ACCEedu
Accessible Audiovisual Educational Resources

Mª Luz Guenaga, Iker Jamardo, Andoni Eguíluz and Javier Oliver

University of Deusto, Avda. Universidades 24, 48007 Bilbao, Spain

Keywords: Audiovisual, Multimedia, Accessibility, Audiovisual Interactive Activities, Moodle.

Abstract: Thanks to information and communication technologies (ICT) audiovisual resources are more available than ever, however their educational use is not as extended as it could be. Usually students perceive the audiovisual resources as a passive way of receiving content, being only the viewers/listeners of the information. ACCEedu provides a set of tools that combined with existing eLearning platforms allow the creation of interactive activities with audiovisual resources as basis, and above all ACCEedu enables the content creator to make these resources accessible for users with special needs through the inclusion of subtitles, audio description or sign language.

1 INTRODUCTION

The use of audiovisual resources in education has a long history (Abdelhakim, M. N. and Shirmohammadi, S. 2007). Movies, videos or audios have been used to illustrate concepts, processes or theories. The fact that «a picture speaks a thousand words» is applied in many educational contexts (Friedland, G., Hürst, W., and Knipping, L. 2007).

From our perspective audiovisual resources lack two characteristics to reach a wider target group of final users. On one hand audiovisual resources need higher interaction with the user. Nowadays audiovisuals are reproduced by the student to acquire the information in a passive manner. Students should be able to interact, "play", with the resource as they do with a sheet of paper (complete, write, do annotations, cut, paste, etc.)

On the other hand, all audiovisual resources, mostly those provided for educational purpose, should be accessible to all users, including those with special needs (Karampiperis, P. and Sampson, D. 2005). There are many legal, political, social and ethical reasons that make accessibility a must for the educational context. Not only the question of an exercise should include audiovisual content, but the answer should also be based on the special needs of the student and therefore include the possibility to introduce text, voice audio or even a video with a sign language recording.

ACCEedu is a project that is being developed in cooperation between Gizer.net and the «eLife» research group of DeustoTech (Deusto Technology Foundation). Gizer.net is a software company with strong social responsibility specialized in the development of accessible technology; this includes web pages but also tools for the accessibility of audiovisual content and its educational use.

2 ACCEedu OVERVIEW

ACCEedu is a set of education software tools developed to be executed independently or in combination with existing Learning Management Systems (LMS). In the first functional version it has been integrated with Moodle (Moodle e-Learning platform, 2009). It provides the capability to interact and work with audiovisual resources, as well as to make them accessible for users with disabilities.

ACCEedu has been developed with three different working profiles in mind. From the user's point of view there are three different installations depending on these user's profiles: the expert (educational content creator), the tutor (content users and students' guide, and evaluator) and the student.

Figure 1: ACCEedu, accessible audiovisual educational resources.

2.1 The Expert: Content Creator

It is essential to distinguish between the content creator, the expert in the educational content that it is being created, and the teacher/tutor that uses this content with his/her students. The expert can be compared with the writer of a text-book, the one who decides the contents, their organization and structure, the number and kind of activities, the multimedia resources to be used, etc.

In ACCEedu the expert is able to create activities and exercises based on audiovisual resources and make them accessible for users with disabilities thanks to a set of tools to create subtitles, audio descriptions or add videos with sign language footage. The audio description is a voice-description of what is happening in the video and it is inserted in the gaps of the dialogue. It helps visually impaired users to acquire information of what is happening in the video that is not strictly the dialogue or narration.
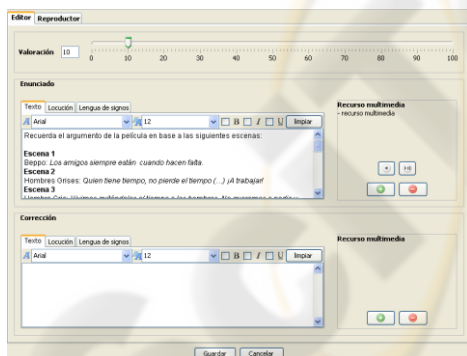

Figure 2: Expert environment screenshot: general overview of the editing screen of an open answer type activity.

