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A Sample of Multimedia Material in Higher Education

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Abstract

The authors present a sample of the multimedia material created within the Laboratory Immersion project at Campus de Nayer, Hogeschool voor Wetenschap & Kunst in Sint-Katelijne-Waver, Belgium. In the project, one of the author collaborated within the Erasmus Lifelong Learning Lifelong Learning Program. The project focused on the creation of multimedia aids for distance learning students in order to provide a suitable combination of teaching methods and means for acquiring knowledge and skills within the subject of physics in the different phases of the project. The output of the project is a multimedia learning aid, the aim of which is to prepare students for the practical part of teaching in technical laboratories.

Keywords:
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1 Introduction

Multimedia in education

"Multimedia could be defined in different ways. Laurentiis (1993) defines multimedia as a means to display text, graphics, animation and video with sound. Brett (1998) states that multimedia is a computer-delivered combination of communication elements (text, sound, pictures, photos, animations and video). Different elements of communication are combined and linked and therefore the multimedia message may be greater than the sum of the individual parts. Dubois and Vial (2000) note that a multimedia presentation uses different media in conjunction with each other. Gyselink et al. (2000) assert that multimedia usually consists of connections of various types of information: verbal (words, sentences or short text), presented in either visual or auditory formats; pictorial (illustrations, photos, graphics), presented visually in either a statica or animated way, and sound. Uden and Campion (2000) maintain that despite the typical conception of multimedia as interactive learning, it is also associated with traditional learning principles. Many aspects of multimedia are different from sequential, computer-based learning and hypertext. Goyne et al. (2000) recommend that learning multimedia should capitalize on aspects that support learning but are not available in traditional learning materials; for example, computer software programs can accommodate both visual and auditory learners." (Piret, L., 2009)

"As a starting point, faculty ought to understand the ways in which multimedia technology may enhance, if not revolutionize, their instructional practice. "Literally, multimedia is the integration of two or more communications media. It is the use of text and sounds, plus still and moving pictures to convey ideas...it is built around the premise that anything words can do, words with sounds and pictures can do better". For higher education, these features, in reference works or interactive courseware, can supplement course content and activities in innovative ways. The pedagogical basis for augmenting instruction in this fashion is sound.

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Research in educational psychology suggests that "student learning is affected positively by presenting text and illustrations together...furthermore, computer-generated animation offers a potentially powerful medium for presenting visually based information to learners". (McFarland, D., 1996, p. 2)

"As technology and visual images become more integral to society, teachers also try to implement information communication technologies and multimedia tools in education, which have many advantages:

1. *Student Engagement - using multimedia tools in the classroom engages students through familiar media and increases enthusiasm for learning.*
2. *Brain Activity and Memory - multimedia lessons are also better suited to how the brain naturally interprets and remembers information. Richard Mayer's theory of multimedia learning states that people learn better with lessons that activate their senses rather than simply reading words. Because students use a variety of sensory channels while viewing multimedia presentations, they are more likely to store the information in their long-term memory.*
3. *Cost Effectiveness and Training - according to Asia's Commonwealth Education Media Centre, a disadvantage of multimedia tools is that they require copious financial and human resources. Because audio-visual files take up more data space than text files, schools need up-to-date computers capable of handling not only the large files, but the multimedia programs themselves.*
4. *Student Focus - another disadvantage is that too much reliance on it can cause social loafing, a phenomenon where a lack of contact between the teacher and students can result in a loss of effort and focus. According to the Social Policy Research Associates white paper "Technology-Based Learning Strategies," technology-driven classrooms may make students feel like they aren't being supervised, causing them to zone out or get distracted. Mayer suggests personalizing technology-based lessons by making them communication-based, creating an exchange of ideas between students and the teacher in spite of a less personal atmosphere."* (Kori, M., 2017)

2 The idea of implementing the project

The main idea of the project, called Laboratory Immersion, was to provide higher education for a group of students who do not have enough of his or her own graduation in the traditional way. The target group consists of students from five partner colleges and universities, namely, students of Campus De Nayer, Katholieke Hogeschool Sint-Lieven and K.U.Leuven, and students of physics and pharmacy from K.U. Leuven. It is especially important about students who combine their study with work, top athletes, and those who in their university studies they combine several study programs.

The implementation of the project is divided into three phases over a three-year period:
1. the preparatory phase focusing on domestic preparation,
2. phase of active participation in laboratories (aiming at acquiring skills);
3. distance post-graduate phase (aim to reflect on the realized experiments and reporting).

