STREAMING MEDIA IN DIFFERENT CONTEXTS: ENGINEERING AND EDUCATION GRADUATION

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ABSTRACT

In this paper we describe a functional model that will be used to develop learning units supported by streaming media contents. The main goal is to test this new methodology by carrying out several pedagogical experiences with students and teachers from different scientifics areas, from Engineering to Education. More precisely, the target courses are Applied Mathematics, Computation Systems, Digital Control and Methods and Techniques of Educational Administration.

Streaming media is viewed as a tool to support innovative pedagogical activities, capable of addressing the new challenges introduced by the current demands of pedagogical environments. The teacher must be capable to formulate new teaching strategies to guarantee the expected learning levels and the entailment of the communication and the interactivity that should exist inside of the classroom. Besides, it demands to the student adaptation to a new contents format, more oriented to a context of virtual learning characterized by a larger flexibility.

This model requires a carefully unit learning design. All the three main actors, students, teachers and contents, must articulate together, in order to find out how this teaching/learning pedagogical system can be augmented by streaming media contents with dynamic characteristics.

KEYWORDS

b-Learning; Education Technology; Streaming Media Contents.

1. INTRODUCTION

The information society and its burst of technology underneath hold a challenge to the development of a School towards the future.

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Nowadays, virtual communities are daily companions to students [1], so it should come as a second nature to them the adoption of b-Learning with attractive and dynamic contents.

Teachers face a different kind of challenge, one that goes through the adaptation of education contents to emergent realities. Their creative talent must be used in order to promote discovery learning among students.

The use of streaming technologies to support conception of academic contents is something new. Questing it for the value of innovation and flexibility, we proposed to test, study and comprehend what can suppress or stimulate its success.

Streaming can be characterized as "multimedia data transferred in a stream of packets that are interpreted and rendered, in real time, by a software application as the packets arrive" [2][1]. Presenting some content through this format isn't, *per si*, different from the traditional education model (unless the control of reproduction), which is subordinated to a logic of mere knowledge transmission and the teacher plays a *one man show* role. The question here is to find flexibility in the actual education context and understanding in which way a, supposedly, static asset such as streaming media contents can be transformed into a live resource with all the dynamics associated to the School of the Future. Towards this goal, several thematic models, supported by streaming media contents, were designed and experimented on different groups of students from different graduation courses and distinct scientific areas. The courses involved in this project were two Master Integrated in technological areas and a first grade in Education, and the learning units were Computer System, Applied Mathematics, Digital Control and Methods and Techniques of Educational Administration.

2. THE FUNCIONAL MODEL OF A STREAMING SUPPORTED UNIT

This functional model should be comprehended as a pedagogical system supported by streaming technologies capable to effectively cope in a personalized way with student's learning necessities. Extending this logical thinking, Adão *et* al. argues, "it is necessary to change the content's format, the mean to distribute the contents, the learning activities purposed, the communication policy and the assessment criteria" [3].

To explain the suggested model, we start by showcasing its inner base framework, following the focus with a few key aspects on how to successfully create a streaming supported learning unit.

2.1 Conceptual Framework

Starting with what Hippel defends about the "open and distributed innovation process driven by steadily better and cheaper computing and communication" and based on the premise that discovery learning it's the one that happens *just in time* instead of *just in case* [5], we consider streaming media contents to be a realistic challenge and to a certain degree, expected, in the evolution course of education environments.

Figure 1 holds a tri-parted vision about possible interactions between main agents in a classroom context, either physical or virtual.

