 reviews the definitions and the models of blended learning. Section 3 presents the methodology...
used throughout this work. First, it gives the reasons we chose the replacement model and the eFront platform. Second, it discusses material constraints of Moroccan high schools. Third, it provides a description of our training scenario. Fourth, it examines the statistics of user’s satisfaction of eFront. Section 4 discusses the evaluation outcomes of this work. Finally, section 5 concludes the paper and provides some future directions.

2. Defining Blended learning

There are many definitions of blended learning, but the most common is which recognizes some combination of virtual and physical environments. For example, in [9], Graham describes, the convergence of face-to-face settings, which are characterized by synchronous and human interaction, and ICT based settings, which are asynchronous and text-based and where humans operate independently. In [10], the authors define blended learning as the total mix of pedagogical methods, using a combination of different learning strategies with or without technology. Others argue that blended learning is a blend of tools and/or a blend of philosophies. The aim is to have the correct theory for the right situation [11].

In the professional development context, the blend of technologies with face-to-face interaction is a means by which a community of practice is established. In this vision, Garrison and Vaughan observe “the word blended is used to suggest that it is more than a bolting together of disparate technologies with no clear vision of the result” [12]. Twigg identifies five distinct course redesign models: supplemental, replacement, emporium, fully online, and buffet [13]. A key differentiator among them is where each model lies on the continuum from fully face-to-face to fully online interactions with students. All five models are very flexible and they present both advantages and disadvantages. Because of space constraints it is not possible to share all of the details of the models, but a rich set of references is provided that will allow the reader to find additional details for the examples of interest ([14, 15]).

3. Implementation of blended learning in Moroccan high schools

In this section, we give the reasons why we chose the replacement model and the eFront platform, then we focus on the material constraints of Moroccan high schools and we will detail the scenario of our training. Finally, we will examine the statistics of user’s satisfaction of eFront.

3.1. The chosen blended learning model

The context of our training is conducive to replacement model, which replaces some of the face-to-face classroom meetings with online interactive activities and offers an extra classroom – the virtual one [16]. Students witness significant changes during the face-to-face meetings: online resources are integrated in the learning experience, as online communication is encouraged [17].

3.2. The chosen eFront platform

There are a variety of e-learning platforms available. Each of these e-learning platforms has different features which make them best suited to different applications. In our training, we chose eFront (The official site of platform is eFront: http://www.efrontlearning.net) for the following reasons:

- eFront is designed to stimulate thirst for knowledge by being easy to use with a visually attractive user interface. It maximizes the time spent on learning new skills, instead of learning how to use the platform.
- eFront is an open source eLearning platform that means we can customize it totally to suit our needs, integrate it with other existing systems and add new functionalities through eFront’s modular architecture.
- eFront automatically detects mobile devices (Smartphone or tablet) and uses a special theme for them, which gives more flexibility to our training.
- eFront is easy to install (especially in local environment).

3.3. Material constraints

Most of Moroccan schools have only one multimedia room (named GENIE) connected to the internet which is accessible for students. However, a single room cannot cover the need of all high school students. Students who do not have computers can use the multimedia rooms “GENIE”, while students who have a computer with an Internet connection can follow online learning from their home. In cases where students’ computers are not connected to the internet, they can install eFront “in local” and start learning, solving problems and answering Multiple Choice Questions. The platform saves into its database all these activities; and the report can be easily saved by students in USB flash drive and delivered to the teacher before traditional session. In order to reduce the teacher’s workload, we use functionalities (of eFront) to integrate students offline reports to the main database of the platform.
t represents time, i represents the number of chapter
j represents the number of module and/or test

**F2F: First meeting**
What is blended learning?
How to use eFront?
Preparing learners for the first chapter

```
| t=0 | i=1 | j=1 |
```

**Online learning: Chapter i**
- Preparatory activities
- Multimedia lessons
- Solving exercises
- Answer MCQ

```
i=i+1
```

```
t<8 weeks
```

```
YES
```

```
MCQ>60%
```

```
NO
```

```
t<2 weeks
```

```
NO
```

**F2F: Chapter i**
- Lesson’s Key Concepts
- Solve students’ problems
- Preparing learners for the chapter i+1

```
i=i+1
```

```
t<8 weeks
```

```
YES
```

