

# EVALUATING AN E-LEARNING EXPERIENCE ORIENTED TOWARDS ACCESSIBLE INSTRUCTION

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Keywords: e-Learning Experience, Accessible Instruction, Quality Evaluation.

Abstract: e-Learning is becoming an essential tool in the field of accessible instruction. This work describes the evaluation of an experience implemented at the Universitat Politècnica de València that addressed the adaptation of its e-learning platform to make accessible its contents and resources. Such experience has been developed in the context of the EU4ALL project which provided a general framework to cope with the needs of accessible lifelong learning at a Higher Education level. The first part of the experience consisted in developing specific components in Sakai, an open-source Learning Management System that is used at UPV as the institutional e-learning platform under the name of PoliformaT. The second part dealt with the evaluation of the developed Sakai version for a set of disabled students who registered in different Engineering and Business courses at UPV and lecturers who contributed to adapt the required learning resources. The results of the evaluation showed, on the one hand, the interest of students about the availability of alternative accessible resources but, on the other hand, the point of view of lecturers who were in charge of developing such resources and manifested the difficulty and effort to generate them.

## 1 INTRODUCTION

e-Learning is becoming an essential tool in the field of accessible instruction. This kind of instruction is growing in importance and there are several initiatives to promote it. For example the Accessible Instruction Pledge (Atomic Learning, 2011) states the opportunity to “*Understand the individual needs and abilities of learners...*” or “*Create documents and handouts that can be read and completed using assistive technology*” among other principles. The current work agrees with this statement and it addresses accessible instructional issues in a Higher Education (HE) context.

Nowadays, there are multiple efforts in different universities to make accesible their web sites and e-learning platforms. However, most of these initiatives have been focused on Web accessibility. In this case, the focus is pointed at checking content aspects and the way to match these instructional contents to the user needs. Such circumstance has required the adaptation of the e-learning platform used at the Universitat Politècnica de València (UPV) with the purpose of improving their content accessibility within the context of an European

project called EU4ALL. This project was funded by the European Commission to construct a general framework and extensible architecture of European-wide services that enable all students, including disabled students, or students with special needs, to access HE studies, from enrolment to examination and graduation (EU4ALL, 2011).

The remainder of the work is structured as follows. The next section provides a general overview about the context of the depeled e-learning experience. The third section introduces the method used to evaluate such experience and then, its implementation for enabling accessible instruction in the given context. The fifth section describes the evaluation results of the e-learning experience. Finally, some conclusions and further works are remarked.

## 2 CONTEXT

The following subsections describe the context of the e-learning system developed at UPV within the EU4ALL project. First, the higher education scenario is introduced and then, the technological



Figure 1: PoliformaT main screen.

support services provided by UPV in such experience are reported.

## 2.1 Higher Education Scenario

The Universitat Politècnica de València is one of the two main universities in the city of Valencia. The interest of the UPV to assist people with special needs in learning and research issues has been growing recently. At the beginning of the year 2010, the Information and Communication Technology Office (ASIC) was invited to collaborate within the EU4ALL project. The ASIC office has been in charge of the institutional e-learning platform called PoliformaT. The main goal for the participation of the UPV in the EU4ALL project was to adapt the PoliformaT platform to integrate it within the EU4ALL framework. Once this adaptation was performed, a set of evaluation experiments were conducted by the paper authors.

## 2.2 Technological Support

The PoliformaT platform was developed from the framework provided by the Sakai environment (Mengod, 2006). Sakai is a consortium of universities, colleges and commercial affiliates working in open partnership with standards, organizations and other open-source initiatives to develop “community-source enterprise-scale software applications to enhance collaboration, research and teaching within higher education” (White, 2005).

The UPV became a Sakai partner in 2005 and adapted its components to produce the PoliformaT

platform. Some of the PoliformaT contributions were the integration within the corporate systems and applications, the customization of its appearance and the internationalization, including the translation to Spanish language. Figure 1 shows a screenshot of a PoliformaT site that displays some components of the EU4ALL-UPV portal such as Tools and Content areas. Several experiences have been developed in the last years using the PoliformaT platform to check its instructional potential in online courses (Buendía & Hervás, 2008) and the current work has enabled its adaptation to the EU4ALL requirements.