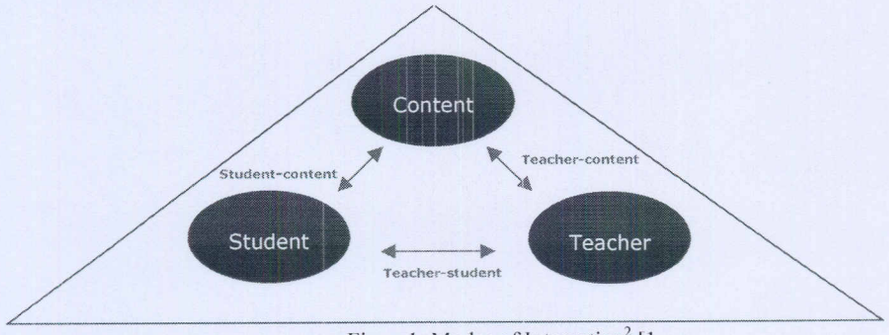

Figure1. Modes of Interaction[2] [1

[1] Wikipedia, http://en.wikipedia.org/wiki/Streaming, visited 1st February 2007, 23:50.
[2] Source: Adapted from Garrison, D. R. *et* al. (2003: 43).

The relationship that develops between these three agents constitutes, regardless of the learning environment, a critical factor to achieve a successful and meaningful learning experience for students.

Concerning what is expected from the teacher role, like facilitating access to knowledge, he is the one that through content interaction decides what kind of feedback he wants to get with his message. This interaction generates rules and politics that will sustain the student learning process. In other words, we could say that depending on which kind of content is selected by the professor, as well as the corresponding communication established, we can expect a unique learning experience regarding its dynamic and creative aspects. Formulate contents to appeal the imagination and curiosity, while simultaneously promote the development of a thoughtful mind that incites the construction of creative solutions to the study phenomenal, represents a challenge to the teacher and his capacity to innovate.

Focusing on the student and his relationship with content, we know by past studies that "the majority of student time in all forms of education is consumed by interactions with educational content" [1]. Acknowledging this reality, besides other relevant factors, such as kinds of interests, motivations and learning rhythms, we understand how volatile, ranging from rich and flexible to poor and static, the learning experience can be for students, especially when mediated by a computer interface.

Lastly, there's an important ongoing process of socialization generated by the interactivity between teacher and student. This acts as knowledge transference because it facilitates "reflection, self-criticism and help to develop learner's knowledge" [6]. This systemic interaction brings us the starting point to the development of new educational processes.

2.2 Functional Model Characterization

The model's properties hold on a system with dynamic characteristics, presenting streaming media contents as a live didactic resource and, simultaneously capable to answer the educational mission towards innovation.

Bologna's process guides this challenge in the sense that building a unified European higher education system opens an opportunity window to the implementation of flexible, innovative and active methodologies. Streaming Media fulfill these requirements since it is:

- Active, stimulating the interaction between the different education agents;
- Flexible, allowing teachers to share the efforts in the development of there pedagogical contents, and allowing access without physical and time limitations to students; and
- Innovative, linking the pedagogical and technological components and creating to students an environment similar to their actual social context. Besides, it is also flexible concerning the possibility of teachers to identify alternative sources of information that facilitate and promote several learning activities that better suit students' needs.

Figure 2 illustrates the model's main lines of orientation. *Information*, in square 1, is a representative metaphor of streaming contents. Via web, they can watch, read and listen to available materials as many times as they like, finding their own learning balances point.

With *interaction*, in square 2, the student should, through content generated dynamics, create his/her own knowledge pyramid, holding on its creative skills to search new information sources that could expand his/her analysis scope. Regarding the matter of creativity, there's a study defending that "it doesn't occur inside an individual, but it's the outcome from his thoughts and his socio-culture environment"[3] [8] in which he lives. It's expected, at this level, that the teacher develop a learning strategy to enable students to explore, practice, simulate and test theirs competencies.

[3] Transcription based on Portuguese language: "não ocorre essencialmente dentro do indivíduo, mas é o resultado da interacção entre os seus pensamentos e o contexto-sócio-cultural".

