Personalised support for students with disabilities based on psycho-educational guidelines

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Abstract

In this paper we present research works we are addressing in EU4ALL project (IST-2006-034778) to enable Higher Education (HE) institutions to support and attend the accessibility needs of their students. This approach is based on integrating i) learning and ii) management of the learning in terms of workflows to support the different types of existing scenarios with a twofold objective. First, involving non-technical staff in their definition. Second, using standard-based learning management systems (LMS). A combination of design and runtime adaptations through IMS Learning Design (IMS-LD) specification is being used, following the aLFanet approach (IST-2001-33288).

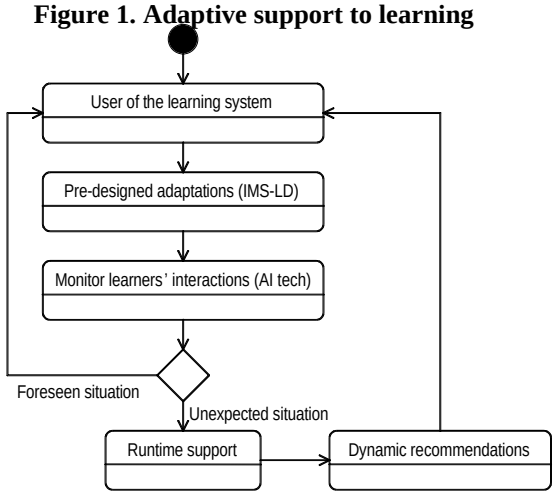
1. Introduction

Adaptation is essential in any eLearning environment since learning is, by nature, an evolving process that strongly depends on users' characteristics and their evolution over time. In particular, eLearning users have a wide variety of abilities, backgrounds, interests, level of experience on the use of resources, etc. Reaching optimal academic performance requires learning environments to adapt to individual user needs. Furthermore, in order to provide inclusive learning services, accessibility requirements have to be met. This implies considering personal needs and preferences regarding the interaction with learning contents and services. To carry out this adaptation a user model representing the user's knowledge state, preferences, learning styles, psychological profile, goals, etc. has to be constructed [1].

Moreover, previous findings in pedagogical and psychological support to students with different learning needs make use of learners' characteristics to better define the student role [2].

Our approach considers instructional design based on IMS Learning Design (IMS-LD), which guarantees pedagogically driven pre-defined adaptive learning paths for different types of users' needs. In turn, to guide user's interactions, users' behaviours are monitored over time applying artificial intelligence techniques to identify troublesome (i.e., lack of knowledge) and promising (i.e., high interest) situations and perform remediation or support actions.

Figure 1. Adaptive support to learning



In EU4ALL we are applying this approach to support HE students with disabilities. Our goal is to model learning scenarios as adaptive workflows. Two illustrative scenarios are described. One case is about supporting students with disabilities through the assessment process, while the other case is about the collaboration amongst students with functional diversity to build a project proposal through a VLE.

2. Design time adaptations

Design and runtime adaptations to support staff, teachers, students, and support services are built considering general psycho-educational strategies which are then translated into the IMS-LD specifications.

The psycho-educational guidelines and best practice material used to design the adaptations are elaborated by the psycho-educational counselling service. At the same time, a taxonomy has been elaborated to support these guidelines. Bloom's taxonomy [6] has taken as a basic reference, as it describes the atomic activities developed by the learner in the educational process.

Our taxonomy includes Bloom´s learning categories as well as additional strategies that are relevant to the learning-teaching process, i.e., cognitive, meta-cognitive, interaction, communication and affective strategies.

These strategies have been previously addressed in the literature: cognitive strategies in [7], meta-cognitive strategies in [8], communication and interaction strategies in [9], and socio-affective strategies in [10].

The application of these strategies allows the learner to undertake activities, such as contact with peers, tutor, and teachers, to ask for support from others, to receive positive feedback of his/her work, to control his/her psychological process in stress situations, etc. These strategies are applied in learning scenarios to optimize academic performance of learners.

