WCES 2012

A proposal for a blended learning methodology and how to apply it with university students

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Abstract

In this paper, our aim is to propose a Blended Learning Methodology generic enough to be applied in any course at least in Higher Education. It is our belief that lecturers could change their teaching strategies if provided with some clear guidelines to follow. That way, we expect that any lecturer can take advantage of the proven benefits of using Blended Learning in their courses. Moreover, to test the validity of the methodology, several experiments have been carried out using the proposed methodology during the 2010 / 2011 academic year in four courses with 5 different lecturers and 273 university students.

1. Introduction

Lecturers are told that using computers for education is convenient (Barro et al. 2006). Teaching strategies based only on master classes are not longer adequate for the new generations of digital natives. On the other hand, Blended Learning, that is, the combination of traditional face-to-face (F2F) lessons and computer-based education (Graham, 2005) seems to provide many benefits (Singh, 2003; Ranganathan et al. 2007, Carman, 2005).

However, up to our knowledge, there is no clear answer in the literature to questions such as: how to set up the combination of F2F lessons and computer-supported lessons, or whether the computer should be used before, during and/or after the lessons. It is our belief that it could prevent lecturers to try any Blended Learning setting without the guidance of some methodology.

It has already been claimed that what Blended Learning needs now are studies that explore which the best models of development adapted to different educational needs are to produce the best possible results (Mossarar-Rhmani and Larson-Daugherty, 2007). Therefore, we have investigated into this topic to share the results among researchers and provide lecturers with a set of guidelines to follow as a Blended Learning methodology proposal.

The proposed methodology combines the attendance to the lessons with the lecturers and the use of two computer-based educational applications to be used before and after the lectures: an on-line platform and a free-text scoring system (Pérez-Marín et al. 2009).

On one hand, the on-line platform has three main goals: to serve as a repository of the digital material for the course, to provide an additional communication channel between the lecturer and the students, and among the students, and, to gather the works done by the students so that the teacher can evaluate them. On the other hand, the

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free-text scoring system has two mail goals: to provide immediate feedback to the students, and to give them more opportunities to have formative assessment.

An empirical study with 273 university students has been carried out during the 2010 / 2011 year to test the validity of the methodology proposed. It is our goal in this paper to publish the results achieved to open the discussion among the research community to eventually agree on a Universal Blended Learning Methodology to be applied in all type of courses at the University.

The paper is organized as follows: Section 2 describes the proposed methodology; Section 3 details the experiment performed; Section 4 presents some results achieved; and, finally Section 5 ends with a discussion of some open questions.

2. Proposed Methodology

Any lecturer who would like to take advantage of the benefits of Blended Learning could follow the four main steps that we propose as indicated in Figure 1. It is possible to modify these steps. However, they are proposed as basic to provide a practical approach from the general idea of Blended Learning of combining the attendance to the lessons with computer-based tools.
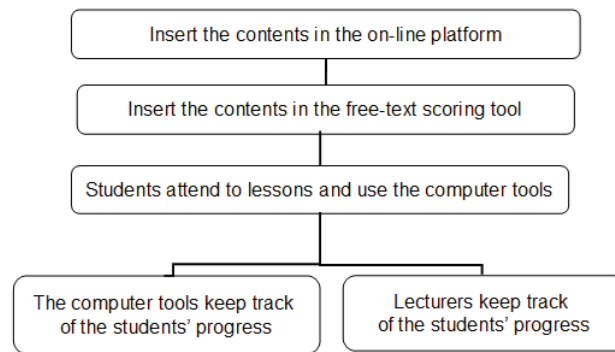

Figure 1. Overview of the proposed methodology

The **first step** is to introduce the contents in the on-line platform. This step is necessary because students should have the possibility of downloading the digital materials of the course before the lessons start. That way, they could print them and bring them to class, and they could also read them to have more time in class to discuss with the other students and the lecturer answering some questions. The questions could have also been posted in the platform in advance to guide the reading of the students.

Some on-line platforms that could be chosen are: Moodle, WebCT, .LRN or Sakai. The minimum requisites are that the platform allows to upload digital contents, to gather work and to provide some forum / chat as on-line communication channel among students, and between the students and the lecturer. Moodle could be a good choice because it is open-source, it is currently adopted by many Universities and there are many books and papers published on how using it for teaching (Cole & Foster, 2007).

The **second step** is to introduce the contents in the free-text scoring system. This step is necessary because students should have the possibility of getting immediate feedback without having to wait for the lecturer to download the works from the on-line platform and evaluate them. Moreover, this step is useful to provide formative assessment as many free-text scoring tools just give an automatic score without explaining the failures.

Usually, free-text scoring tools request from the lecturers to introduce some questions with their correct answers. That way, it is possible to automatically compare the student's answer with the lecturer answer, and the more similar they are, the highest the score given to the student.

