Journal of Accessibility and Design for All

(CC) JACCES, 2012 - 2(2): 155-164. ISSN: 2013-7087

# SUBTITLED VIDEO TUTORIALS, AN ACCESSIBLE TEACHING MATERIAL

Luis Bengochea[1], Flor Budia[2]

(1) Department of Computer Science, University of Alcala (Spain)

(2) Agricultural Engineering School, Polytechnic University of Madrid (Spain)

luis.bengochea@uah.es

***Abstract:*** The use of short-lived audio-visual tutorials constitutes an educational resource very attractive for young students, widely familiar with this type of format similar to YouTube clips. Considered as "learning pills", these tutorials are intended to strengthen the understanding of complex concepts that because their dynamic nature can't be represented through texts or diagrams. However, the inclusion of this type of content in eLearning platforms presents accessibility problems for students with visual or hearing disabilities. This paper describes this problem and shows the way in which a teacher could add captions and subtitles to their videos.

***Keywords:*** Educational resources, knowledge pills, multimedia eLearning design, eLearning accessibility, deaf students, captioned video.

## Introduction

In many of the subjects taught in engineering, there are complex and dynamic processes whose learning is difficult for students if additional support materials provided with animations, simulations and explanations or video recorded images are not used. In agronomy, for example, with these materials students could observe with detail abnormal growth processes as a crop attacked by a plague. A complex application in computer engineering would be better understood if students could visualize its dynamic behavior [1]. The problem is that these kinds of materials cannot be represented in

traditional text books, and are not regularly offered by college professors in their online courses yet.

The inclusion of multimedia contents in teaching/learning engineering courses [2] is useful both to help to deeply understand a problem (learning), and to apply knowledge to new problems to be solved (skills).

The creation of small pieces of video by teachers, to be included both in lessons and virtual classroom where they can be consumed several times and by mean of different devices by students, provides additional motivation increasing their learning rate and helping to understand and retain complex contents.

This type of video tutorials, known by many authors as "learning pills" consist on small pieces of learning materials created as audiovisual content. Theses "learning pills" are designed to complement traditional training strategies and to facilitate the understanding of some aspects of curricular materials that presents greater difficulty to understand for students, as evidenced by its conceptual depth and its instrumental complexity.

The production of learning pills can be autonomously done by a teacher, using basic computer equipment and affordable and easy to use applications. Since its purpose is purely educational and targeted to students enrolled on a particular course, it's not necessary to use sophisticated or institutional means of production or publication that generally meet different approaches [3].

However, this kind of multimedia material unlike other traditional, presents new accessibility problems that must be taken in account. Nowadays there is a special sensitization towards integration in all life spheres for people with some kind of functional diversity. In many developed countries schools are under anti-discrimination legislation and are required to meet the needs of students with disabilities. It is therefore necessary for the authors of multimedia learning content to provide them with the necessary features to make them accessible and interoperable with other systems and external content repositories [4].

(CC) JACCES, 2012 - 2(2): 155-164. ISSN: 2013-7087

## Learning pills

Audiovisual learning pills combine creativity, multimedia integration, sound and animations. Their design as self-contained pieces of videos of 5 – 15 minutes is focused in being integrated into a broader educational content in which several pieces of this kind may appear. Due to its shortness, the concepts or techniques which aim to strengthen learning should be clearly identified and should be part of the unit that is being created. They may be presented arranged in several ways and reused in different learning units, but without losing its characteristic of units with its own entity for themselves.

In this respect, learning pills differ from other types of video learning content, such as recorded lectures offered for example in Massachusetts´ MIT within their initiative of open courses, or in Youtube channels from other universities. Despite its great diffusion potential to students worldwide, these recordings present some drawbacks such as:

Their duration is the same as traditional lessons (50 minutes), which make them uneasy to watch more than once if you want to reinforce a concept developed in that lecture.

- Their duration is the same as traditional lessons (50 minutes), which make them uneasy to watch more than once if you want to reinforce a concept developed in that lecture.
- The video records everything that happens in the classroom, although is not relevant for the lesson. (Fig.1)
- It requires expensive resources and facilities: lightning, professional technical material, specialized staff for recording etc…
- High occupancy of memory in disc of the created media files.