Table 1. Taxonomy of learning strategies

COGNITIVE STRATEGIES	**TECHNIQUES**
Rehearsal	Using mnemonic activities
Organization	Diagramming the information
Codification	Identifying concepts
Elaboration	Creating analogies, making hypothesis
Synthesis	Replacing words, synthesizing paragraphs
Transfer	Using equivalent sentences
META-COGNITIVE STRATEGIES	**TECHNIQUES**
Focussing attention	Detecting only a specific type of stimulus (visual, acoustic, tactile), relating a piece of information to the learner´s needs
Planning	Scheduling (daily ritual, weekly pattern)
Monitoring and Regulating	Employing test-taking tactics.
Evaluation	Answering questions
INTERACTION STRATEGIES	**TECHNIQUES**
Cooperation	Asking for collaboration from peer learners
Clarification	Confirming the information
COMMUNICATION STRATEGIES	**TECHNIQUES**
Face / Gestures	Practising reading body language to can better understand other's reaction
Para-linguistics	Controlling voice speed, volume, fluency, tone, time
Conversational	Using appropriate language according to the environment and his objectives
AFFECTIVE STRATEGIES	**TECHNIQUES**
Self-esteem improvement	Reflecting inner critic
Change of attribution	Improving adjustment
Self-efficacy improvement	Setting realistic, clear and accessible goals
Self-control improvement	Delaying immediate rewards

These learning strategies are used to design reusable units of learning where adaptive learning flows are implemented. IMS-LD provides the necessary support to design strategies that address these particular issues, aiming to support learners who encounter barriers.

To define the learning design, a bottom-up approach has to be followed. First, the learning activities have to be defined, which are clustered into activity structures. Lessons are developed by creating activity clusters including the previously defined for each module. Activities take place in learning environments. The creation process could be described as follows. First, the learning objects have to be defined. For instance, the text of the learning materials is enriched with diagrams as an enhancement for people with hearing disabilities. Then, these learning objects are allocated to an environment, and then the environment allocated to a learning activity.

3. Learning management scenario: Support through the assessment process

The following case aims to describe the assessment accommodation service. This service [3], has been traditionally provided ad-hoc at Higher Education institutions, such as UNED. First, we describe the overall assessment adaptation process in our university, and then we detail how a student with

specific needs would be supported through an adapted workflow.

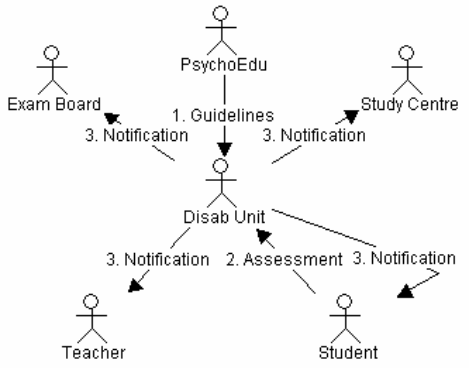
3.1 Assessment support service

The main roles involved in the assessment adaptation service are: a) The student; b) the disability support unit, c) the psycho-educational counselling staff; d) the teacher of the subject for which the exam should be adapted; e) the examination board; and f) the study centre where the exam will take place. The process could be described as follows:

1. During the enrolment process the student is informed about the accommodations available in assessment activities.
2. The student then makes a request by filling-in an application form provided by the disability support service in the institution intranet.
3. This request is received and assessed by the disability support unit, according to the accommodations requested, the student personal information, the available guidelines, and the subject characteristics.
4. The disability unit notifies on the accommodations finally approved to all the involved parties, i.e., the student, the teacher, the examination board, and the study centre.
5. The teacher, the examination board and the study centre will ensure that all the accommodations are in place for the assessment.

In order to meet administrative deadlines, an agile administrative process is required. Providing the student with a timely feedback about their request will also help to minimize the student's degree of anxiety. This will avoid the situation of students having to apply again or to contact with other university roles. Moreover, it will ensure that the assessment environment is ready by the time of the assessment.

Figure 2. Collaboration diagram for assessment support



3.2 Support to a student with attention deficit

Paula is a student who has an attention deficit disorder. As a consequence, she presents some learning difficulties such as: i) bad organization of the work, ii) difficulties to finish the daily tasks, iii) poor handling of the time, iv) problems in reading comprehension, v) problems to extract relevant information, and vi) difficulties in finishing the examination in the established time.

