A *deafinite* step towards eInclusion: A case study at the *University of Sannio*

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Abstract

Starting from the learning needs analysis of deaf students, often struggling with language disabilities determining some difficulties in information acquisition and processing, this paper describes an innovative distance learning environment developed and organized to support deaf learners acquire more skills related to some scientific and digital subjects such as Information Technology, Mathematics, as well as English.

In particular this paper derives from the experience of the University of Sannio that created an experimental Degree Course in Information Technology for deaf students a few years ago. Lectures were then supported by innovative ICT solutions based on distance learning technologies and methodologies specifically oriented to meet special needs of deaf learners.

Key words: *Inclusion, university, distance learning, case study*

State of the art

Throughout 2008 the European Commission invited authorities and industries to promote the electrical competences and the digital learning that are fundamental especially for those citizens who run the risk of becoming the victims of a digital divide, and, consequently, of being excluded from the modern e-society. As a matter of a fact, in Europe less than one disabled person out of five is employed.

For example in Italy, the observatory about the role of the ICT in the social inclusion of disabled people has noted that the disabled employed in the SMEs are divided among 90% physical disabled, 6% deaf people and 4% blind citizens. A further point made by the observatory highlights that these employers do not use ICT solutions during their working activities.

Nearly 40% of all employed people with disabilities in Poland works part-time. The highest number of people with disabilities is employed in agriculture, hunting and forestry as well as in manufacturing (respectively 30% and 19% of all employed people with disabilities). They are employed also in real estate and business activities (15%), trade and repair (11%), health care and social welfare (6%) and construction (5%).

The reason for the low vocational activities of young disabled, in most European countries, is to be found in various factors, among which are a low-level education and inadequate vocational qualifications. One of the main reasons for the inadequate vocational formation of young people

with disabilities is the lack of an early vocational orientation and an appropriate profiling of vocational preparation. Schools often focus on teaching jobs and skills that are no longer required or marketable or are not appropriate.

Considering this background about the employment of disabled citizens it is fundamental to give disabled people the opportunity to access education services necessary to acquire new marketable skills. To this end it is also fundamental that the disabled can enhance their knowledge of and communicative skills in foreign languages on the labour market, thus overcoming their language disabilities and difficulties.

For these reasons, learning "digital" subjects (Mathematics, Information Technology) as well as foreign languages - especially English - is fundamental to provide disabled citizens and, in particular, the deaf with modern vocational learning opportunities, so as to acquire more "marketable" skills.

Teaching the deaf and the PSELDA project

When teaching hearing-impaired students it is important to try and use methods for including them and for helping them to get the most from lectures and seminars. Although the learning process in a deaf student basically does not differ from a regular learner's, it is however useful to keep in mind some points when teaching to the deaf:

- they heavily depend on visual aids, since they structure and organize their thought through images rather than through words. So the teacher should use "visual" clues for learning (e.g. pictures, posters, videos) and often resort to writing as a way of communication;
- the teacher should never talk to students turning them her/his back while writing on the board. Indeed, it is helpful to address students only if you are in front of them, so as to favour lipreading;
- a deaf student cannot make notes and lipread at the same time;
- students should be given basic information and book lists before the beginning of the course, as they may rely more heavily on handouts and textbooks than lectures;
- the lecture should be carefully and logically structured - allowing for a frequent variation of activities - and include regular opportunities to review the material;
- point out who is speaking in group discussions: deaf and hard-of-hearing students get lost in classroom discussions when several students are talking at the same time. Environmental noises as well can prevent them from understanding.
- if a sign language interpreter is employed, there will be no eye-contact between the teacher and deaf students, as the latter will look at the interpreter and answer either through him/her or by themselves.

Considering all this, it is worth reflecting on how ICT can be used to enhance the potentialities of deaf students by devising specific e-learning environments capable of helping them bridge the communication gap they are often forced to struggle with and that can prevent them from fully participate in the world they live in.

The availability of technology today has affected education too, and it can prove to be particularly relevant to enhance the inclusion of deaf and hard-of-hearing people by improving and/or devising new teaching modes and methods. In particular, the relevance of technology lies in its ability to:

- help improve communication;
- help reduce dependence on others;
- translate spoken words into visual cues.

New technologies can indeed broaden the communication opportunities of deaf and hard-of-hearing people and provide opportunities for distance learning and communication with the world outside the classroom. An example is the PSELDA (E-Learning Experimental Project for Deaf Students) project, a national experimental project created by the *University of Sannio* in 2003 - and

funded by the Ministry of Education - with a specific mission: supporting and enhancing the university education of deaf students through the use of specific pedagogic models and methods tailored to the users' needs. Indeed *the University of Sannio eagerly participates in innovative projects with specific regard to the methodological and ICT-based features of learning activities, tools and contents designed for deaf learners*.

