

# A PROPOSAL OF METHODOLOGY FOR E-LEARNING CONTENTS PRODUCTION

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## ABSTRACT

The present work deal with a crucial problem in e-learning systems: content creation. In order to face this matter a new methodology for e-learning content production is proposed through the acquired experience in the development of multimedia contents for e-learning applications, and its use in the exposition of an analysis model and process design. The proposed engineering of teaching content is carried out by means of a methodology, which divides the multimedia production process into phases and assigns tasks to each member of a professional development team. All these different phases include research on suitability of the content for e-learning, a previous analysis to select multimedia techniques to apply and, finally, the development of the contents based on the project design.

## KEYWORDS

Teaching content engineering, resources, content creation, production.

## 1. INTRODUCTION

During recent years University Education has experienced important progress with respect to the resources used for lecturing. Techniques have changed from traditional blackboard methods to the use of projector transparencies and, later on, the use of video projector and PowerPoint, to present the content of the lessons. Nowadays, the use of these technologies has become more common.

As far as content availability for the student is concerned, it has passed from traditional notes taken in classrooms, books and photocopies to digital format of books or notes taken in classrooms which are available in the subject's web page.

Lately, lecturers with experience in the use of multimedia tools can prepare animated presentations, and some didactic videos. However, the use of these technologies continues to be unreachable for the great majority of teachers.

The proposal of *European Higher Education Area* provides the framework to take an important step forward in techniques used in lectures and in the methodology used to create them.

This work presents the acquired experience in the development of multimedia contents for e-learning applications, and its use in the exposition of an analysis model and process design for the creation of a new methodology in content production.

## 2. E-LEARNING IN EHEA

The *European Higher Education Area* proposes the setting up of a convergence process of educational material in Europe. New methodological approaches are introduced in order to value an active learning as opposed to a traditional passive learning. To value the effort that students should make in order to assimilate knowledge and not only consider the number of hours of attendance to classes. All this, is made easier by the use of e-learning, whose extensive work field, in all range of subjects, allows the quality of education and its availability to increase.

The creation of multimedia contents for e-learning could be developed together with other European Universities, and its use could be shared within the same knowledge areas. This allows a new common

line of work to be opened. It will be possible to promote European cooperation to guarantee the quality of higher education using comparable methodologies and criteria.

### 3. TEACHING CONTENT ENGINEERING.

In the same way that software engineering was developed in order to apply proved techniques of exposition and software development at a reasonable cost, creation of large-scale e-learning content requires similar techniques. Therefore, the wide variety of knowledge areas in which these contents will be used, leads us to propose the development of this Teaching Content Engineering

The extent of the teaching material development project requires a multidisciplinary team (group of professionals). The improvement of productivity and quality in teaching content creation will constitute the main objective of this engineering.

The proposed engineering of teaching content is carried out by means of a methodology which divides the multimedia production process into phases and assigns tasks to each member of this professional development team. All these different phases include research on suitability of the content for e-learning, a previous analysis to select multimedia techniques to apply and, finally, the development of the contents based on the project design. With respect to the multidisciplinary team, it will be composed of a project manager, programmers, designers, and multimedia experts, as well as the teachers of each subject.

#### 3.1 Methodology

The obtaining of an optimum workflow and the use of resources by the different production tasks is the main purpose of the proposed methodology. For that, we define different production phases and the professional profiles of the multidisciplinary team.

***Suitability of the content for e-learning.*** To create multimedia material for subjects using e-learning techniques, mean a considerable resources investment. Therefore, some factors which help to make a decision about its profitability should be taken into consideration. In this first phase a study on the suitability is made in accordance with the factors below:

- *The content validity.* The period of time in which teaching content does not need to be updated, having such force as to compel serious attention and usually acceptance.
- *The number of students who attend classroom training.* This factor considers the number of traditional resources used in their learning.
- *The modularity* and reusability of independently operable units, which are part of the total structure for creating more contents.

All these factors affect directly in the amortization of the investment made for the creation of contents.

***Contents analysis.*** The creation of multimedia contents is carried out through the division of teaching contents in didactic objectives acquired for the students through multimedia didactic units.

In this way, in this phase the modularization of content takes place. The extraction of the teachers' knowledge will be necessary for the selection and proposal of different multimedia didactic elements which will constitute part of these multimedia didactic units.

To achieve this aim, the tasks below are introduced:

- *Meetings with the teachers.* In these meetings teachers expound the teaching objectives of the subject, explain the lesson content and the actual way to portray the contents to the students.
- *The selection of lessons for multimedia format.* The project manager together with the teachers carry out the selection of lessons for which multimedia teaching content will be created.
- *Proposal and techniques selection.* According to the techniques selected, and the modules repository, the project manager makes a proposal to the teachers.

**Development.** Starting from the analysis of the previous phase, a formal design is carried out, this formal design will identify the activities and work planning that will be done under the supervision of the project manager. In the process, although according to a structure, creativity of the development team is considered fundamental. Therefore, this phase is structured as shown below:

- *Formal design* includes all the multimedia didactic elements to be used. In accordance with this design, both human and material resources are managed.
- *Development of interactive applications* will follow a development methodology belonging to software engineering.
- *Creation of videos*, for which, the work will be divided into: script writing, recordings, postproduction and codification.
- Combination of both software applications and videos will be composed of the different multimedia didactic units.
- And finally, on-line disposition of multimedia contents, becoming, this way, accessible for the students.

