MULTIMEDIA TECHNOLOGY FOR SELF-LEARNING LOGIC AND PROGRAMMING LANGUAGES

Vieira de Castro, António
Departamento de Engenharia Informática, Instituto Superior de Engenharia do Porto, Portugal
Rua Dr. António Bernardino de Almeida, 431, Porto, Portugal
acastro@dei.isep.ipp.pt

Vaz de Carvalho, Carlos
Departamento de Engenharia Informática, Instituto Superior de Engenharia do Porto, Portugal
Rua Dr. António Bernardino de Almeida, 431, Porto, Portugal
cvc@dei.isep.ipp.pt

M. Carrapatoso, Eurico
Faculdade de Engenharia da Universidade do Porto / Inesc Porto, Portugal
Rua Dr. Roberto Frias, s/n 4200-465, Porto, Portugal
emc@fe.up.pt

ABSTRACT

In the past years there has been an increase in the interest in e-learning of the society, in general, and of the academic community, in particular. Given the faster internet access to specific contents through the web, together with improved compression techniques, it seems possible, in the short term, to provide multimedia contents with improved quality and reasonable delays.
The purpose of this paper is to present a case study that evaluates the use of multimedia technology in learning environments.

KEYWORDS

Multimedia, learning, case-study, self-learning, e-learning, technology

1. INTRODUCTION

The authors of this article were involved in a case study of teaching/learning programming languages and logical concepts in an e-learning environment, using multimedia contents to support self-learning.

With this study our goals were to identify the advantages and limitations of multimedia technologies use for e-learning and which steps must be taken before, during and after the teaching contents preparation, in order to make teaching, learning and evaluation more motivating and effective.

It was also our purpose to check whether the application of multimedia technologies can minimize or even replace the teacher's role in a live class and to analyze the student's behavior during the transmission of knowledge through multimedia methods and compare it with their behavior when learning the same contents in live classes.

2. ANALYSIS OF FACE TO FACE LEARNING SYSTEM

The learning process must be understood as an act of acquiring knowledge.

When we want to teach logic to the students we should analyze the theories of thinking in a valid way. Usually to teach logic we use programming languages.

The existing learning methodology is based on theoretical and practical classes where the teaching takes place in well defined moments in time followings the classes schedule of is specific discipline planning.

Fig 1. The schedule of weekly classes

Its contents are taught in 14 weeks in the theoretical and practical face to face classes. At the end of the semester, these contents must be finished but this could be compromised if any problems occur during the presential classes. In this case the assessment will be based in the contents actually learned. If a student fails a class then he must find a colleague who could lends him his notes to help him to study. Anyway, if we talk about logic and a programming language these notes must be very good to provide him with all the information that he needs.

3. CASE STUDY

A case study course was developed based on an experience of teaching a certain subject in an engineering school. The subject was taught simultaneously in face to face lessons and in e-learning terms with the help of multimedia contents, previously created by the authors to support the research in progress.

3.1 Analysis and design

The learning subjects were identified during the planning and assessment moments for this study were chosen.

The audience has been studied to identify possible problems and the new course has been designed.

After the analysis of the structure of knowledge to be provided in the face to face classes the authors started the development of the contents that would provide the information needed for the project.

The subject was divided into modules and the course was developed subdividing each module into different themes.

The course based in modules subdivided in themes

For each theme theoretical material, practical exercises and multimedia contents were developed to provide information that should be sufficient when the teacher was absent.
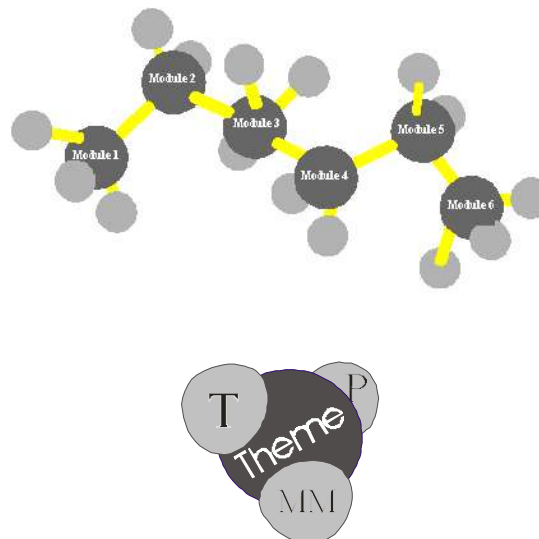

Figure 2 - Each theme provides theory, practical and multimedia contents.