(CC) JACCES, 2012 - 2(2):155-164. ISSN: 2013-7087

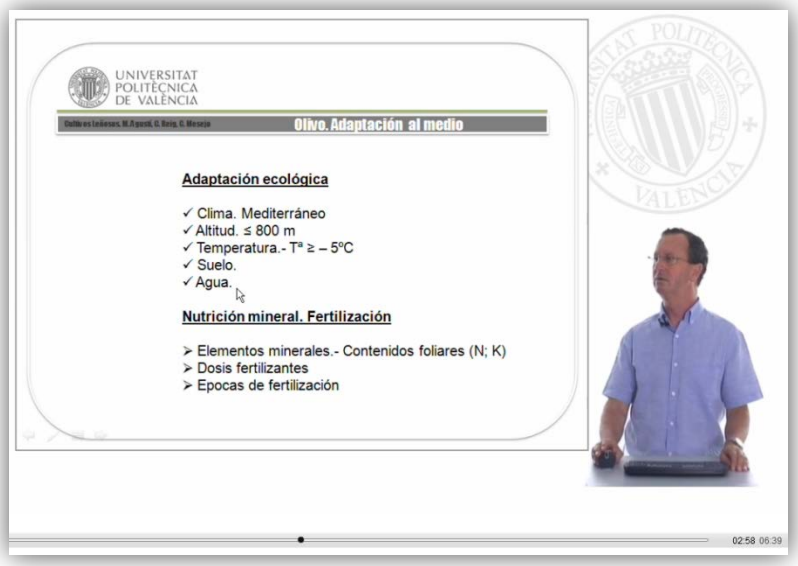
*Figure 1. "A Computer Science master class videotaped and offered as part of the "OpenCourseWare" (OCW) by the Massachusetts Institute of Technology (MIT)". Source: MIT*


Several Spanish universities are using for the production of video tutorials a tool named "Polimedia", developed at the Polytechnic University of Valencia in 2007. It allows the recording of a talking teacher or student, with a screen that shows slices or videos, while explaining the contents (Fig.2). To minimize the size of the file and an easy transfer of it, "Polimedia" uses a low-resolution image for the teacher and a larger one for the screen. From the point of view of educational content, in most cases the support consists of a central slide presentation accompanied by the figure of the speaking teacher explaining the subject.

Notwithstanding, it also creates learning pills in the sense given in this paper, such as those developed by the authors of a pilot experience at the University of Vigo [6], being the characteristics: "Autonomous objects, focused on a topic, indivisible, clusterable and targeted for an specific audience ".

(CC) JACCES, 2012 - 2(2): 155-164. ISSN: 2013-7087

*Figure 2. "An agronomy video tutorial recorded with "Polimedia" at the Polytechnic University of Valencia. The display shows a presentation next to the teacher´s talking head, normally without subtitles". Source: Polytechnic University of Valencia.*




## Creating a video tutorial

Any teacher who wants to prepare teaching materials in the form of short video tutorials or learning pills, has available a wide range of tools, both free software and owner, assessing aspects such as image and sound quality regarding the size of the files, or the possibility of its spreading by streaming it from the University eLearning platform so students don't need to download it.

In the test we have done to bring out our first video tutorials, we were interested in catch everything that appeared in an area of the computer screen, on which there were superimposed images, video clips, presentations or an application window in which the teacher interacts. At the same time he was recording the explanations through a microphone.

The tools evaluated included 'Adobe Captivate', 'Camtasia Studio' or 'SnagIt' [7]. This last was finally chosen due to its simplicity and good video and sound quality. Videos were produced in AVI format, with a size of 640x480 and 25 frames/sec, and subsequently transformed into Flash Video format (FLV) in order to integrate them into the subjects´ HTML pages

(CC) JACCES, 2012 - 2(2):155-164. ISSN: 2013-7087

within the virtual platform of the University, where they can be watched without downloading.

## Students with hearing disability

In a traditional classroom, deaf or hearing impaired students may use several means to access educational content. In some cases, a language interpreter is needed, while there are people able to read directly from the lips of the teacher. It can also be made by someone taking written notes that they can read later. None of the methods is intrinsically better than another and mainly depends on the individual and the exact nature of his hearing loss. It also depends on when they became deaf and their prior education [8].