Each text introduced in the activity that will be read by the student, for example the question or the possible answers of a multiple choice question, is what we call an «accessible text». That means that

the expert can provide it in three complementary formats: the text itself, the text in speech-audio format and the video including the sign language. That is how students with disabilities will be able to access and understand the contents depending on their special needs. Visually impaired users could listen to the speech or read the text using screen readers or Braille displays, and hearing impaired users are able to read the text and to complement it with the sign language. Even cognitive impaired users will benefit from the speech complementing the text format.

The expert is also able to fix other parameters as the value of each activity within the exercise, the time limit, the student's possibility to see the correct answer, or go back to modify an answer.

Once an exercise has been created it is exported, packaged with all the audiovisual content, so it can be added as a Moodle activity or played with the stand-alone ACCEedu application.

2.1.1 Legal Constraints, Copyright

One of the problems that experts face is the copyright of the audiovisual content. Nowadays there are plenty of free videos, audios and multimedia resources on the Internet, and some material is free or low-cost for educational purpose. Moreover, students should participate in the creation of their educational material. The expert can propose activities where students are the authors of audiovisual content that can be used in another learning process in the future. That is a motivating task for them and it creates a real 2.0 collaborative educational environment.

2.2 The Teacher: Content User

The teacher or tutor is the person who uses the educational content created by an expert in the classroom or an on-line course. The tutor is the guide of the learning process, the one that adapts the material and activities to his/her students in particular.

With ACCEedu, teachers are able to change the order of the activities or to hide them; the system allows adding comments, instructions or guides to the student.
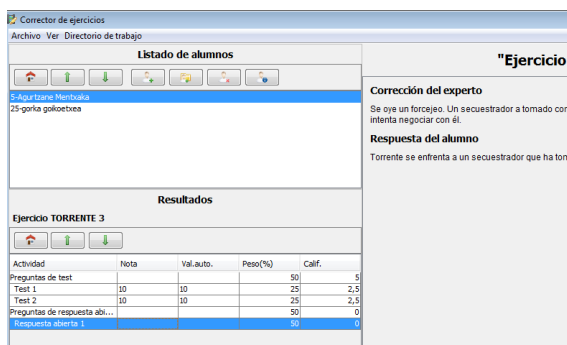
Figure 3: Teacher environment screenshot showing the evaluation of an exercise of a group of students.

The tutor is also the responsible of supervising and evaluating the activities solved and uploaded by students. In case of using an e-Learning platform like Moodle, the whole process is monitored and integrated with its evaluation system. ACCEedu provides advanced tools so this work can be easily done with individual students or groups, as can be seen in figure 3.

2.3 The Student: Content Interaction

The student is not only the receiver of the educational content (viewer in the case of audiovisual). ACCEedu includes interaction between the student and the multimedia content, completely integrated in the eLearning environment and complementing LMS environment with new features.
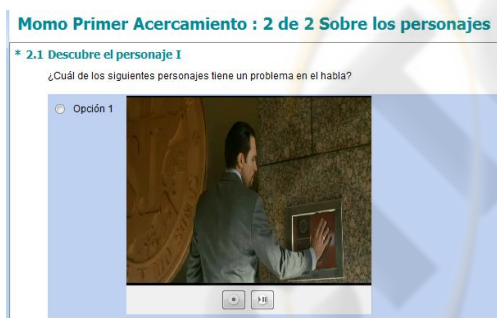

Figure 4: Student environment screenshot showing the resolution of a multiple choice activity with videos as part of the answers.

In the next section we describe some of the most innovative activities that can be design wih ACCEedu. New ways of working with audiovisual content are introduced in the classroom or in eLearning processes. This represents an innovative, motivating and attractive setting for the students that

can create a 2.0 collaborative and accessible way of sharing their enriched audiovisual resources.

eInclusion is also a priority of the research group and if the expert has design the content taking people with special needs into account, students with disabilities will be able to access all the content and fulfil activities.

3 INTERACTIVE AUDIOVISUAL

As we have mentioned before, one of the most innovative characteristic of ACCEedu is that it includes a great variety of activities with audiovisual resources as an essential part of them and that students can directly interact with the multimedia content.

Following we describe some of the most interesting type of activities:

- Add concept-labels to images, audio or video. The expert can define a set of labels (eg. adjective, name, verb) and the student has to identify these concepts in the content and mark them. For example, "*mark names, verbs and adjectives in the following text*" in a written text.
- Create, modify or complete subtitles, audio description or narrations, not only with the objective of making videos accessible, but to improve oral and writing skills, comprehension and other abilities.
- Traditional activities like multiple choice, match items from two columns or fill in the gaps where the possible answers are not only text but any multimedia resource.
- The system is prepared to record audio from a microphone and/or video from a webcam, the student(s) can edit it with the tools provided by AcceEdu and send it all packaged to the teacher.