Such a pedagogical paradigm as the one employed by PSELDA basically relies on *visuality*: that is, the use of images, animation and visual data boosting the message conveyed by the written code and further supported by ISL, which allows the learner to choose by herself/himself the linguistic code s/he found more suited, and, therefore, to be an *independent* learner.

The curricula of the subjects scheduled for the 1st year students of IT at the Faculty of Engineering of the *University of Sannio* were made available on an e-learning environment. The contents of each subject were then arranged into a list of activities and each activity was made highly interactive.

In a few words, PSELDA could give deaf students the best conditions for learning, because of the activities' "visibility", and of their visual and interactive features. The e-learning platform could actually create an illustrated, colorful, interactive, timely feedback learning environment for the hearing-impaired students of IT enrolled at the *University of Sannio*.

The teaching methodology used by the PSELDA project

The teaching methodology adopted in this project was agreed on thanks to the suggestions given by experts in teaching the deaf, and in particular thanks to the collaboration of University of Sannio with some specific national associationsa [ASUA 2006] [rif convegno 2005] such as with the A.S.U.A association [rif ASUA] and A.I.E.S. [AIES], [AIES 2006], concerned with the integration of deaf students in the academic context and ANIMU [ANIMU], an Italian association of interpreters of Italian sign language.

Through the PSELDA system, the learning process takes place through a series of related didactical steps that can basically consist in:

- lectures;
- activities.

The topic of a lecture is presented to the user step by step, through descriptions closely related to the images illustrating the functions to be carried out. Lectures need to have a high "visual impact" to be easily understood and memorized. For this reason they strongly exploit various multimedia objects (text, images, videos, animations, etc.)

The interactivity offered by the PSELDA system for multimedia lectures, basically consisting in a sequential navigation, is aimed at illustrating, in an easy and immediate way, the various steps to be followed in order to get the explanation of a specific topic.

Also activities are presented to students in a highly interactive way. They can be mandatory or optional and give the student a score which can be useful for the evaluation phase by the teacher. An activity is made of three main parts:

(1) introduction
(2) answer
(3) help

The introduction presents:

- the theoretical context of the activity;
- the specific activity goal/s and what skill/s it can give the student;
- the activity outline.

The answer is presented by means of several options: multiple choice, drag and drop, or by typing it in appropriate spaces.

The “help” function gives some useful suggestions to solve the activity. Such suggestions can be organized into one or more steps, typically starting from simple theoretical recalls towards more and more practical steps.

The user can autonomously work on the proposed activity and try to give the correct answer. If s/he has any doubts about the correct answer or has any difficulties in solving the activity, s/he can use the help. According to the answer given and to the procedure followed to get to it, the user obtains a specific score: a positive one (which depends on the complexity of the activity) for an immediate correct answer, a minor score for a correct answer given with the “help”, and, finally a score equal to zero for a wrong answer.

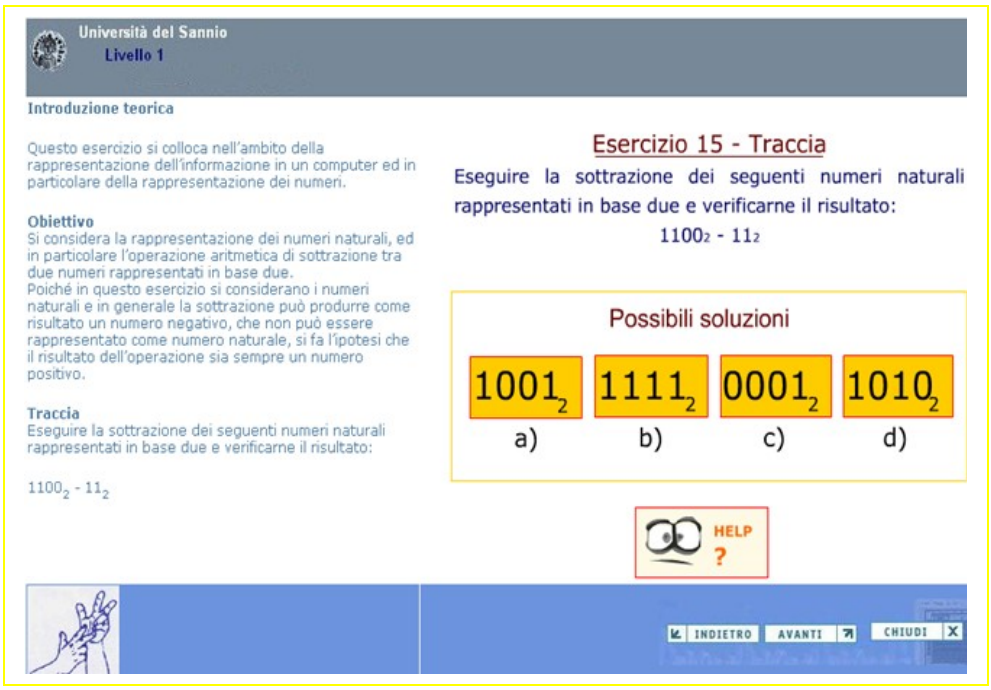

Figure 1. A sample activity structure

The user receives feedback about the correctness of his/her answer, through a high visual impact. In particular the project experimented the use of emoticons (happy and sad expressions), that can be useful to give the student an immediate feedback and spur him/her to study more and obtain good results.