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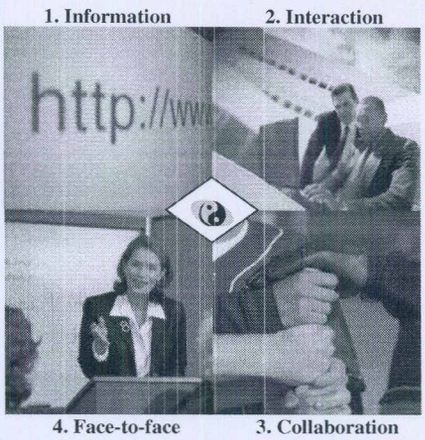

Figure 2. Representation of a Functional Model from a Streaming Supported Learning Unit [4][7]

With *collaboration*, square 3, certain conditions should be created to develop group dynamics (virtual or physical). Shared spaces, like forums and discussions, are scenarios that can promote expected results.

Inter-university or inter-disciplinary virtual classrooms (of national or international scope) find in this model, and particularly at this level, a privileged stage to its expansion and adoption. The creation of team works with multicultural characteristic could offer a new dimension to the act of learning. "Reinventing" an educational dynamic based on the premise of "sharing through difference" will trigger off creative searches, critical attitudes and the discovery of new ways to obtain, apply and transfer knowledge.

At last, the physical complement and its social aspect brought by *face-to-face* offer high learning levels. It's possible to teachers and students to share ideas discuss doubts and expose the obtained working results. Through an empathic relation, teachers can connect with students and explore theirs motivations and capacities or minimize signs of frustrations. This is possible because there's an instant feedback.

Generally, we can say that these forces act at different strategic levels and contribute in the end to a positive mutation regarding the student's knowledge. There isn't a rigid hierarchy between these four levels, neither a right formula to its application. It's up to the teacher, with his sensibility and creative skill, to choose the appropriate strategy and best moment to apply it.

To end this presentation and subscribing Alves's idea, we can say that the rate of success of Streaming Media contents under the university education depends upon both teachers and students capacities to "innovate on their everyday jobs"[5] [9]. This capacity to innovate starts by "questioning old habits, ruling out routines, imaging non-existing scenarios and adopting new realistic solutions"[6] [9] contextualized with today's changing scenarios that marks the future.

3. EXPERIENCE DESIGN

To test and to validate the described model, several small thematic modules were developed. These modules are parts of the curriculum of the considered different units learning as described in Table 1.

[4] Source: adapted from IBM's 4 Tier Learning Model *in* http://www-304.ibm.com/jct03001c/services/learning/ites.wss/zz/en?pageType=page&contentID=a0003032. Visited 17th October 2006, 23:00.

[5] Transcription based on Portuguese language: "inovar nos seus ofícios".

[6] Transcription based on Portuguese language: "questionar de velhos hábitos, contestando rotinas, imaginando cenários inexistentes e adoptando novas soluções realistas".

Table 1. Streaming Contents

Graduation Courses	Units Learning	Thematic Module	Level
Education	Methods and Techniques of Education Administration	Organizational Learning	3
Integrated Master in Computation	Computer System	Multiprocessing	2
Integrated Master in Industrial Electronic Engineering and Computers	Applied Mathematics	Differential Equations	2
	Digital Control		3

For each modules, were previously defined the learning results for each of the contents.

Each module integrates the theoretical aspects, presented in streaming (video with the teacher presentation, added with power points presentations), complemented with several activities based on problems resolutions to be discussed on face-to-face classes. The teacher also offers a set of alternative information sources. This allows the student to explore one of each area of knowledge presented, building for him self or in group, the answers for the formulated challenges.

In order to track all students' activities, the contents were presented in a learning management system. An access counter was associated with the streaming contents as described in Figure 3, to give to the teacher an idea of the study hours that students prefer.

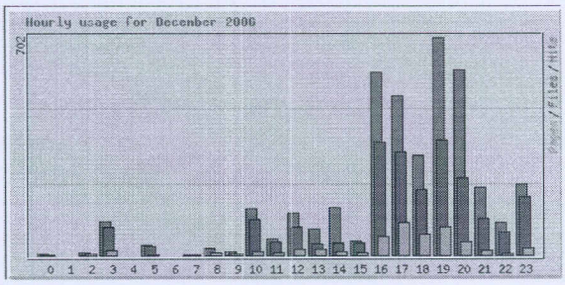

Figure 3. Access Hours to the Content in December 2006 for the Applied Mathematical Module.