## 3 METHOD

The evaluation of the e-learning experience developed within the EU4ALL project has been based on a method addressed to check the user’s point of view. There are multiple proposals in the evaluation of e-learning experiences such as quantitative vs. qualitative models, formative vs. summative, internal vs. external, evaluation based on experimental works or ethnographic studies (Mandinach, 2005). In this case, the chosen method was oriented towards gathering qualitative information about the user experiences and considering several phases in the evaluation process, from the assessment of the user profiles (either students or lecturers) to the final collection of their perspectives and their analysis. In order to analyse the obtained evaluation results, the UPV research team selected a quality model (Pawlovsky, 2003) proposed in the context of the European Quality Observatory (EQO) and addressed to structure

quality approaches for evaluating e-learning experiences. This model has also been applied to evaluate experiences based on the use of the Poliformat e-learning platform (Ejarque et al., 2007).

In summary, the method to evaluate the EU4ALL e-learning experience at the UPV has been divided in three main tasks.

- First, to define specific learning scenarios in which these experiences are developed, establishing the elements to be addressed along the target experiences.
- Second, to state the main research questions to be evaluated through the defined learning scenarios. This research was mainly focused on checking the Needs Assessment and the Authoring Support services which are part of the EU4ALL project. Additionally, several quality evaluation criteria were assigned to the proposed research questions.
- Third, to collect the evaluation results from users who participated in the EU4ALL experiences. This collection process was performed through questionnaires submitted to users and their results were analyzed by means of the referred quality model.

### 3.1 Data Collection

Two different types of data collection techniques were deployed. The first one was oriented to gather the point of view of users through a personalized interview, one addressed to students and a second one for lecturers. The students' interviews were promoted by the technical responsible at CEDAT (UPV disability office) who contacted with several students with different disability issues. These interviews revealed a huge variety of user profiles and subjects and this fact moved the research team to establish a set of basic teaching scenarios to be evaluated:

- Computing topics in several fields such as Computer Fundamentals, Computer Technology, or Data Structures.
- Business topics such as Marketing or Legal Economic aspects.

Another technique to collect data was the use of questionnaires which were submitted to users after the final tests at the end of the project. First a questionnaire for students was prepared that included three main sections: i) Demographic data, ii) Filling out the profile form EU4ALL and iii) Access to the course resources. A second questionnaire was designed for lecturers with question items classified also into three categories: i)

Demographic data, ii) Filling out the point of view about the current PoliformaT version and iii) Filling out the point of view about the new prototype of PoliformaT.

### 3.2 Participants

The participants in the evaluation process were classified in two main groups: i) lecturers who provided course materials to be adapted in the EU4ALL context and ii) disabled students who were registered in different UPV courses, mainly in Computer, Business and Engineering disciplines. One of the main problems in the evaluation of the UPV pilot site was the diversity and heterogeneity of student profiles and courses. About ten lecturers were asked for participating in the project but only six of them were able to evaluate the UPV pilot site. In the case of students, the CEDAT office contacted with them and finally, ten students participated in the experience (four with hearing impairment and six with visual impairment).

### 3.3 Materials

The evaluation was focused on two main areas: i) Computing courses and ii) Business courses. These courses were face-to-face (classroom-based) and they provided a set of instructional materials mainly based on text documents (pdf in most cases), and Microsoft PowerPoint® presentations. However, they also included video or other multimedia formats. For instance, in Computing courses, audio versions were produced for pdf documents for describing lab instructions or adding additional information in graphical presentations (e.g. wiring diagram), which were difficult to read for visually impaired people. In the case of Business courses, some deployed materials were screencasts, lecture recordings and podcasts, which were captioned or provided transcripts to students with hearing troubles.

All the aforementioned materials were stored in a Web site provided by the PoliformaT platform which was assigned to the UPV-EU4ALL project. Moreover, this site has been used for lecturers and students who provided samples of different kind of teaching materials and resources, and also for other lecturers and students as end-users who were interested to check the produced materials before testing them in the PoliformaT prototype adapted to the EU4ALL requirements.

## 4 IMPLEMENTATION

The UPV evaluation was carried out using the two main data collection tools aforementioned. This evaluation was performed on the PoliformaT prototype developed within the EU4ALL project with the collaboration of the ASIC office (Mengod, 2006). Next subsections describe the main steps to implement such evaluation.