In the case of virtual education, access to multimedia content such as video tutorials by students which have some kind of functional diversity, whether visual or audible, presents a particular difficulty that classical contents doesn't, mainly composed of texts and presentations with text and graphics. To access to written material, students with visual disabilities have programs able to dictate through speech synthesis the displayed text, and will also include if it has been attached, a description of the images.

Hearing impaired students are able to access to texts without an additional difficulty. In this regard it should be taken into account that accessibility considerations for these students should avoid making unrealistic assumptions about their levels of prior knowledge and their understanding of reasoning. In general students with hearing disability have poorer literacy skills due to language barriers during their previous training [9].

### Subtitles

Despite of the enormous potential of the videos to prepare teaching materials is not yet fully developed, the need to make them accessible must be taken as a requirement from the earliest stages of planning and production of video tutorials.

(CC) JACCES, 2012 - 2(2): 155-164. ISSN: 2013-7087

There are several types of subtitles. The most common are those in text transcribing the spoken content in either the same language or translated into another different. These subtitles are very useful for students who do not speak the language in which the video was made. For example, English subtitled video tutorials for a course at our university, allows us to make them accessible to visitors with a limited knowledge of Spanish.

However, this kind of subtitles have been widely criticized by deaf or hearing impaired people because they do not provide enough information about the context in which the action takes place in the video [10].

The accessibility of video tutorials requires the use of captions to provide additional information such as a sound produced in the scene (e.g. a telephone rings), which character has said a sentence, the tone employed (angry or happy), etc. This is an area where more research is still missing. The use of colors in texts to represent emotional contents, the position of subtitles on the screen to identify who is speaking or the size and typography used to provide the written text with the emphasis which is being talked about, are still experiences which have not been transferred to a mostly accepted rule [11].

Both subtitles and captions can be pre-recorded on video, so you cannot visualize it without them, or be contained in separate files so that the user should decide whether to display them or not. There are systems that allow you to see captions and subtitles separately and even choose their language.

## Adding subtitles to a video tutorial

The task of adding subtitles and captions to a video is not entirely straightforward. In the literature about the creation of educational material is often recommended to leave this task to specialists. However the runtime and cost requirements make this recommendation only valid if the audiovisual material being prepared is intended for a wide audience and with a long duration in time.

A teacher who has prepared a short video tutorial to reinforce a topic in a course of several dozens of students may provide it with enough quality

(CC) JACCES, 2012 - 2(2):155-164. ISSN: 2013-7087

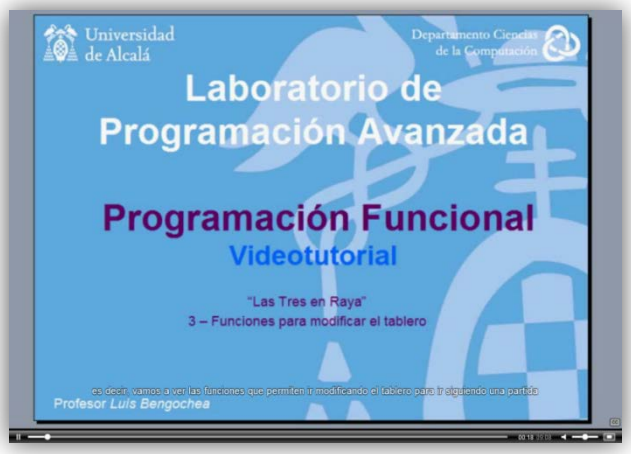
subtitles to make it accessible both to hearing impaired students and to those with difficulties to understand the spoken language of the video.

Countless programs that allow you to add subtitles to a video are available on the internet. In some cases this can be made by recording the text directly on the video frames and in others by creating a text file with the synchronization information of the video.

It is convenient to separate the subtitles in a file apart so that they can be shown only when the student desires. Videos recoded with subtitles may cause rejection when viewed several times. There are several formats for subtitles, as 'SubRip' (.srt), 'MicroDVD' (.sub), 'Universal Subtitle Format' (.xml), 'Substation Alpha' (.ssa), 'Advanced Substation Alpha' (.ass), etc.., but there are programs that allow you to switch from one format to another. For our tests we have used the open source program 'Aegisub' and the .srt subtitle format.