The technologies involved in this experience were the Microsoft Producer to compile the streaming contents (Figure 4 show the interface layout) and Moodle platform as virtual scope virtual classroom. The unit learning was kept on-line during the entire course unit.

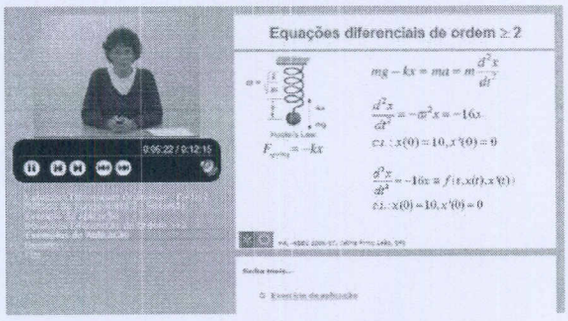

Figure 4. Structure of Streaming Learning Unit in Moddle Platform

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4. CONCLUSION

This article refers the main requirements of Streaming Media as a tool to support any pedagogical activity, considering this technology a dynamic resource and oriented to a model of shared learning.

Being flexible and easy to use turns it in a powerful instrument to serve pedagogical activities. The teacher still needs to function as a learning process driver. Thus, he is responsible for defining which content might be transformed into streaming and what purpose it will serve.

Based on these premises are the necessary conditions to the development of digital contents, strategically oriented to specific knowledge acquisition. Simultaneously they should stimulate innovation, educate young minds and entrepreneur spirits to guide students to improved competencies. Following Cannings and Talley's thinking, we should "demand active student engagement and promote the preservice teacher's ability to discern the essential learning and teaching elements in a given situation, and to analyze and interpret data to inform an action"[10].

Knowledge through sharing is a proven fact. Institutional or departmental partnerships are key factors to the promotion of virtual classrooms between shared scientific domains inside the national or European space. These conglomerates represent a pool of knowledge experiences and cultures that are unexplored and streaming contents could be extremely useful and can fulfill this area.

Streaming Media answers these questions and others, enabling, for example, teachers to benefit from a peer-to-peer network like when they share their efforts on the development of didactical resources and be reused on identical curriculums classes on a later moment.

Based in this idea, it is being implemented the interdisciplinary share experience involving two teachers from different departments teaching different learning units with common scientific base, where some of the contents can be reused. The two learning units involved are Applied Mathematics and Digital Control, taught to the second and third years of the Master Integrated in Industrial Electronic Engineering and Computers degree.

Open access contents repositories, or just institutional kinds to obey law, may win a new dimension and turn themselves into a rightful asset to both teachers and students in the process of building a community intellectual capital. In this scenario, it's also possible to share efforts and benefit from different skills, reducing associated costs to the conception of didactical materials, storage and diffusion. According to Dodds, "one of the most important areas where information technology (IT) can contribute to innovation is through infrastructure and services that enable collaboration". Also according to the author, "effective IT-enable services at university have certain key characteristics that take them as great contributors to innovation. They scale from small to large so that they are available to everyone who needs to use them" [11].

Obviously, Streaming Media is not a totalitarian answer to educational problems, particularly when it includes people that are geographical spread.

In spite of these constrains, if we concentrate on the organizational microstructure, this content format must be, in the first place, accepted as valid option by students, teachers and educational institutes. It will come to a point when teacher feel the necessity to reach a compromise: contents need to be flexible and dynamics or they will succumb as inert materials.

Although this experience is still in a development phase, there are already several learning units using streaming media contents, in the referred courses. On a later phase, it is expected to wide the scope of intervention of these academic contents. Like many other innovation initiatives, to promote its acceptation it is still required to give the human agents involved in the educative process some confidence level regarding the effectiveness of streaming media contents.

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