These activities show the varied set of possibilities offered by AcceEdu to enrich existing eLearning tools.

4 AUDIOVISUAL ACCESSIBILITY

One of the main objectives of ACCEedu is the accessibility of the educational content and tools created in the project. Gizer.net and «eLife» research group have been working for the inclusion of people with disabilities to technology, specially to

eLearning environments, audiovisual resources and the Web.

Many projects have been carried out on Web accessibility, and the Web Content Accessibility Guidelines 2.0 have been recently published (Web Accessibility Initiative, 2008). But not so many projects face the accessibility of content provided in other formats like audiovisual or multimedia resources (Miyashita, H., Sato, D., Takagi, H., and Asakawa, C. 2007). ACCEedu has been designed and developed takin into account audiovisual accessibility specifications that the Spanish certification organism has stablished: UNE PNE153010 and UNE PNE 153020

ACCEedu integrates in the same environment a set of easy to use tools to edit subtitles, audio description or sign language. They provide great capabilities for advanced users but these tools offer a basic version for beginners with more than enough functionality to make audiovisual resources accessible.

We do not only provide the tools but also complete guidance and methodologies for the correct creation of these accessible complements to videos and audios.

That is how students with special needs will be able to follow the same educational process as those without disabilities, not being favoured but giving them the same opportunities.

4.1 WCAG 2.0

The Web Accessibility Initiative is the responsible of creating guidelines that assure the accessibility of Web pages and content. In 2008 they published the Web Content Accessibility Guidelines 2.0 (WCAG 2.0) that improve the previous version and make guidelines technology independent.

WCAG 2.0 provides four main principles to make Web content accessible, it has to be perceivable, operable, understandable and robust. Mainly the first principle focus on the accessibility of audiovisual content. Guidelines precise:

- «*Provide text alternatives for any non-text content*», this includes subtitles for videos.
- «*Provide alternatives for time-based media*», including subtitles, sign language and audio description.

4.2 IMS Guidelines for Developing Accessible Learning Applications

IMS GLC represents more than 140 Member organizations and Common Cartridge Alliance

participants from every sector of the learning community (IMS 2010). They provide solutions for creating learning applications that support accessibility to maximize the benefits of using the specifications. It includes principles for accessibility in online distributed learning, as well as specific guidance on how to use XML, multimedia, communication and collaboration tools, legal issues, and more.

4.3 ISO/IEC 24751

The ISO/IEC 24751 "Individualized adaptability and accessibility in e-learning, education and training" (ISO, 2008) is published in three parts. It provides a framework and reference model, with "access for all" criteria on personal needs and preferences, and a digital resource description.

ISO/IEC 24751 aims to meet the needs of learners with disabilities that is seen as a consequence of a mismatch between the learner's needs (or preferences) and the education or learning experience delivered.

- Part 1-"*Framework and reference model*", provides a common framework to describe and specify learner needs and preferences and the corresponding description of the digital learning resources, so that individual learner preferences and needs can be matched with the appropriate user interface tools and digital learning resources.
- Part 2-""*Access for all" personal needs and preferences for digital delivery*", provides a common information model to describe how a user desires to access online learning content and related applications. It includes how needs and preferences can be ranked with respect to priority, and the use of generic and application-specific needs and preference specifications.
- Part 3-""*Access for all" digital resource description*", provides a common language for describing aspects of a computer system (including networked systems) to facilitate their being matched to learners' accessibility needs and preferences. This part also describes application information scenarios and gives informative implementation examples.

4.4 International Legislation

Main European governments have laws that promote the accessibility to technology and audiovisual content, but they often fail in daily developments and services.

▪ «*United Nations Convention on Rights of Persons with Disabilities*» and the «*The Standard Rules on the Equalization of Opportunities for Persons with Disabilities*» approved in the National A°ssembly of the United Nations (UN) December 2006 and December 1993 respectively.

At European the «*Council Resolution on eAccessibility*» improves the access of people with disabilities to knowledge society. Resolution of January 14, 2003, it urges State Members to carry out a series of measures to promote electronic accessibility.