It was our intention that these multimedia contents should be able to provide similar information as a presential teacher. Therefore, we tried to identify what could be developed using multimedia technology to play this role.

For that it was important to understand the way presential classes work and the student needs.
We verified that they very often need explanations
- about certain theoretical subjects
- about the code used
- how to design the interface of the applications
- how the program works
- how the problem is used in real life

So, before starting the development of contents we tried to identify the real needs and the multimedia content required to "teach" those explanations.

3.2 Development and implementation

The WeBCT platform was used to provide all the information to the students and for the synchronous moments as well.

The course was planned with six modules to explore the discipline syllabus.

Every week (without holydays and other events as in presential classes) the students had to study the contents of the module that at that time was going to be evaluated.

For that we adopted the following scheme:
- Put the information in the platform;
- In synchronous moments the teacher and students "talk" about the theme of the current module
- The students are invited to explore the multimedia contents;
- Students are asked to put some home-works in the platform during the time of the current module;
- The doubts should be clarified in several different ways as in synchronous or presential classes, and non-synchronous moments using for example e-mail.

In several ways, multimedia could be "the perfect partner" in the self-learning process. Multimedia can:
- *Explain the logic: A simulation synchronized with audio can explain the logical functionality in certain problems;*
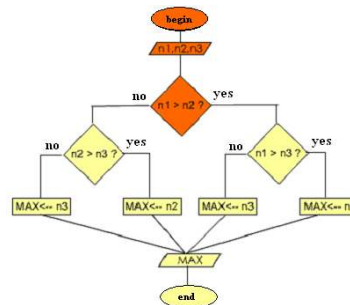

Fig 3. Logical explanation using a fluxogram

- *Teach the theory through the development of models that could explain the basic concepts being exposed;*

Fig 4. Multimedia to explain matrices

- *Teach how to develop the design interface of the application through the use of hypermedia;*

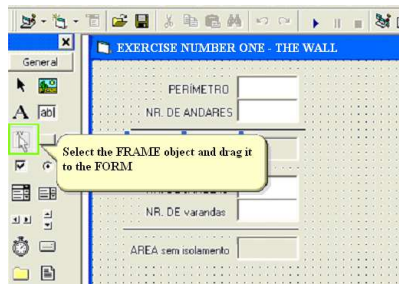Fig 5. Using hypermedia to help with the form conception

- *Ask questions and wait for answers;*
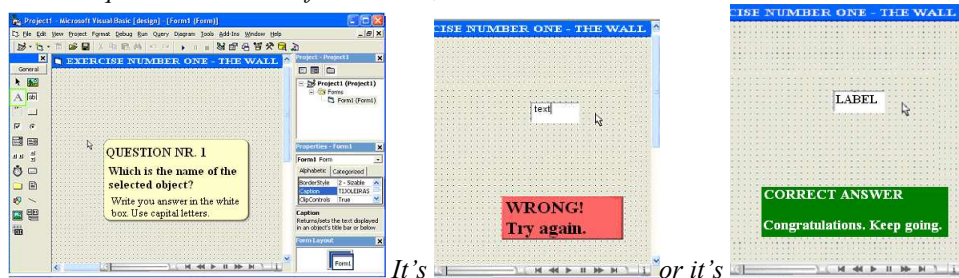
 It's *or it's*

Fig 6. Questions can be made and answers can be given
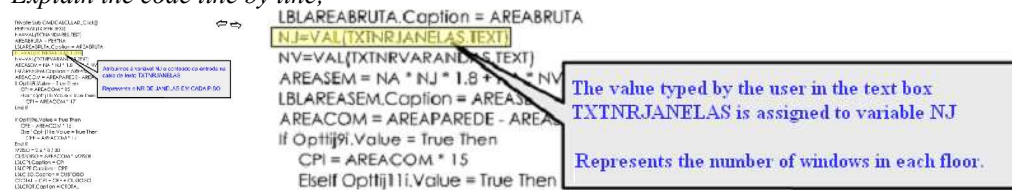
- *Explain the code line by line;*

Fig 8. Code can be explained line by line

- *And even show a real life usage of the program using videos to motivate the students by making them understand that the program could be useful.*

Fig 9. Videos to explain the use of the programs in real life

- *Provide discussion* - After the analysis of the contents of each theme, the students should then discuss them to prove that they have understood the goals of the theme. The teacher must motivate and help them in these discussions showing them in several different ways how to understand and apply the concepts of the theme.

