SEMI-VIRTUAL CLASSROOM FOR PHYSICS CONTENTS

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ABSTRACT
Some years ago, it was believed that the learning process would eventually become mostly virtual. ICT tools were therefore designed with this scenario in mind. Nevertheless, today's learning process is still predominantly face-to-face; at most, we have seen a shift towards blended learning. Today we are in the process of incorporating ICT tools both inside and outside of the classroom. In this paper, we explore how contents—specifically physics contents—can be used optimally either inside or outside of the classroom.

KEYWORDS
Keywords: virtual learning environment; web interface; distance education.

INTRODUCTION

This study follows a paper presented at CIDUI 2006 (Jaén, Bohigas and Novell, 2006) that examined how contents are processed in virtual learning environments (VLEs) (Jaén, Bohigas and Novell, 2006; Dougiamas; Dokeos). In the earlier paper, we studied how contents are incorporated in virtual courses. We found that VLEs were used in a distance-learning way. In this paper, we explore how these contents should be handled in order to meet real needs in courses that, in practice, have become blended. We are currently in the process of adapting an electromagnetism subject to the European Higher Education Area (EHEA) guidelines (Bohigas, Jaén, Novell and Periago, 2006).

In blended courses, students and teachers sometimes interact face-to-face in a classroom and other times through a network interface. When teachers present contents in the classroom, they use what is usually called a lecture, which is actually a very effective educational tool. Until recently, teachers used the blackboard as the sole means of support for oral presentations. Some teachers would occasionally use transparencies. Blackboards were gradually relegated to second place. Today, both blackboards and slides have been replaced by PowerPoint presentations, with varying degrees of acceptance (Bartsch and Cobern, 2003; Susskind, 2008). This development has nothing to do with the Internet, although the Internet has also emerged in classrooms.

Teachers now have access to a wide range of resources in various formats that they can present in the classroom or make available through a virtual classroom. At our university, UPC, students can take Moodle™ courses through our virtual classroom (ATENEA). If the teacher allows it, students can view or download resources in various formats and use them before or after attending class. Even if the teacher does not allow this, students can find other resources that will help them pass the subject.
Many universities have created open repositories (see, for example, UPCommons) where students can access an increasing number of resources. Somewhere along the line, we have forgotten textbooks.
In this complex and increasingly confusing scenario, it is necessary to establish some guidelines.

THE SEMI-VIRTUAL CLASSROOM

When a course is taught in a distance-learning format (e.g. a Moodle™ course), we usually refer to the implementation of the classroom on the network as the "virtual classroom." In a virtual classroom, students find tools that allow them to follow the course without having to attend classes. Specifically, students attend the course by sitting in front of the screen with mouse in hand.

If the course has both face-to-face and distance-learning phases, is the current virtual classroom format appropriate? As far as content is concerned—and that is what concerns us here—the usual practice is to use PowerPoint presentations in class and upload them to the virtual classroom together with some explanations. Are these two elements sufficient? Can we somehow combine them more efficiently?
The name "semi-virtual classroom" refers to a set of tools that can be used in both the face-to-face and distance-learning phases. In this paper, we study the Semi-virtual Classroom for Contents (SCC), which was specifically designed for physics contents. In the following sections, we describe the tools that are or may become part of a semi-virtual classroom (from the standpoint of contents) and how they can be combined to ensure that the whole is consistent. We will not discuss virtual interactive tools (collaborative work in the classroom, discussions, etc.), which, like the aforementioned Moodle™, have in general been successfully implemented. The tools we discuss are textbooks, blackboards and the teachers themselves. Because these tools must be present in both the face-to-face and distance-learning phases, it is necessary to somehow implement an SCC.

THE TEXTBOOK

Some tools have always formed part of semi-virtual classrooms, and the textbook is one example. For some strange reason, the textbook—the ultimate semi-virtual tool, despite the fact that it is a physical object—has been replaced by a multitude of other documents, first printed and later online. The textbook has been lost in the midst of a bibliography whose great length may render it useless. We believe that the textbook should be reclaimed and understood as a tool in a semi-virtual context. A textbook can be carried from place to place (a good textbook should be light!) and its content can be accessed easily and immediately. It can be used in both the classroom and beyond, as has traditionally been the case. We need to discuss how ICTs can be used to ensure that existing semi-virtual tools such as textbooks can be combined, in a mutually reinforcing manner, with intangible tools, with the goal of building a complete semi-virtual classroom.

THE BLACKBOARD

In one format or another—chalk, markers, slides, PowerPoint, etc.—the blackboard is always present in the classroom. The blackboard by itself does not generally constitute a self-sufficient tool. Other elements must be synchronized with the blackboard to ensure that everything makes sense. In the classroom, this other element is the voice, but it can also be written text such as math problems contained in a textbook or other media. If we understand the blackboard as the visual support available to the teacher in the classroom, then its role has undergone significant changes in recent years as the Internet has entered the classroom. Now there are PowerPoint presentations. Other tools, such as interactive simulations (applets, also known as physlets in a physics context), can be projected in the classroom. This allows teachers to explain phenomena while students see and analyze the parameters involved. The traditional blackboard is very limited in this sense. If all of these elements are used carefully, students can come to better understand physical phenomena. At the same time, with this set-up, it is more difficult for students to take notes. How do we want students to use their time during a lecture? What alternative can we give students so that they do not leave the classroom empty-handed?