In particular, the PSELDA project allows deaf students of IT to:

1. benefit from a continuous on-line formation (lectures and activities are available at any time and whenever the user needs them);
2. enjoy IT courses specifically thought for them;
3. receive an effective help in their learning process, thanks to the help of multimedia technology;
4. personalize their education through a one-to-one learning;
5. benefit from didactic models of distant learning based on the creation of virtual classes, where teachers and students can still interact throughout the learning process though being far away;
6. monitor the quality and quantity of their learning (tracking the time spent on lectures, activities and obtained results, etc.).

Exploring and devising new teaching methods, through the mediation and support of technology, can help make the exchange of information and communication easier for hearing-impaired students while they are studying, which seems to be one of the basic conditions for them to enjoy a higher education as their hearing peers.

The PSELDA architecture

From a technological point of view, the PSELDA project aims at offering deaf students the possibility of remotely accessing through a common Web browser a software system endowed with a series of innovative and efficient e-learning tools, specifically thought for them.

The following picture presents the distributed system architecture. The students access to the system functionalities through a common Web browser in a remote way. The e-learning functionalities are delivered by a LMS (Learning Management System) and accessed by the users via the Internet by means of a Web server which is responsible of handling client requests and responses. Didactical material (multimedia lectures, exercises, supplementary material made of videos, book chapters, etc.) are stored in a database accessed by the LMS. Such didactical contents can be organized in learning objects following the standard AICC [AICC] or SCORM [SCORM] format for e-learning content in order to grant interoperability and reusability in different LMSs.

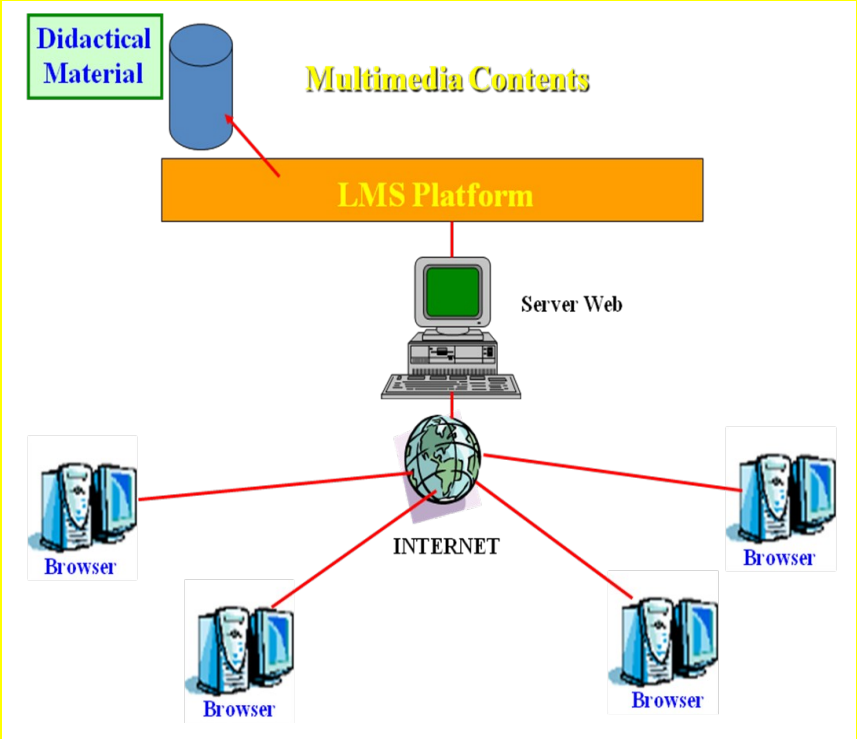

Figure 2. The PSELDA architecture

The proposed eLearning system for deaf students was experimented extending the functionalities of an already existing LMS, called In.Form@, developed by *Didagroup* S.r.l. In order to be flexible and extensible, the In.Form@ architecture is developed in a modular way so to be effectively configured to be exploited in different contexts. It is composed of a set of components with specific functionalities.