Some free-text scoring systems that could be chosen are reviewed in Pérez-Marín et al. (2009). The minimum requisites are that the system allows the student to provide any type of answer and get immediate feedback. The Will Tools could be a possible choice because they are free to use, and they provide feedback not only at the level of each question but also global feedback in the form of a conceptual model. That is, the set of concepts and their

relationships of the topic under study. It can have a graphical representation following a semaphore metaphor in which the concepts best known have a green colour, and the concepts less known have a red background.

The **third step** is that the students start using the computer tools. Once the lecturers have introduced the digital material in the on-line platform and the free-text scoring tool, the students should get a user account to start using them from any computer connected to Internet at any time. It is interesting to highlight that during this time, the students keep attending the lectures. Thus, it is possible that some doubts that may appear when using the free-text scoring tools can be solved during the lectures. At the same time, it is also possible that lecturers could keep track of the students' progress by looking at the computer tools. This would be the **fourth step** that is the tracking. During this step, it is possible that it is detected that some students are not using the computer tools, then some mails can be automatically sent to remind the students of keep studying with the computer too.

3. Experiment

In order to test the proposed methodology, it was applied to four university courses during the 2010 / 2011 academic year with 273 students. The four courses were Education Theory, Mobile devices development, Compilers and Multimedia. WebCT was chosen as the on-line platform tool. It is because it is the tool acquired by our home university, and the students already knew how to use it. The free-text scoring tool chosen was the Will Tools because we could freely use them in Spanish. Once the tools were chosen, we asked the lecturers of all the courses to start using the methodology by completing the first step: to insert the contents in the on-line platform, in this case WebCT. Next, we asked the lecturers to use the Will Tools to complete the second step.

Lecturers were requested to provide at least five questions per each one of the lesson of their courses with their correct answers. The correct answer could be as short as one sentence or as long as some paragraphs. Once the course starts, and the first and second step have been completed, students are given their user accounts to log into the on-line platform and the free-text scoring system. From that moment on, they should be allowed to use the computer tools at any time to study after class.

Figure 2 shows a sample page of Willow. The system provides automatic feedback and the correct answers of the lecturers for the question. It also allows students to self-assess themselves. It is possible that the answer of the student is so creative that it is very different to the answer of the lecturer and even being correct, the system could be mistaken and assign the student a bad score. In those cases, students could change their score and the system will save both the automatic score and the score provided by the student (Pascual-Nieto et al. 2008).
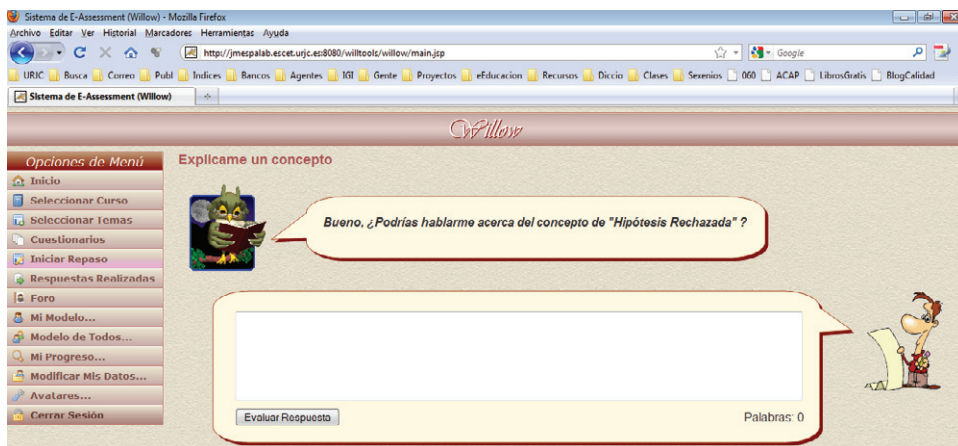

Figure 2. Sample question in Willow

4. Results

The lecturer of the "**Theory of Education**" course successfully completed the first and second steps of the methodology by uploading her contents in WebCT and Willow. Next, 181 students attended a first F2F lesson in which they were explained how to use Willow (they already knew how to use WebCT). They were also told that they would have a positive in the final score of the course if they studied with WebCT and Willow, and they would have a digital certificate of their use of these computers tools.

Students attended their F2F lessons as always, and after class they used WebCT to communicate with the lecturer via mail, and used Willow to study on a daily basis answering more than 15 questions per day, except for the days December 9th - 12th that were holidays. When students are asked by the lecturer what they think about the new methodology of study they said that: *"it is useful to study better"*, *"it is a good idea because it helps you to study during all the course"*, or *"to study after class is funnier with the computer"*.