### 4.1 Interviewing Users

A first step consisted in the implementation of interviews with both types of users. This step can be considered crucial because it enabled the configuration of the evaluation scenarios and the teaching materials selected to check them. In summary, it was unfeasible to implement formal full courses due to the diversity of student profiles and teaching disciplines. Nevertheless, the UPV research team considered that the selected scenarios were enough to obtain a meaningful sample of different classroom-based contexts to be evaluated. This set of learning scenarios allowed researchers to check the main aspects of the EU4ALL potential to provide an accessible content support.

### 4.2 User Experience

The second step in the evaluation procedure was based on the EU4ALL research questions for testing the user experience. A first version of the PoliformaT prototype was developed including the Preference form displayed on Figure 2 that allows students to gather their needs and preferences about the content features, for example to select text or audio contents.

Once students select a specific course, they can access the Resources provided by such course adapted to their stated preferences. Figure 3 shows part of the resources available for the Marketing course students. In this case, there is an introductory video to Marketing concepts based on a lecturer interview and a transcription of a podcast about a Marketing on-line topic.

In a similar way, lecturers who were involved in the project checked the introduction and review of resources. Figure 4 shows a screenshot that displays the different options available for a specific resource and the types of adaptation features which can be selected. For example, in the case of multimedia resources these can be based in audio-description or captioned versions. These information items are then stored in the Metadata Repository module provided

within the EU4ALL project. Such adaptation data are used by the Content Personalization module to offer users those resources that better fit their needs.

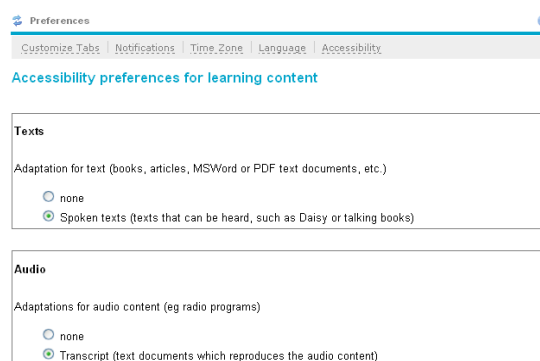


Figure 2: Student Preference form.

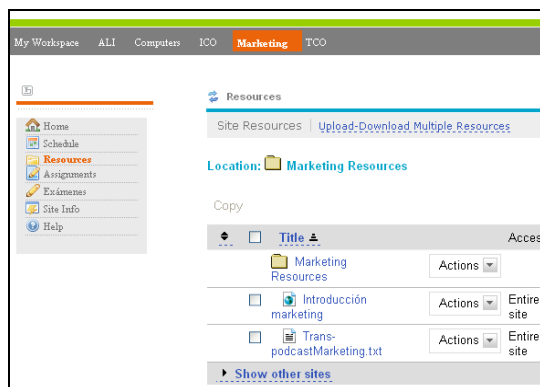


Figure 3: Resources in a Marketing course.

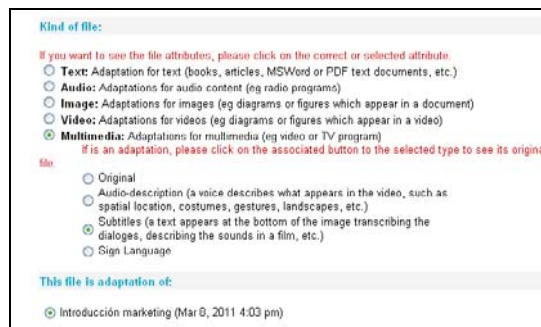


Figure 4: Edition of Resource attributes.

## 5 RESULTS

The final evaluation results have been divided in two parts: the first one is addressed to show the point of view of students regarding issues such as their Preference inputs or if they take advantage of the Resource access in the PoliformaT prototype and the

second one, to check the point of view of the lecturers who produced the teaching materials and stored them as Resources in the adapted PoliformaT.

In this first case, the starter questions were addressed to gather demographic data about the students who participated in the evaluation experience. The average age was about 30 years (only one person was older than 40 years). Only 30% of students stated that they deployed some kind of assistive technology such as special headphones for hearing impairment and text magnification tools for visual aids. Figure 5 shows a chart that displays percentages in the answers to questions about the usage of the Preferences form by students. As previously mentioned, a numeric scale was used to assess the user answer from 1-strong disagree (dark colour) to 5-strong agree (light colour).