It is made of a core component, which delivers core functionalities such as platform configuration, organization chart management, management of user profiles and courses, access to didactical and communication environments, report access. Other useful components are:

- ***Live teaching***: a virtual room for synchronous education, where students can communicate on-line with the teacher and among themselves;
- ***AICC management***: a module to integrate in the platform learning courses built following the AICC standard. It allows to manage the course structure through a manual procedure or by importing descriptor files. It is possible, moreover, to export descriptor files and change the

course structure and information. In.Form@ allows the integration of e-learning content built using the AICC standard till the third level of specification.

- ***QMS*** (Question Management Module): this module allows to define test sets associated to a course and to a particular topic. The function “Esito test” allows to access a report of the user’s answers.
- ***WBT generator***: this component allows to define courses using a Web format compliant to the first level of AICC specification. The component is used by operators responsible of producing the course.

Experimental phase of the PSELDA Project

The experimental phase of the PSELDA project consisted in the development of didactical material for some scientific disciplines such as Information Technology, Physics, Mathematics and English. The production of such material was made in cooperation with university teachers. Moreover, the content graphical presentation and structure was designed following W3C specifications.

Such multimedia contents consist of lectures mainly made of texts and images. Some videos containing the ILS translation were produced and associated to lectures.

From the technological point of view, the “Help” section of the activities was tested using simple text and images and with advanced Flash animations. The latter technology is useful in an autonomous learning process, because it allows to use animated images to provide step by step suggestions about the correct solution procedure.

Thanks to experimental courses for deaf students at Faculty of Engineering at University Sannio, the PSELDA system was practically tested by a group of deaf students, which could appreciate the advantages of e-learning functionalities and materials specifically thought for them as support in their academic studies.

Pursuing eInclusion: eFESTO

The PSELDA project and in particular the experience of the *University of Sannio* with deaf students has led to the definition of a new proposal named eFESTO that has been funded by Lifelong Learning Programme - Leonardo Da Vinci - Transfer of Innovation.

This project’s main objective will be an innovative learning environment for deaf learners for acquiring more skills about managing and using electrical and electronic apparatuses in different application fields, such as in biomedical, telecommunications, industry and sustainable environments. This aspect will give disabled learners the possibility to acquire new competences and so to have different chances to be employed in the modern e-society. The system will also provide specific courses of English language for deaf learners, a very important competence to possess in the labor market.

The consortium includes the *University of Sannio* (Italy), *Dida Network s.r.l* (Italy), *Techin* (Poland), *Time-Foundation* (Bulgaria), *Istituto Canossiano Scuola Audiofonetica* (Italy), *Polish Association of the Deaf* (Poland), *Corvinno Technology Transfer Center Nonprofit* (Hungary), *Hungarian Deaf Sport Association* (Hungary).

The link to the eFESTO project, first started last November, 2nd, is: www.efestoproject.eu

Bibliography

- [AICC] The AICC Specification, on-line: http://www.aicc.org/
- [AIES] “51° Corso Nazionale di Studio, Formazione e Aggiornamento” http://www.aies.it/Moduli/Convegni/SchedaConvegno.aspx?ID_Convegno=2
- [AIES 2006] “52° Corso/Convegno di studio, aggiornamento e formazione” http://www.aies.it/Moduli/Convegni/SchedaConvegno.aspx?ID_Convegno=9
- [ANIMU] The ANIMU Association, on line: www.**animu**.it/
- [ASUA]The ASUA Association, on line: http://www.storiadeisordi.it/articolo.asp?ENTRY_ID=839
- [ASUA 2006] A.S.U.A. National Symposium, “L’integrazione del sordo dalla scuola di base all’Università”, June 2006, Benevento. Available at: http://www.aies.it/Moduli/Convegni/SchedaConvegno.aspx?ID_Convegno=10
- Domagala-Zyśk E., “Teaching the Deaf English as a Foreign Language - Polish Experiences”, Poland: Catholic University of Lublin.
- Janákóvá D. (2002), *On Improving Study Conditions of the Deaf*, The Unie Journal 11 - 12/2002, 17.
- King C.M. & Quigley, S.P. (1985), *Reading and Deafness*, San Diego (CA): College-Hill Press.
- Stokoe W.C. (2004), "The Study and Use of Sign Language", Sign Language Studies - Volume 1, Number 4, Summer 2001, Gallaudet University Press.
- “Teaching Students who are Hard of Hearing” (2001), Henderson State University, The Disability Resource Center, Faust, August 2001.
- Volterra,V. ed. (1981): *I segni come parole: la comunicazione dei sordi*, Torino: Boringhieri.
- Volterra V. (1994), *Linguaggio e sordità. Parole e segni nell’educazione dei sordi*, Firenze: La Nuova Italia Editrice.
- [SCORM] The SCORM Specification, on-line: http://www.adlnet.gov/Pages/Default.aspx