If we understand PowerPoint presentations as a more sophisticated evolution of the blackboard, we might think that blackboards are about to disappear. We propose that the blackboard maintain its identity and remain part of the classroom as a tool for supporting discussions, in addition to the standard explanations that can be made with PowerPoint-type tools. It would be difficult to carry out this

function in a distance-learning context and, in most cases, the amount of technology needed to make it possible would not be justified. Now we can answer the question about how we want students to use their time during a lecture: the role of blank paper, which all students should have in front of them, should be very similar to that of the blackboard. Students should not waste time trying to hastily copy a diagram shown on a slide. Instead, these contents should always be available to students.

THE TEACHER

Some time ago, people thought that the figure of the teacher would disappear in favor of ICT tools. Today, it is clear that this does not make sense. Teachers must continue playing their traditional role, but they should also use other tools.

The teacher is necessary, obviously, in the face-to-face phase. In the previous section, we mentioned the blackboard as a tool for discussion. We cannot (always) hold discussions without the teacher. The teacher's role is also essential in the distance-learning phase. More precisely, it is essential that lectures not be one-time performances. We need tools that can convert many lectures into distance-learning sessions so that class time can be used for activities that truly require face-to-face contact between teacher and students. The tools used in each phase must be similar so that students can easily recognize the contents in the various channels of communication.

THE SEMI-VIRTUAL CLASSROOM OF CONTENTS

In recent years, we have gained experience by working simultaneously to implement virtual contents through the La Baldufa project (La Baldufa) and actively participating in the adaptation of a UPC electromagnetism subject to the EHEA guidelines. This has enabled us to analyze the fundamental characteristics of a tool that implements an SCC specialized in physics contents. This prototype facilitates experimentation in order to advance the design of tools that can serve teachers more efficiently.

The following factors were taken into account in this design:

- The tool must be useful in both phases (face-to-face and distance-learning). We want to reproduce the basics of classroom lectures in the virtual space, but not only as a collection of images. The appearance of the SCC can differ from one phase to another, as shown in Figures 1 and 2.

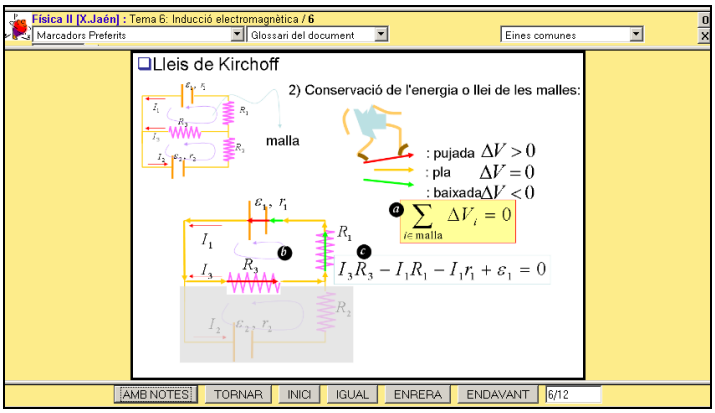

Fig. 1: The SCC in the face-to-face format.

- PowerPoint and similar programs are very useful to teachers during the content-creation stage, especially in physics, because of the need to mix drawings and diagrams with text or formulas.
- Due to the constraints of the program, we cannot simply replace the blackboard with PowerPoint (Bartsch and Cobern, 2003, Susskind, 2008). Some of these constraints are related to the fact that students cannot take a PowerPoint presentation with them after a lecture. Part of

our goal is to make images available to students in a compatible format at any time and from any computer.

- In the face-to-face phase, PowerPoint-generated images are shown and accompanied by other explanations by the teacher. Likewise, in the distance-learning phase, the SCC must show pictures along with related text.
- Incorporating images and text should not entail any additional difficulty in the set-up process. In our case, this means that images can be generated using PowerPoint, and the accompanying text (a simple HTML document) can be generated using any of the existing editors (e.g. Dreamweaver).

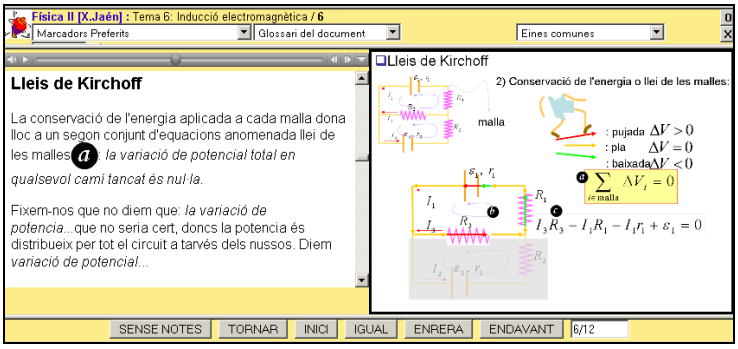

Fig. 2: The SCC in the distance-learning format.