The expounded methodology should be carried out taking into account these factors:

- *Quality.- The degree of acceptance on the part of students and the reached academic efficiency.*
- *Human and material resources.- The proposed multidisciplinary team, software, hardware and premises. Optimizing resources has a direct influence on major productivity*
- *Costs.- A thorough study of time and staff required for project development will take us to a suitable planning, and this to an appropriate economic investment.*

### **3.2 Resources**

Among the means that will be used to carry out this technology we find both human and material resources.

The competences of the multidisciplinary team are defined by different profiles:

*Teachers*, whose main tasks are, the structure of the subject program, script writing, and the proposal and collective agreement with the project manager on the multimedia didactic units.

*Project manager*, who advises teachers, coordinates efforts of the development team and assigns tasks according to the planning made.

*Designers*, for tasks of graphic design, user interfaces and creation of 2D and 3D elements.

*Analysts /programmers* to develop software application analysis and programs (HTML, Flash, Actionscript, PHP, Java, etcetera)

*Multimedia technicians*, responsible for recording, editing, and postproduction.

Different tasks of each professional profile will come together in order to create a production line to maximize results.

The material resources are comprised of: a recording studio, where recording of lessons are made by the teachers and a laboratory room for development and editing of content where multimedia interactive applications are created and where all postproduction of the material is done (Figure. 1).

In addition to this, tools to develop interactive web applications will be used, creation and editing of images, audio processing and editing of digital video.



Figure 1. On the left we can observe the record Studio used for the recording of lessons. On the right workstation of the editing room.

### 3.3. Techniques

The collection of techniques used to develop multimedia teaching content is:

Video recording:

In the studio.- Recording of lessons are made by the teachers in the studio.

In-situ.- Recording of lessons are made in laboratories or external premises. This allows the students to know firsthand the object of the subject to be studied.

*Screencast*.- Digital recording of computer screen output, also known as a video screen capture, often containing teachers' audio narration. Using special software. (Figure. 2).

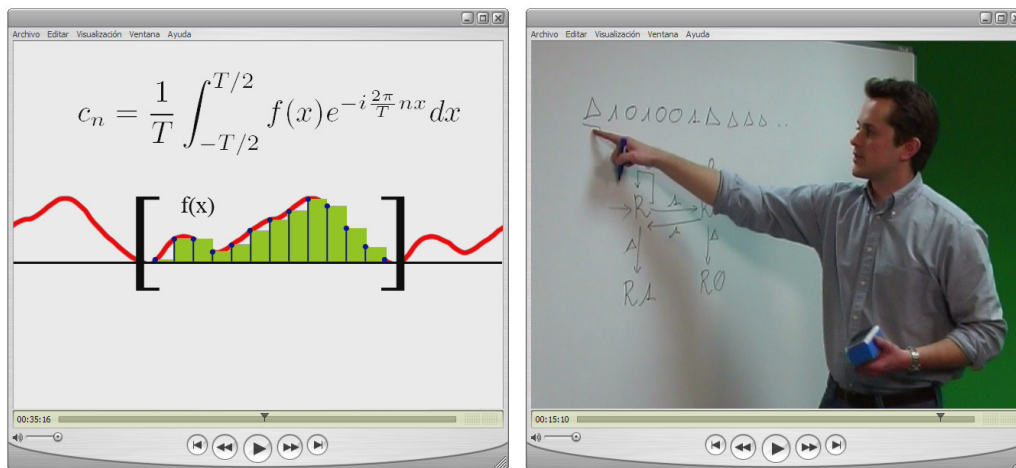


Figure 2. On the left a video frame created using screencast technique. This technique allows the video screen capture. Very useful for any computer science application. On the right another one video frame for the solution of a practical exercise.

*Interactive software applications.*- Interactive learning applications are truly differential elements and exclusive from computers, used as a learning tool, in comparison with other traditional teaching resources. The interactivity of these applications allows students (or users) “to manage”, although virtually, the matter to be studied enabling them, in this way, to create a mental model of its working. In this case the learning does not come simply by reading and understanding a concept, but from the understanding of its behaviour and reaction as opposed to some actions carried out by the student. . (Figure. 3).



Figure 3. The image shows an interactive software application. The student, after studying the photography theoretical lessons can manage the virtual camera and check the results obtained when the parameters are modified.

### 3.4 Other methodologies

There are different strategies for the creation of teaching content for e-learning. These approaches often use a similar set of stages or phases for content development. Among them we find the “waterfall philosophy” characterized by the use of a number of phases strictly ordered in such a way that each phase begins once the previous one is finished; and the “evolutionary philosophy” or “based in prototypes”, characterized by considering since the beginning that, although the project start out with a set of requirements, will arise changes in these requirements as the project is developed. However, the methodological proposal made in this work for an e-learning content engineering focuses on lecturing and this means a set of differences, related below:

*Scope.*- Traditional methodologies for content development are directed, generally, towards content development for corporate e-learning. The proposed methodology is focused on content development for lecturing.