Finally, in Spain there are several laws affecting accessibility: «*Services of the Information Society*», «*general Telecommunications*», «*digital terrestrial television*», «citizens' electronic access to Public Services», «sign language», «Equal Opportunities», etc. And there are also guidelines created by the Spanish Standardization and Accreditation Agency (AENOR): hardware (UNE 139801:2003), software (UNE 139802:2003), subtitling (UNE 153.010) and audio description accessibility guidelines (UNE 153.020).

4.5 Checking Accessibility

An interesting option of ACCEedu is the possibility to check the accessibility of the content. The expert that is editing educational material, with or without audiovisual resources, would be able to check for the accessibility of part or all the information, activities and resources of a project.

The author has to define the language of the course and also the special needs of the target student: visually impaired, hearing impaired or others, so the checking will be made for these group of students. For example if the expert checks for the accessibility of visually impaired people in English the evaluation could give as result:

▪ Video: «*intro*».
  o Missing: audio description Language: en.
▪ Image: «*London.jpg*».
  o Missing: alternative text. Language: en.

Another example: checking the accessibility of a material in Spanish for people with hearing disabilities, the result could be:

▪ Video: «*presentation*».
  o Missing: subtitles Language: es.
▪ Audio: «*answer1*».
  o Missing: subtitles. Language: es
  o Included: subtitles Language: en.

  o Included: sign language Language: es.

If the course is being prepared including people with disabilities in the target group of students, this checking will allow the content creator to see which content, audiovisual resources or multimedia elements can be a problem for these users.

5 MOODLE INTEGRATION

ACCEedu is a stand-alone application that can be executed independently. Educational content can be shared and played with its specific editor and player. But in that way it lacks of many functionalities provided by existing eLearning environments. The aim of the project group was not to re-implement all the services offered by the most advanced LMS, but to integrate the ACCEedu approach into existing LMS workflows.

Therefore, the idea is to join with these LMS and make the most of the union. Moodle has been chosen as the perfect complement to AcceEdu due to its open source code, all the potential of its tools, activities, user administration and evaluation system and widespread usage. An essential characteristic of ACCEedu is the accessibility and Moodle is an accessible eLearning platform that is complemented with the accessible audiovisual content and activities of ACCEedu. Till July 2008 there are more than 21 million people registered, it is distributed in more than 46.000 sites and it has been translated to more than 75 languages.

For those users of Moodle, integrating ACCEedu activities is a very natural task. The process is as follows:

▪ The expert creates an exercise using the ACCEedu for experts standalone installation and exports a packaged unit with all the resources included in it.
▪ If any modification is needed the tutor can use his/her own specific standalone installation of ACCEedu for teachers to adapt some elements of the exercise. Then he/she has to upload it to Moodle (using a modified version with the cappabilities to insert ACCEedu activities).
▪ The student who accesses Moodle has to install his/her ACCEedu standalone instalation for students (only the first time), download the activity, complete it and upload the result as any other file in Moodle.
▪ The teacher downloads solved exercises of his/her students (one-by-one or grouped) and uses his/her own ACCEedu for teachers

installation to evaluate their results. Finally the tutor uploads the results so the student can see his/her whole evaluation of Moodle activities, including those done with ACCEedu.

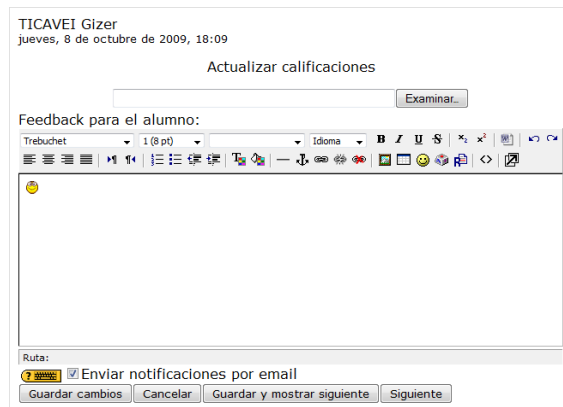Figure 5: teacher uploads the AcceEdu activity to Moodle.

Figure 6: teacher uploads the evaluation of an activity to Moodle.

As can be seen, the integration with Moodle is complete and the users only need to install the player in order to use ACCEedu activities.