- The interface that implements the SCC must be consistent with the educational environment. In our case, as a general rule, it is better to distribute contents in parallel than in separate windows (Min, Yu, Spenkelink and Vos, 2004). This is particularly relevant when showing both text and images.
- Voice is an element of the face-to-face phase that can often be replaced by simple text, although it may sometimes be a good idea to strengthen texts with voice. A voice could even be used to transmit tips or warnings that might be overlooked if conveyed using only text and pictures (Mann, 2008). A voice in the interface is an optional element that can be authoritative but not imposing.

With these objectives in mind, we designed the SCC described below:

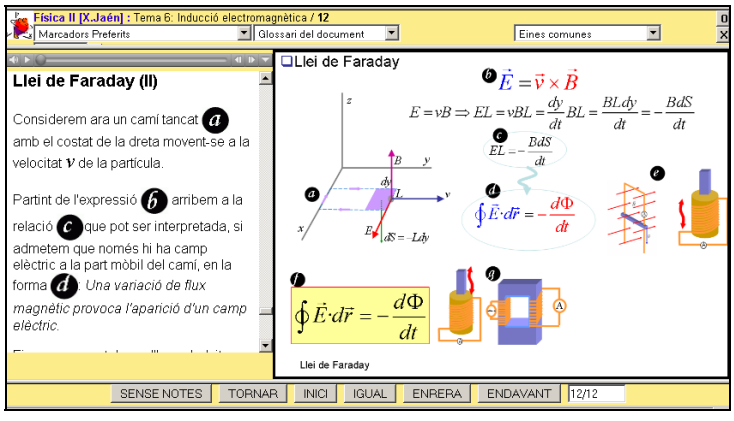

Fig. 3: Another screenshot of the SCC in the distance-learning format.

The SCC can be viewed using any browser (see Figures 1, 2 and 3). When used in the face-to-face phase (Figure 1), it is not very different from a PowerPoint presentation. The difference is that we are not restricted to any particular program. The presentation is embedded in a VLE (Jaén, Bohigas and

Novell, 2006) that makes it possible to contextualize the presentation with other tools and contents, thereby facilitating navigation.

Although the SCC is designed to display images created with any program using standard formats, it is highly advisable to use the PNG format. New browsers such as Firefox 3.X allow PNG format to be scaled without excessive loss of quality. This allows the teacher to determine how large the browser window should be in order to work comfortably in the classroom.

In the distance-learning phase, the SCC plays a more important role. Figure 4 shows a window divided in two parts. The main image is reduced and the text that accompanies it appears on the left. The standard commands to activate the sound appear above the text and optionally during the start-up phase.

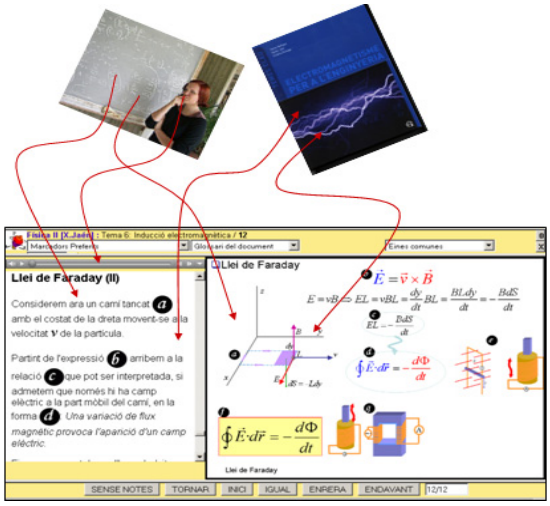

Fig. 4: The SCC is designed to host the various elements that make up the contents of a classroom.

In the distance-learning phase, the SCC can replay face-to-face lectures in a way that goes beyond the mere images that make up a presentation. The images are exactly the same as those shown in the face-to-face phase. These images should not be very different from those appearing in the textbook, which is also present during the distance-learning phase.

The teacher's commentary can also be recreated by using text to accompany the pictures, or a voice can be used to give warnings or reinforce the text (Mann, 2008). All items that appear—images, text and voice—can easily be generated and replayed using standard software.

CONCLUSIONS

We have presented the prototype of a tool, the Semi-virtual Classroom for Contents (SCC), that meets a series of objectives based on the experience of the authors and the conclusions of other studies on content treatment. Students are increasing their use of ICTs, so blended learning is a practical solution for courses of all types. Just as designers have developed good managers for creating virtual courses (the paradigm being Moodle™), we believe that contents have been divided into two parts: PowerPoint presentations for the face-to-face phase and PDF documents, often unrelated to the PowerPoint presentations, for the distance-learning phase. In this scenario, we believe that the two phases can be better integrated if the tools for contents are compatible with both. Moreover, these tools should allow us to design contents that suit the reality we face.

We have offered a response to various articles that have studied the efficiency of presentations made using PowerPoint or similar software in the face-to-face sessions of blended courses. PowerPoint is designed primarily for face-to-face sessions. We believe that better tools need to be developed to meet

the needs of blended courses. Our modest contribution will enable us to test the SCC inside or outside of the classroom in order to work towards designing better tools for teachers.

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