*Contents modularity .*- In each knowledge area to create independently operable units intended for reuse in the same or a different one is proposed. This means the use of a knowledge area thorough analysis in order to make these operable units relocation possible when creating new teaching programs.

*Extend of involvement.*- Lecturers should be part of the work team that will create multimedia contents for e-learning, should be involved not only in didactic advises tasks, according to the teaching objectives of

the subject, but also should take part in the conception of the whole set of tools proposed by the project manager.

*Resources.*- The wide variety and quantity of multimedia resources used are essential in the proposed methodology for e-learning content creation. Multimedia technology and the development of interactive applications provide suitable capabilities to develop quality contents at the university level.

#### **4. LECTURING EXPERIENCES**

For the evaluation of e-learning techniques in lecture content, some subjects have been selected. Specifically, the subjects which correspond to bachelor degrees "Computer Science Engineering", Multimedia and Automaton Theory and Formal Languages II. Multimedia content, which shows the lessons that were taught using a traditional way in the past, has been generated. Specially, the subject of Multimedia has the special feature of covering two fundamental aspects in the teaching of computer science knowledge. On the one hand, we find purely theoretical and mathematical content which supports audio compression, image and video technologies. On the other, we find content which makes reference to the use of multimedia tools (such as audio editors, image and video) and web programming languages (Java, PHP, Javascript, HTML...). In particular, the subject of Multimedia has a teaching timetable of 30 theoretical hours (twice a week), using traditional classrooms, and other 30 hours of practical lessons in the laboratory. The prepared material embraces half the timetable in the classroom. The content generated for Automaton Theory and Formal Languages II corresponds to the practical exercises of the subject.

As teachers can now count on this new multimedia material teaching model, the methodology which has been followed till now in Multimedia has changed substantially. Firstly the students still have the same number of learning hours; however, they receive some lessons by means of video in a dedicated server. This means that they receive, weekly, one hour in the classroom and another one through video streaming. This new material allows traditional lessons to be divided into two groups. In this way the lesson in the classroom is repeated and the student attends the most convenient classes. Therefore, not only do they not miss the opportunity to ask the teacher doubts, but also the number of students is reduced, allowing a more personalized treatment. With respect to Automaton Theory and Formal Languages II, the prepared material only provides support to the personal training of the student.

The results of this experience have been very positive. Students have valuated unanimously this new teaching model as completely recommendable. Even, the students have taken part in the improvement of the material contributing with their own ideas, needs, and wishes. With respect to the academic efficiency revealed in the assessments, we should say that, although they have not been reduced, a perceptible increase has not been observed either. However a particular fact which is known by all teachers when the exams' dates come close should be commented. In the previous weeks to exam dates the students come more frequently, and in many cases only on those dates, to the tutorials. It is remarkable that during this teaching experience there have been practically no consultations in tutorials in all the academic year, not even on dates coming up to the exams.

#### **5. CONCLUSIONS**

New information technologies and e-learning will be indispensable tools in lecturing in the near future. The increasing band width available for Internet connection and multimedia properties for computers makes it possible for teaching through computers to become one of the main means of teaching methodologies. However the lack of multimedia content production is a very important cause which limits e-learning spreading extremely.

The creation of large-scale teaching content for lecturing needs a production methodology to assure the optimization of resources and, therefore, a reduction in costs. This work intends to contribute with the methodological lines applied in the production of multimedia teaching content for lecturing.

In spite of the existence of many jobs and proposals for using e-learning applications, the problem of producing this multimedia material and its widespread use in lecturing in a wide range of knowledge areas still has not been tackled.

This project shows how the multimedia material production process has been made for e-learning with some subjects of the degree in Technical Engineering in computer systems science, satisfying, through these technologies more than half of the teaching timetable of these subject programmes.

New teaching methodologies require new teaching aims, the role of teachers in the new educational process should be restated in the whole educational process. The teachers should reduce the time dedicated to teaching lessons using traditional blackboard methods. This activity could be mainly, replaced by e-learning techniques. Teachers could dedicate time to activities which offer a better quality in teaching, transmitting motivation about the subject being studied and directing the students in their studies.

Furthermore, a very positive valuation of the results has been made and we have obtained the confirmation of the advantages that e-learning offers to lecturing.

The future of teaching in the European society, should see an improvement in the quality of education, its availability, and a lower cost for students as well as for educative organizations.

## 6. GLOSSARY

**Multimedia.** Is media that uses multiple forms of information content and information processing (such as text, audio, graphics, animation, video, interactivity) to inform or entertain the (user) audience.

**Multimedia didactic content.** Multimedia teaching material used to teaching lessons using e-learning methodologies.

**Didactic objectives.** Concepts and/or abilities that students should acquire after study the subjects.

**Multimedia didactic units.** Each association of multimedia didactic elements used to acquire didactic objectives.

**Multimedia didactic element.** Each component created to constitute part of the multimedia didactic units (video, applets, Flash applications, text files, ...).

**E-learning applications.** Software created for e-learning.

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