- *Provide clarification* - If during the discussions and multimedia visualizations the students keep having doubts then the teacher must have other solutions to provide clarification. In the present project this clarification was provided by email, presential and synchronous classes and using the teacher's office. Continuous communications have been established between the players.

- *Provide assessment* - The assessment was pre-defined and was performed on three different moments as shown.
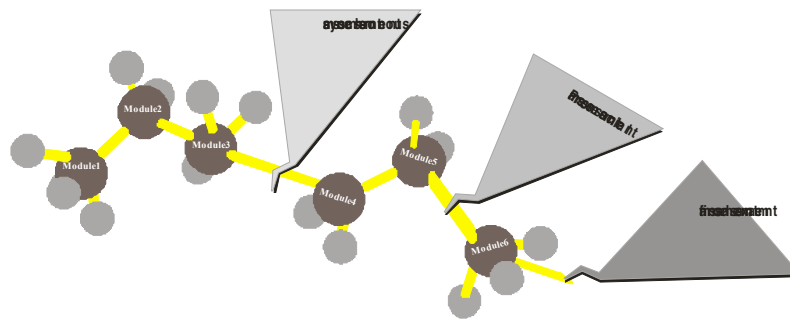
Fig 10. Assessment moments in the course

The main difference relatively to the evaluation in presential classes was that the first test was token in e-learning platform were students were asked to answer questions and develop programs using Visual Basic.

4. EVALUATING THE PROJECT AND THE USE OF MULTIMEDIA

To evaluate this project and the role of multimedia learning contents the students answered some questionnaires. Their answers were treated and the following graphics illustrate their opinions.

In a 1(minimum) to 5 (maximum), scale they consider the importance of the used technologies.
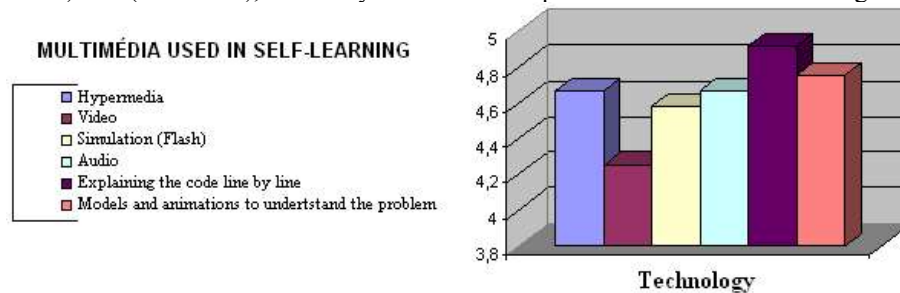

Fig 11. Shows how multimedia contents are evaluated in self-learning

They considered that code explanation line by line through hypermedia and simulation models (as for matrices) perfect to their learning.

We have identified the student's opinion about the use of multimedia in their learning as shown in figure 12, 58% classified this role as very good and 42% as good.

Given these results, our intention is to present here some conclusions:

Developing multimedia learning contents is not an easy task.

Sometimes it can be frustrating if the time spent in the construction of contents does not provide the expected results.
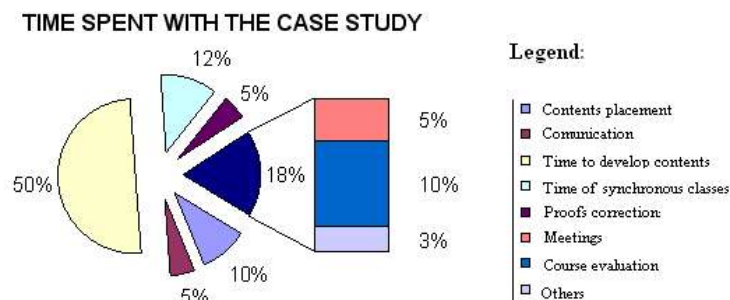