Because of these problems, Paula requests some exam adaptations for the courses where she is registered in, in order to minimize the negative psychological aspects that could arise during the assessment process, such as anxiety or lack of attention.

Once the student's request is approved, and all the parties are notified, the teacher consults the guidelines for anxiety reduction and attention improvement. By following the recommendations given in the guidelines, the teacher decides on the most suitable exam type for the student´s needs. For instance, a questionnaire is more suitable in order to minimize concentration loss and physical effort. Both of them are common problems when the student has to face a long exam. Furthermore, facilitators may also be allowed or provided during the assessment: e.g. availability of calculators, computer support for spell-checking, scratch paper during exams, etc. Other accommodations are granted, such as doing the exam in a separate room to minimize distractions.

The disability unit notifies the student and the rest of the parties about the accommodations and the evaluation criteria.

Furthermore, Paula may receive advice from the psycho-educational counselling service about which activities could help her in reducing anxiety in exams, and therefore optimizing her academic performance. These techniques aim to support her in comprehending exam's questions, organising her thoughts, identifying keywords and concepts when answering to essay questions.

4. Learning scenario: Collaborative work through a VLE

The second scenario consists of a group of students collaborating through dotLRN open source standard based LMS [4] to design a development project by using the collaborative extension of the Logical Framework methodology [5]. Adaptations support two students with different needs. One student is pre-lingually deafened and the other has an active learning role, but no previous experience in the Logical Framework methodology.

Next, the learning flow of this learning scenario is described. At the beginning of the course, the system provides the teacher with a list of the students enrolled in the subject. John is reported to be pre-lingually deaf. The teacher checks the system and accesses the psycho-educational guidelines in order to provide the adequate adaptations related to time, content format, recommendation for test taking, etc.

According to the psycho-educational guidelines, the teacher provides the pre-lingually deaf in advance with an executive summary of the project and the basics of the section that the student is assigned to elaborate. This information will facilitate the student to have a context´s perspective where he should develop his tasks. These documents are complemented by a glossary of terms and a dictionary of synonyms. The aim is that, by the time that the rest of the students start to carry out the practical work, the deaf student is familiarised with the work topic and terms, and understands what is the section (s)he has to elaborate.

The rest of the group students receive the request to be part of the team, the work topic, as well the section they are assigned with. They all start to work individually in their own sections. Essentially, they write their sections.

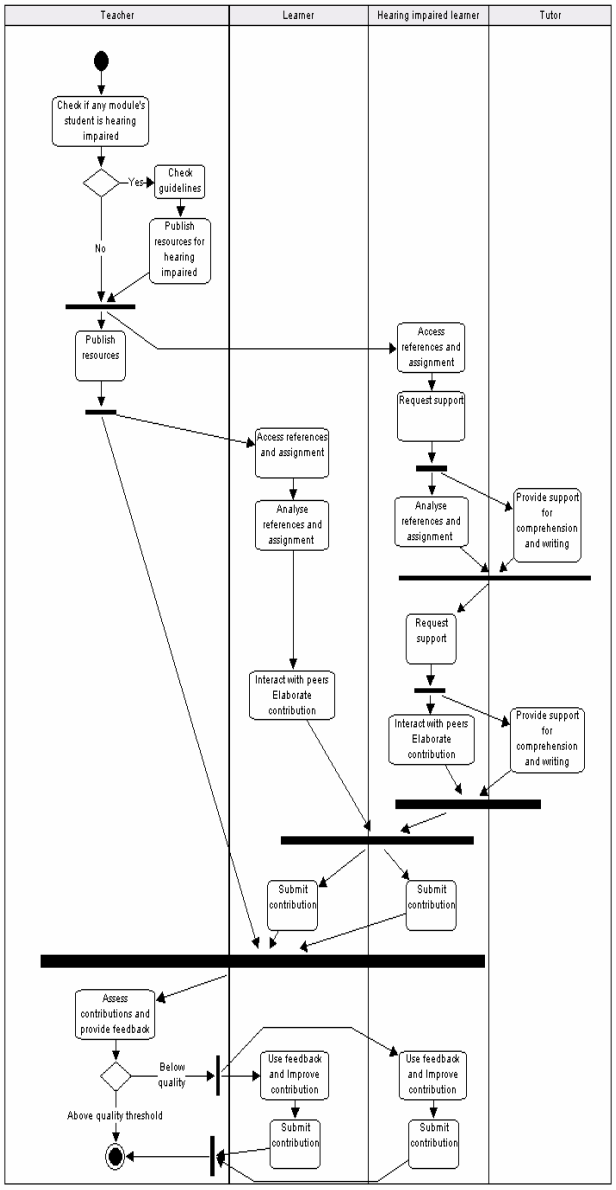
While writing, the deaf student is supported by several means: glossary, synonym dictionary, etc. The glossary of terms could be enhanced with sign language interpretation of the terms. There is also a service for support in comprehension and writing of texts where the student is supported by a tutor. They have an asynchronous communication through a forum. The student sends this information (e.g. one section that the student is assigned to write) to the tutor, who provides with some feedback and suggestions if necessary. The tutor detects problematic words and expressions, and reports them to the teacher, in order to improve the available glossary.