The main aim of the prelaboratory phase is the theoretical preparation of the students from the given issues, as well as their motivation to realize the second phase, the active participation phase in laboratories. Preparation in the first phase consists in the systematic acquisition of professional theoretical knowledge to enable students to work independently and efficiently during work in laboratories. Practical skills are trained in the student's home environment through a "experimental box" assembled. At the end of the prelaboratory phase students must comply with the conditions of e-evaluation. Only well prepared students can enter the lab and start a real lab work.

At this stage of the implementation of the project, the authors of the contribution participated in the mobility ERASMUS Lifelong Learning Program Students, as module makers for the area physics, which is the only one implemented in English. Content of others modules, microbiology, industrial information technology and chemistry was in professional the competence of the staff of these institutions and was created in the Flemish language. The learning content of each learning area - modules is created in the form of online, provided by Lector's management training system, which makes it comfortable course administration, also in the form of a

distance study. LMS Lectora provides the ability to create courses in SCORM and AICC with the possibility of subsequent implementation to others systems such as LMS eDoceo, Moodle.

3 Content structure of the created product

The content of the "physics" module is based on the basic knowledge that is inevitably needed to understand the basic principles of geometric and wave optics. Range module covers the complex content of subject teaching physics, thematically structured into four, relatively separate sub-modules as follows:

• What is electromagnetic waves?

After completing this sub-module, educates should control physical patterns electromagnetic waves, to understand how the different types are being propagated waves, define terms such as electromagnetic spectrum, frequency and wavelength, etc.

• What is the origin of light?

The objective of the sub-module is to guide the students in the physical patterns of the problem thermal radiation of bodies, light phenomena of luminescence, emissivity, absorption of light.

• Light interaction options

The aim of the sub-module is to approach and explain to students the possible interaction of light with individual subjects, understand the meaning of light, the basic concepts of the diffusion of light in the environment, refraction, which are part of the problems of geometric and beam optics.

"Light interaction options".

•Spectroscopy

Students would be after the last one the Spectroscopy sub-module should understand what it is the essence of spectroscopy, what methods generation of emission and absorption spectra, etc.

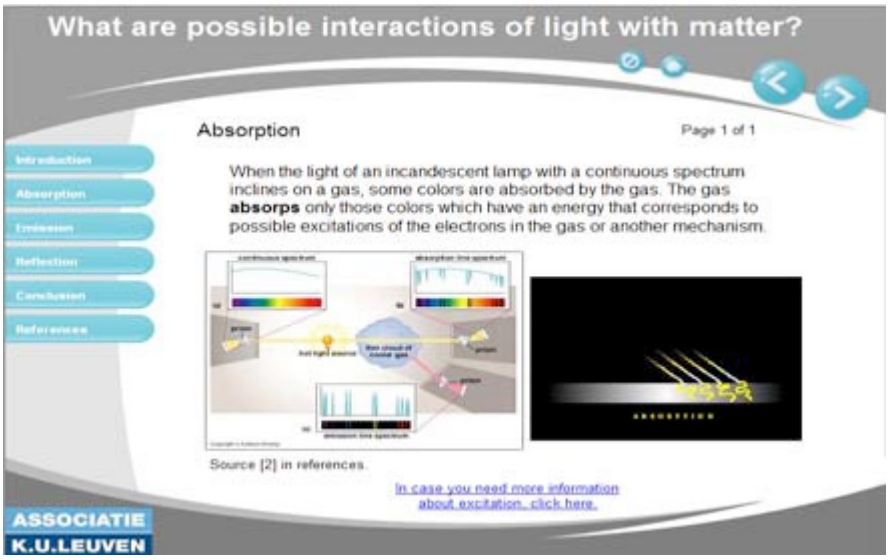

Fig. 1: Demonstrates a snapshot of a sub-module

Because we put great emphasis on the visualization of the processed issue, they contain individual sub-modules except static images or schemes, as well as a significant number of animations of the physical principles of the phenomena described, which are supportive of the textual part. Their implementation we want to enable students to acquire the acquired curriculum more thoroughly, faster and more complex. Authors used the subdomains (figure 1) and hyperlinks to interesting resources that provide the educant with the opportunity to supplement the processed physical issues. After studying the text of the sub-module, students should be ready answer the questions in the electronic test at the end of the sub-module. Tests by help students to test their knowledge and find out how far they have mastered of the relevant sub-module. As is generally known, teaching physics is essential and required competencies as well as gaining practical experience and skills in laboratories.