**Test j**
- Go to the next module (j=j+1)
- Go to the next chapter (i=i+1)
- t is initialized to zero (t=0)

```
t=0
i=i+1
j=j+1
```

```
J<4
```

```
YES
```

```
NO
```

**End of training**

Figure 1. Teach computer science by blended learning approach
3.4. Training scenario
The training scenario for the first level of secondary school is presented in Figure 1. The training consists of four modules and each module is composed of three chapters and ended by a test. This control takes place two months (8 weeks) after the first meeting of the teachers and the students. The first session of our training will be devoted to welcoming students, manipulating the platform eFront and describing the new method of learning (blended learning) to them. During the following two weeks, students learn online and start the first chapter by looking at preparatory activities. After they learn the multimedia lesson, students will study the core course, then solve problem sets, and finally respond to Multiple Choice Questions (MCQ). The MCQ results are automatically sent to the tutor via the platform. When students encounter difficulties, they can contact their teachers or colleagues via email, forum, chat or video conference. The transition from one chapter to another is conditioned on achieving a score of at least 60% in the final quiz of the chapter. If the score is below this threshold, the student will then have to meet the teacher (two weeks after the first F2F meeting) in the traditional classroom. For each chapter, we devote two hours of face-to-face instruction. Traditional teaching will focus on the key concepts of the course on correcting problem sets and preparing students for the next chapter.

3.5. Users satisfaction of eFront
To measure the degree of satisfaction of eFront users, an investigation was conducted with seventy students from two schools (ABOU BAKRE and KHADIJA OMO MOUEMININE high schools in XXXX city), who used the platform for two months (from 04/10/2012 to 04/12/2012) to teach Microsoft PowerPoint 2007 in the computer club activities. The questionnaire is composed mainly of close-ended questions as affirmative statements, focusing on the following points:

1. The student can easily identify themselves to access the platform eFront.
2. The use of eFront requires little prior knowledge.
3. eFront platform is readable and comfortable.
4. The student can easily install eFront “in local.”

For the first three questions, the satisfaction rate is quite good (between 84% and 95%). The installation of the platform seems to be more difficult with 79% of satisfaction. These results confirm that students do not find difficulties when they use and install eFront. The results of this investigation are presented in figure 2.

4. Discussion
In this section, we discuss the issues that we considered important for the good running of our training.

- The results of the investigation prove that the platform eFront is adapted to our context. If students are satisfied with one element of the online learning, they will likely be satisfied with other online learning elements.
- As part of the final study project of Engineering education and multimedia, we also found that there were positive correlations between the course structures, the posting of resources, the use of online quizzes and students’ satisfaction [18].
- The problem of students who have a computer without Internet connection can be solved by eFront. This platform allows the integration of the offline reports of students to the main database of eFront.
- In order to motivate the students in this new way of teaching, we propose to deliver a certificate of mastery of ICT to students who complete this training with a score of 70%.
- The administration of schools is invited to be more flexible to make the multimedia room accessible.
5. Conclusion
In this paper we adapt the blended learning approach, which combines the best elements of online and face to face learning, to the Moroccan education system. This combination is helpful and makes learning more interesting. Other advantages are: offering students a sense of autonomy, easy access to knowledge, the possibility to interact with people from different parts of the world, cost effectiveness and the possibility to assess more students at the same time. On the other hand, teachers must plan lessons with a multimedia component which requires more planning than a traditional classroom lesson. Moreover, teachers must take into account their students’ different learning styles in order to adapt the online content to them.

In our training, the classroom time is reduced from eight hours to four hours per month. Lectures were replaced by a series of interactive multimedia lessons. The in-class time was altered to allow students to meet with peers in small groups. These group meetings provide students with the opportunity to review their team members works and offer feedback and suggestions to each other. The replacement of face-to-face classroom meetings with online interactive activities, helps to overcome material constraints (in Moroccan high schools) to teach computing at all three high school levels.

The scope of this study is limited and preliminary in nature: user satisfaction of eFront. Additional areas should be explored; for instance, although students were asked to measure the degree of satisfaction of eFront, they were not asked whether they had taken an online course or online components in a course before. Other research exploring what to teach online and what to preserve in classroom, would also prove useful in determining how best to implement blended learning.

10. References