Regarding the lecturers of the "**Mobile Devices Development**" course, they also successfully completed the first and second steps of the methodology by uploading their contents in WebCT and Willow. Next, 8 students were explained how to use Willow (they already knew how to use WebCT) by a PowerPoint presentation uploaded in WebCT. Students were also told that they would have a positive in the final score of the course if they studied with WebCT and Willow, and they would have a digital certificate of their use of these computers tools. The attendance to F2F lessons in this course is voluntary, so students use the on-line platform to read the materials of the course and ask questions to the lecturers. They also used Willow to study mostly on the weeks before the final exam. The number of students using the system was increased from 8 to 28. When students are asked by the lecturer what they think about the new methodology of study they said that: *"it has helped me to focus on the most important concepts to study"*, *"I think that this methodology should be used in other courses of the degree too"*, or *"I like this way of studying although the automatic score is sometimes wrong"*.

Regarding the lecturer of the "**Compiler**" course, she also successfully completed the first and second steps of the methodology by uploading her contents in WebCT and Willow. Next, students were explained how to use Willow (they already knew how to use WebCT) by a PowerPoint presentation uploaded in WebCT. However, unlike the previous courses, students were not provided with any external motivation to study with the computer tools. Moreover, given that the attendance to F2F lessons in this course is compulsory, students could follow the course just by going to class. Students use Willow mostly on the weeks before the final exam, and eventually all the students used the system but answering less questions. When students are asked by the lecturer what they think about the new methodology of study they said that: *"they did not have time to study after class if it was not compulsory"*, *"I think that the methodology is fine"* or *"Willow is too strict"*.

Finally, regarding the lecturer of the "**Multimedia**" course, she also successfully completed the first and second steps of the methodology by uploading her contents in WebCT and Willow. Next, students were explained how to use Willow (they already knew how to use WebCT), and they were told that they could get a positive in the final score by using Willow. The attendance to the F2F lessons in this course is compulsory. In this course, students use Willow on just some days, and when they were asked what they think about the new methodology of study they said that: *"it is OK"*, *"I do not have any negative comment to say."* or *"I am pleased"*.

Table 1. Results gathered from the courses in which the methodology was applied

Performance result	Education Theory	Mobile devices	Compilers	Multimedia
Type of the course	Theory	Theo-practical	Practical	Theo-practical
Type of attendance	Compulsory	Voluntary	Compulsory	Voluntary
Type of the student	Non technical	Technical	Technical	Technical
Type of motivation	High intrinsic	High intrinsic	Low extrinsic	Med-extrinsic
#students in the course	198	28	12	35
regular / irregular use	regular	irregular	irregular	irregular
% students who have passed at least half of the course	**83%**	61%	70%	19%
% students who have passed the whole course	48%	**61%**	20%	9.5%
comments	**positive**	**positive**	neutral	neutral

5. Discussion

It was our goal to propose Blended Learning methodology generic enough to be applied in different type of courses at the University: theoretical / practical, compulsory / voluntary attendance, for students with / without computer skills and for students with intrinsic / extrinsic motivation. It is possible that there are other type of courses and other factors to take into account, but it is our belief that these factors could serve as a starting point of discussion towards an agreed universal Blended Learning methodology.

As can be seen, the highest % of success in students passing at least half of the course is registered in Education Theory, while the lowest % of success is registered in Multimedia. If we compare which factors differentiate these two courses, we could appreciate that the main change is the level of motivation (higher in the case of Education Theory). Similarly, in the case of the % of students who have passed the whole course the highest result is registered for Mobile devices development, in which the level of motivation was as high as in the case of Education Theory.

The theoretical / practical factor seems to have no impact whatsoever, highlighting the generality of the methodology proposed. Both in Education Theory that is the most theoretical course and Compilers, that is the most practical course, the results achieved are similar and the methodology could be applied. Although the number of students passing the whole course is much lower in Compilers, it could be due to the lower motivation of those students. The compulsory / voluntary attendance seems to have no impact either. Both in Education Theory and Mobile devices development the results are quite similar, and the attendance in Education Theory was compulsory while in Mobile devices development was voluntary. Even the regular use of the platform cannot be said that it is because of the attendance to the lessons. For instance, Compiler students had to attend to all lessons and they did not regularly use the platform (again it could be due to their lower motivation).

Finally, the competence skill using the computer seems to have no impact either, assuring the possibility of using the methodology in any course, even when students are not for a technical degree. In fact, the Education Theory students were the highest motivated and used more often the computer tools for education.

We would like to encourage other researchers to apply the methodology in their courses, and given the importance found in the motivation, to provide an explicit score in the final score of the course and some kind of certificate indicating that the students have used the computers for education as those types of motivation seem to be key for achieving the highest percentage of students passing the course and dropping the number of unknown concepts down to zero. Furthermore, we would like to discuss the methodology with other researchers to find out changes that could be applied so that this proposal can serve as a starting point to reach an agreed universal Blended Learning methodology, and thank to the Universidad Rey Juan Carlos for the Innovation Project granted.

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