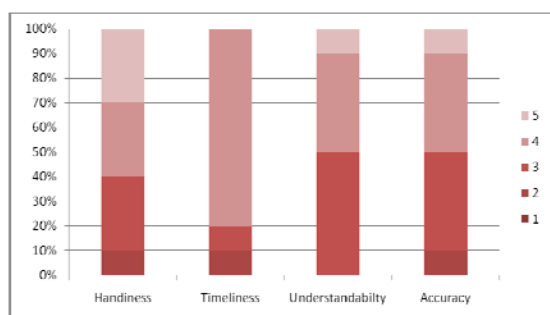


Figure 5: Testing Preference form.

Four quality criteria were selected to measure the required research questions in this case:

- *Easiness* that asked if students had found easy the process to enter the accessibility preferences. The results were rather balanced and no specific valuation was dominant.
- *Timeliness* about the time needed to fulfil the preferences form by students. Most of them (about 80%) were satisfied in this aspect.
- *Understandability* represented the ability of the students to process the preference information. In this case, the percentage of indifferent-neutral opinions and agree was quite similar (50% and 40%, respectively).
- *Accuracy* that referred if students consider that the preference options display the required features in a precise way. Also, the percentage of indifferent-neutral opinions and agree was similar.

Concerning the lecturer point of view, a questionnaire was submitted to 6 lecturers in different disciplines. The main body of the questionnaire was divided in two sections: the first one, asking lecturers about their point of view about

the current version of PoliformaT in several issues related to the process of introducing, authoring, organizing and managing Resources in the PoliformaT course. In general, comments of the lecturers were sceptic about the efficacy of the Authoring Support service and they realized that a big effort developing accessible resources and researching about the generation of accessible contents was required.

## 5.1 Discussion

Once the results were collected, mainly through questionnaires, and a preliminary analysis was performed, based on the exposed quality criteria, some issues could be commented. First of all, although the number of interviewed students was low and the gathered results could not be conclusive, their point of view was globally positive and research questions about User Experience such as “Are the questions about user needs or preferences clear?” or “Are these needs appropriately assessed?” could be easily connected with the *Understandability* and *Accuracy* quality criteria which were checked in the Student view. In this case, the average value of *Understandability* was 3.6 and the *Accuracy* criteria averaged 3.5 (scale from 1 to 5). The evaluation of research questions related to the Framework adoption such as “What are the benefits and drawbacks of the service?” could be checked by means of the *Usefulness* and *Performance* criteria which obtained average values of 3.7 and 3.9, respectively. Therefore, a relatively high benefit can be determined from these values. The research question about the “integration with planned/current UPV systems” was only evaluated in an informal way by contacting with some manager responsible who reported their interest in incorporating this Needs Assessment service within the Info-Accessibility initiative at the UPV (SGAU, 2010). Currently, this Info-Accessibility initiative is only planned for UPV Library and Employment services but mainly focused on physical accessibility.

Another aspect that was informally evaluated was the lack of official initiatives in the Sakai context to make accessible this platform. A preliminary work was presented (Buendia et al, 2011) but more research is required in this topic. As an additional suggestion, evaluation methodologies of this kind of accessible e-learning experiences should be deeply investigated and reviewed.

## 6 CONCLUSIONS

The current work has described the evaluation of an e-learning experience developed in the context of the EU4ALL project. EU4ALL implemented an open and extensible architecture of services to provide accessibility at HE scenarios. The project developed a general infrastructure, composed by several standards-based interoperable components such as Need Assessment or Authoring Support services. UPV participated in this project as a test partner to demonstrate the applicability of the EU4ALL architecture in a medium-size university. This participation also included the adaptation of the e-learning platform used at UPV (PoliformaT) to the EU4ALL requirements.

Once the e-learning platform was adapted, a group of UPV researchers in collaboration with the Disability office (CEDAT) at this university recruited users to check different issues within the EU4ALL context. Members of this UPV research team contacted with lecturers in Computing and Business disciplines who were able to elaborate different versions of the contents used in their courses. The CEDAT office has assisted in the selection of disabled students to test the EU4ALL services developed in the PoliformaT platform.

The results of the evaluation showed, on the one hand, the interest of students about the availability of alternative accessible resources when accessing an e-learning platform. On the other hand, lecturers who were in charge of developing such resources manifested the difficulty and effort to generate accessible versions of them. Further works will be oriented towards the research in tools to help lecturers in the development of accessible contents and the implementation of new e-learning experiences.

## ACKNOWLEDGEMENTS

This work is supported by the EU4ALL Project (IST-FP6-034778) and the TEA project (PAID-UPV/2791).

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