Fig 12. Time used by task to develop this case study

- Multimedia creators must know that they should spend long hours in the development of their contents even if they will be consulted in a few seconds or a few minutes. Certainly their effort will be rewarded by re-use in future courses;
- The use of multimedia contents can play in an e-learning environment a teaching role, motivating and providing self-learning. In fact, the students that have a pre-registration in the discipline, considered that the use of multimedia made e-learning very similar to presential classes
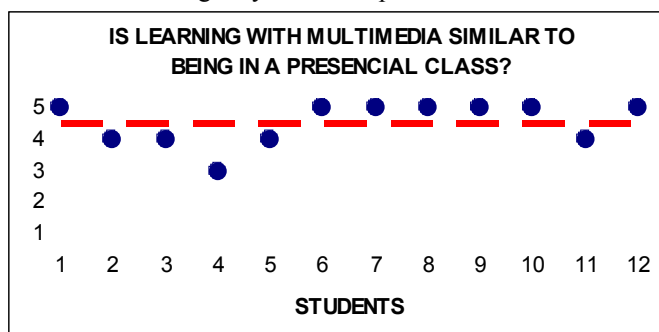

Fig 13. Student's evaluation to the use of multimedia to provide self-learning

The process of teaching, learning and evaluating should be adjusted to the new tendencies and social realities through the usage of available multimedia technologies to create teaching-learning prototypes in the most varied areas.

After properly tested they can constitute a credible resource for the act of teaching and learning with great value for all those that, because of them lack of time to attend face to face sessions, aim to acquire the equivalent knowledge through self-learning systems.

We observed that multimedia could be used in learning systems to provide:
- Motivation;
- Simulation;
- Creation of learning models;
- Teaching and learning.

5. CONCLUSIONS

In conclusion, multimedia may provide mechanisms to make learning enjoyable an so that students enjoy learning and to motivate then to understand the real usage of the specifics taught in the courses, it may provide them with information and simulations to make them acquire knowledge.

Multimedia may also provide models to transmit essential knowledge about a specific matter and effectively teach and help the away how to develop the program. Multimedia may make all the considerations that usually the teacher does and even replace him when the student needs.

The teacher's must identify what is important to explain and multimedia must be developed to do it. If the teachers can not spend much time with every student explaining contents as the code line by line then multimedia will certainly help.

As shown, that task was very appreciated by the students making them understand better the programs.

When needed, multimedia must play the role of the teacher in lab sessions when the student asks for help. In these situations, hypermedia must be clear and provide all the needed steps as if the teacher was there doing his job.

Certainly if the content is well done, it will play the role of the teacher.

The long time needed to develop these contents looks now as it was a very well invested time. Actually these contents will certainly be reused in future events of the course.

As the results have been satisfactory our conclusions are that multimedia can effectively be a very good partner in learning environments and provide information that the students can transform in knowledge on their own.

We believe that multimedia contents can be more audacious, more attractive, motivating, and more interactive, standing out for their creativity (singularity) and high quality. It should be possible to provide new

mechanisms and new learning models to make the students learn, on their own, the subjects and the concepts inherent to a specific knowledge.

REFERENCES

Amaral, Fernando A. F., 2001. *"Atelier de Introdução às ferramentas multimédia, Programa da acção de formação"*, Portugal.

Andrade, António Manuel, 2004. *"Uma abordagem sistémica à utilização das tecnologias na educação"*, Universidade Católica Portuguesa, Portugal.

Carlos Vaz de Carvalho, 2001. *"Dissertação de Doutoramento: Uma Proposta de Ambiente de Ensino Distribuído"*, Universidade do Minho, Portugal, pp 145-160.

Fernandes Paulo, Artur Pimenta Alves, Maria Teresa Andrade, 2000. *" MPEG-4 – Áudio - Televisão Digital e Novos Serviços"* Porto, Portugal.

Gouveia, Luís Borges e Ribeiro, Nuno Magalhães, 2003. "*Proposta de um modelo de referência para as tecnologias multimédia* ", Porto, Portugal.

Gomes, Anabela, 1998. *"Ambiente de suporte à aprendizagem de conceitos básicos de programação"* - Centro de Informática e Sistemas da Universidade de Coimbra , Instituto Superior de Engenharia de Coimbra, Coimbra, Portugal.

Hammond, N, 1993. *"Learning with Hypertext: Problems, Principles and Prospects"* In C. McKnight, A Dillon & J. Richardson (Eds.) *"Hypertext, a Psychological Perspective"*. London, U.K., pp 51 - 69.

Jorge Reis Lima e Zélia Capitão,2003, *"e-learning e e-conteúdos*" Centro Atlântico, Porto, Portugal.

Rodrigues, P., 1992. *"Avaliações em educação: Novas perspectivas"*, Lisboa, Portugal, pp. 15-72.