At a certain date, students have to share what they have produced in their sections, and they must integrate them to generate the final document. This requires that the students are able to communicate. To ensure an accessible communication among the peers, communication has to be either face-to-face (with a sign language interpreter) or through an instant messenger.

The students compose the joint document and submit it to the teacher, who carries out the evaluation, based on group and individual contributions.

There is a two-step process on evaluation. Students can ask for further clarifications and comment on the teachers´ remarks. At the end, the teacher assigns a mark to each student and closes the activity.

Figure 3. UML activity diagram



The IMS-LD Unit of Learning will include specific support for the hearing impaired student:

1. Timeline adaptation, as some environment resources will be available in advance (i.e., executive summary of the publicity project, and the basics of the assigned section).
2. Additional resources will be 'visible' (i.e., dictionary of synonyms, asynchronous communication with tutor).
3. Accessibility to learning objects through personalisation of contents. The glossary of terms will include redundant information (i.e., images and sign language equivalents).

5. Runtime adaptations

As introduced in section 2, both scenarios are translated into environments, where different activities are carried out by the different user roles, as defined by IMS-LD. Properties may also be defined and used in the workflow conditions to build the adapted path for each particular user. However, since not everything can be defined in advance, there is a need for a dynamic support at runtime. At runtime, users are requested to follow the workflows of activities defined in IMS-LD. However, the student might encounter an impasse that has not been covered in the design.

For the learning management scenario (i.e. support for the assessment process) considering the previous experiences of other learners following the process for the assessment adaptation, the system may recommend the most appropriate alternative at a certain point. For instance, although the design (defined in the IMS-LD guidelines) may allow users to ask about the status by phone or e-mail, the system may explicitly recommend Paula to write an e-mail and even provide her with a text proposal for the mail contents, which she should revise and complete, if needed. In this way, the effort an anxiety of having to make the request from scratch or of having to explain on the fly the request by phone is reduced.

For the learning scenario, "lack of knowledge" and "high interest" situations can be detected. In this case, dynamic support can be provided. In particular, the system can look for similar students (based on their user model features) that overcame difficulties when performing the same activity and recommend the current student to do the action that some similar student did. For instance, she may have read a forum message where detailed explanation is given.

6. Work in progress

In EU4ALL project we are extending the aLFanet approach to cover inclusive scenarios in HE. In this sense, we are currently clarifying i) how to manage the user features in IMS-LD specification, considering that accessibility was not addressed in the origin of the specification (i.e., implications and interoperability with IMS AccLIP and ISO PNP initiatives [11]), ii) the level of compliance of IMS-LD units of learning with available LMS players, and iii) how to involve professionals with a non-technical background (like those specialized in the psycho-educative guidance) in the design of the scenarios.

7. Acknowledgments

This work was funded by the EU under grants IST-2006-034778 (EU4ALL project) and IST-2001-33288 (aLFanet project). The opinions herein are those of the authors and not necessarily those of the funding agencies.

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