The research and development team is also working on a seamless integration with Moodle by using the standalone installations and uploading or downloading the information to the Moodle web server directly by just a click of a button and some user validation.

6 CONCLUSIONS AND FUTURE WORK

ACCEedu is a set of tools that allows the users a higher interaction with audiovisual accessible educational resources. Its main and most innovative characteristics are:

- Integrated tools that make audiovisual resources accessible for people with special needs thanks to the possibility of complementing them with subtitles, audio description and sign language, even in different languages.
- High interaction with audiovisual and multimedia content. The student is no more a passive receiver of the audiovisual content but he/she can create, edit, complete or mark it, as he/she would do with a written text.
- Stand-alone application or total integration with Moodle, so that regular Moodle users do not have any difficulty in using ACCEedu activities.

ACCEedu is a project that has a long way to go because it proposes a lot of new educational possibilities and can be applied in many different contexts. In the short term the actions proposed by the project research and development group are:

- Intensive user tests of the three profiles (expert, teacher, and student) are needed to publish the first stable version of the platform. Collaboration with educational institutions is key to introduce ACCEedu so it can be used in their daily activity and report all kind of feedback like errors, modifications or suggestions to improve the system.
- Though ACCEedu files result on standard based files, SCORM and other learning and accessibility compliance is an important objective for the development team, so we can integrate our innovative tools in different eLearning Management Systems.
- Testing the accessibility and usability of the whole system with users with special needs. The interface, the accessibility of the content generated with ACCEedu and the tools and methodology proposed to the content creator, have to give as result, an easy to use accessible system.
- Collaboration with teachers, content creators and educators to increase the number and variety of activities.

An analysis of the specific applications of AcceEdu is being done. For instance, the system has a great variety of possibilities applied to language learning (DiGello, E. A. 2004). Projects like LvS-Learning via Subtitling, (Sokoula, 2006) demonstrate the potential of using subtitles in language learning.

REFERENCES

Abdelhakim, M. N. and Shirmohammadi, S. 2007. *A web-based group decision support system for the selection and evaluation of educational multimedia*. In

Proceedings of the international Workshop on Educational Multimedia and Multimedia Education (Augsburg, Bavaria, Germany, September 28 - 28, 2007). Emme '07. ACM, New York, NY, 27-36.

DiGello, E. A. 2004. *Understanding the social and instructional meaning of a multimedia, bilingual instructional tool for educators of the deaf*. In Proceedings of the 6th international Conference on Learning Sciences (Santa Monica, California, June 22 - 26, 2004). International Conference on Learning Sciences. International Society of the Learning Sciences, 650-650.

Friedland, G., Hürst, W., and Knipping, L. 2007. *The future of multimedia education and educational multimedia*. In Proceedings of the international Workshop on Educational Multimedia and Multimedia Education (Augsburg, Bavaria, Germany, September 28 - 28, 2007). Emme '07. ACM, New York, NY, 125-126.

IMS Global Learning Consortium. 2010-
At. http://www.imsglobal.org/

ISO, International Organization for Standardization. ISO/IEC 24751-2008. At: http://www.iso.org

Karampiperis, P. and Sampson, D. 2005. *Designing learning systems to provide accessible services*. In Proceedings of the 2005 international Cross-Disciplinary Workshop on Web Accessibility (W4a) (Chiba, Japan, May 10 - 10, 2005). W4A '05, vol. 88. ACM, New York, NY, 72-80.

Miyashita, H., Sato, D., Takagi, H., and Asakawa, C. 2007. *Making multimedia content accessible for screen reader users*. In Proceedings of the 2007 international Cross-Disciplinary Conference on Web Accessibility (W4a) (Banff, Canada, May 07 - 08, 2007). W4A '07, vol. 225. ACM, New York, NY, 126-127.

Moodle e-Learning platform, 2009. http://moodle.org

Sokoula, R., 2006. *Learning via Subtitling (LvS): A tool for the creation of foreign language learning activities based on film subtitling*. MuTra 2006 – Audiovisual Translation Scenarios: Conference Proceedings. http://levis.cti.gr/

WCAG 2.0 2008. Web Content Accessibility Guidelines. http://www.w3.org/TR/WCAG20/

AENOR UNE 153020: Audio description for visually impaired people. Guidelines for audio description procedures and for the preparation of audio guides

AENOR UNE 153010: Subtitling for deaf and hard-of-hearing people. Subtitling by teletext.