Another requirement was to be able to embed the video tutorials on web pages with additional information such as a description of its contents or recommendations for viewing. For this we have been using plugins for 'Flowplayer'´s html. This is a video viewer for the web, allowing open source stream video from a web server, such as the virtual classroom, inside web pages in where the student can turn on or off the subtitles (Fig.3).

*Figure 3. An Advanced Programming video tutorial. Subtitles can be removed and activated by pressing the small CC button that appears at the right bottom. Source: Author*



## Conclusions

Video tutorials as short "learning pills", addressing the basics concepts of a subject and being available in the virtual classroom as self –learning materials, can help to strength the interest and motivation of students. However, accessibility creates challenges for students with functional diversity, which in the case of hearing impairment can be addressed by creating subtitle files and legends that can be displayed as a desire of the student when they are served from the eLearning platform. Subtitles can also be written in a language other than the one of the video tutorial if the aim is to make it accessible for students with language difficulties.

Both the creation of the audiovisual, and the writing and synchronization of the subtitles can be directly done by the teacher making learning content, using simple and easily accessible tools, and with a learning slope similar to other IT applications widely used.

## Acknowledgements

This work has been supported partly by the European Union through the project ESVI-AL of the ALFA III program (2012).

## References

[1] Tang-Hung Nguyen, I-Hung Khoo (2009): Learning and Teaching Engineering Courses with Visualizations. Proceedings of the World Congress on Engineering and Computer Science 2009 Vol I WCECS 2009, October 20-22, 2009, San Francisco, USA.

[2] González,M.J.; Montero,E.; de Heredia,A.B.; Martínez,D.(2010): Integrating digital video resources in teaching e-learning engineering courses. Education Engineering (EDUCON), 2010 IEEE 2010, Page(s): 1789–1793.

[3] Author(2011). *Píldoras formativas audiovisuales para el aprendizaje de Programación Avanzada*. Actas de las XVII Jornadas de Enseñanza Universitaria de la Informática. JENUI2011. Sevilla. Julio 2011. ISBN:978-84-694-5156-4

[4] M. Cooper, A. Heath (2009): "*Access For All to eLearning*". Research, Reflections and Innovations in Integrating ICT in Education. Published by FORMATEX, Badajoz, Spain (2009) VOL. 2 (pp. 681-1231) ISBN Vol. 2: 978-84-692-1790-0

[5] YouTube channels: UCBerkeley: (http://www.youtube.com/user/UCBerkeley); Stanford University: (http://www.youtube.com/user/StanfordUniversity). Retrieved: Feb2012.

[6] Sanchez,A.;Cancela,A.;Maceiras,R.;Urrejola,S.(2010): *Multimedia Productions: Knowledge Pills for University Teaching*. IADIS International Conference e-Society 2010. Avila (Spain) ISBN:978-972-8939-07-6. Pages:351-355.

[7] TechSmith. SnagIt: http://www.techsmith.com/snagit . Retrived: Feb.2012.

[8] Judith Mole; Diane Peacock.(2005): *Learning, teaching and assessment: A guide to good practice for staff teaching d/Deaf students in art, design and communication*. 2005. University of Wolverhampton, United Kingdom. On internet at: http://www.wlv.ac.uk/teachingdeafstudents.

[9] A.S.Drigas,D.Kouremenos (2005): *An e-Learning Management System for the Deaf people*. WSEAS Transactions on Advances in Engineering Education, Issue 1, Volume 2, pp. 20-24. 2005

[10] M.Hersh, J.Ohene-Djan (2010): *Representing Contextual Features of Subtitles in an Educational Context*. 10th IEEE International Conference on Advanced Learning Technologies. 2010. 5-7 July, Túnez.

[11] J.Ohene-Djan, R.Shipsey (2006): *E-Subtitles: Emotional Subtitles as a Technology to assist the Deaf and Hearing-Impaired when Learning from Television and Film*. Proceedings of the Sixth International Conference on Advanced Learning Technologies (ICALT'06)