Students can perform experiments during the phase of active participation in laboratories in the lab and to collect quantitative data through didactic and professional instruments. This meeting takes only half a day so students need to be well prepared. Depending on the needs of the students, this part of the project is realized during the evening hours or during weekends. The last postgraduate phase is realized for each student separately in the home environment. The role of the student at this stage is to write a scientific report of the results of the measurements made. Output and content should be in line with the concept you take studied during the initial, prelaboratory phase. The final mark of the course will consist the evaluation of the scientific report and the results of the electronic test.

Advantages, disadvantages and recommendations for project
"The use of this method has many advantages. The prelab will help the student to be better prepared before starting the experiment. The pre- and postlab will allow the student to study at moments it's comfortable for him. Working students will not have to take several days off in order to be present in the laboratory sessions. The students who combine several programs will be able to take more theoretical courses. For the moment laboratories get priority, and theoretical courses are skipped. Non-traditional students won't feel guilty anymore when the regular students have to finish group reports or group exercises on their own without the help of the non-traditional students.
However, implementation of this method also has weaknesses. The students will miss social contacts and the group-feeling with the associated social pressure. The students will need a lot of discipline and responsibility for the pre- and postlab and will have to come to the university or the college when other people are free.
Main recommendations for the project activities are: the group feeling is important. It's more comfortable to have your own teacher as a guide. The guidelines for the pre- and postlab should be clear and representative. The e-applications should work properly. One should organize a help desk for all phases. The laboratory immersions should be flexible tools adaptable to the different types of students." (Verelst, F. – Langie, G., 2009)

Conclusion and Discussion

"Laboratory work is an important component of the formation of engineers and scientists. Twenty to sixty percent of the contact moments in scientific and engineering higher education are dedicated to laboratory work. These are strictly organised, intensively coached learning activities at the campus of the University or College. The attendance to these on-site training activities is mandatory to the program. Non-traditional students cannot attend all the scheduled sessions, so ad-hoc solutions are introduced which unfortunately do not always have the same aims as the original practical work or do not fit the required quality standard. We are in need of a structural solution which can be offered to the students when the regular experimental courses in the laboratory cannot be taken. In the past two decades' great efforts have been made in designing flexible study paths." (Verelst, F. – Langie, G., 2009)

"There are some examples, for instance in computer science, where all competences can be acquired through a distance course using only a virtual lab. The strong point of a local laboratory is to permit the student to acquire real practical skills. In the virtual systems there is a lack of interaction with the real equipment and a lack of sufficient feedback. To solve the feedback problem some, make use of a virtual assistant to complement their own feedback. For some topics it is easy to solve the lack of hands on experience by offering laboratory experiments which can be done at home, using materials readily available from local grocery and hardware stores. Other course developers created a networking laboratory that allows students to connect to and configure devices remotely. Many problems can be addressed by e-learning, but there are still many disadvantages. Course facilitators try to avoid these by making all kind of blends consisting of e-learning and face-to-face learning. E-learning can be used as to facilitate existing face-to-face teaching and to encourage more effective student preparation. Sometimes students do experiments in the lab and continue practicing at home using e-learning. The research presented in this paper focuses on a possible flexible solution for non-traditional students: laboratory immersion. This is a short, very intensive on-campus laboratory practical preceded by and finished with distance learning activities. In fact, the three phases in the experimental work are consciously divided: the virtual prelab phase at home focussing on preparation, the on-site laboratory session for the hands-on activities and the remote postlab for reflection and reporting. As Barros, Read and Verdejo noted 'The addition of virtual laboratory scenarios which include simulations, collaborative tasks and periods to encourage student reflection, greatly improved the learning of the experimental material and enabled students

to work more effectively when they actually undertook the real lab work. This idea is conform with previous projects. The design of these three phases depends on the aims of the practical work and the needs of the non-traditional students for whom we perform this project. We should be aware of the barriers these students encounter. We focus in this paper on these barriers. Answering this question includes that we know which students are non-traditional and their relative amount in the total student population. In the following section we discuss the categorization of the non-traditional students and their share in the student population. The barriers these students run into, are discussed afterwards and finally some conclusions are presented." (Verelst, F. – Langie, G., 2009)

Combined form of study is one way to solve current problems full-time studies at college. Learning material of created electronic course "physics" should therefore serve the teacher as an aid to existing forms of attendance learning process in computer-supported lectures, but also as important part of combined teaching. On the other hand, an e-learning course may be used, students as part of their self-study, as well as in home preparation for a training or exam from the discipline. Parallel to the implementation and evaluation of the learning curricula materials will be monitored also influence of this teaching aid on the motivation of students and on the effectiveness of the proposed method of teaching the relevant thematic unit between the respondent by a group of respondents.

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