Inclusive education: helping teachers to choose ICT resources and to use them effectively

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Summary

This paper looks at the issue of school inclusion by referring to the concept of Universal Access to Education. It focuses on the strong potential Information and Communication Technologies (ICT) provide to avoid any kind of discrimination among students. The paper also argues that teachers play a fundamental role in capitalising the opportunities offered by new technologies to support the full inclusion of all students in mainstream education systems. In this perspective, to view the Universal Access to Education as a concrete and reachable goal, teachers need to be aware of the ICT potential and they must be able to acquire the suitable knowledge and operational skills to choose and use appropriately this type of resources.

Findings of the *Teachers' View about new Technologies and Inclusion Questionnaire* proposed by ITD-CNR to approximately 300 Italian teachers show that the majority of them (75%) acknowledge that ICT tools and resources may have a great potential to foster and actualize inclusive practices in schools. Notwithstanding this, almost all of them declare that they still need specific information and guidance on how to choose and use the appropriate ICT products to these ends.

Two pilot research projects addressing these needs are presented in this paper. One is designed to provide teachers with full and effective information about the accessibility features of educational software. The other is oriented towards the dissemination of know-how and good practices to support the construction, sharing and reuse of "inclusive" pedagogical plans. Such projects have given birth to two specific online services respectively providing information on the accessibility features of educational multimedia products and bringing to light best practices in school inclusion.

The basic idea is, in fact, that the process of inclusion can be fostered by means of new technological tools, but in turn it requires changes and modifications in educational contents, approaches, structures and strategies.

Keywords: accessibility, inclusion, best practices, educational multimedia, universal access, resoureces, ICT, teachers, schools

Introduction

All students, irrespective of their *sex, race, color, ethnic or social origin, genetic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, disability…*[1] have the right to have equal opportunity in education (Klironomos et al., 2006), and to be considered as being an integral part of the learning community.

Recognition of this right has recently given rise to the concept of "inclusion", which has gradually substituted that of "integration".

Throughout the 1980s, the concept of integration was, in fact, based on the distinction between "normal" students and those with special needs (thus requiring specific educational interventions); the idea of integration suggests that the school stays the same but takes steps to accept *also* those students who present a variety of problems or difficulties (Northway, 1997).

Inclusion is actually a much stronger concept which refers to "*the right to belong to the mainstream*" [2]; leaving behind the idea that only few learners have "special needs", the social model of inclusion rather suggests that all students as individual learners present their own peculiar characteristics and have their own specific educational needs. Such a perspective implies a Copernican revolution which brings *all* students at the very heart of the educational process whilst the school is required to adjust and change in order to enable each of them to participate in the life of the school to the best of their abilities.

"*Inclusive education -* according to UNESCO [3]- *means that the school can provide a good education to all pupils irrespective of their varying abilities. All children will be treated with respect and ensured equal opportunities to learn together. Inclusive education is an on-going process. Teachers must work actively and deliberately to reach its goals*".

Inclusion should, then, be regarded as a long-lasting process which requires time, effort, competence and strong conviction by all those involved in students' education, first and foremost, by teachers.

The key role of teachers in giving birth to and maintaining a truly inclusive classroom is unquestionable (Anderson et al, 2007), but such an important mission also requires that suitable, effective and barrier-free educational means should be employed.

From this perspective, ICT resources are promising; there are grounds for maintaining that they help most students overcome barriers to learning, thus increasing their school achievement, together with their autonomy, willingness and self esteem.

Indeed, educational research provides strong evidence that: *"ICT is both a medium and a powerful tool in supporting inclusive practice. It provides wide-ranging support for communication, assisting many learners to engage with learning, including those who are hard to reach, and helps to break down some of the barriers that lead to under-achievement and educational exclusion"* (Becta, 2007).

In the following, it is argued that documenting the accessibility of educational multimedia products and offering access to best practice can (may) help teachers to make effective use of ICT tools in order to support all students' full inclusion. We begin with an analysis of main teachers' wants/needs to this respect, and then explore two pilot research projects aimed at fulfilling them.

Looking at ICT and inclusive education from the teachers' perspective

How do teachers feel about their ability/readiness to accomplish the mission of building up a really "inclusive" classroom by fully exploiting the possibilities offered by technology?

Becta (2004) reports that: "*Teachers cite lack of time, insufficient knowledge of the pedagogical uses of technology, and a lack of information on existing software as three major barriers to integrating technology. Teachers and support staff need ongoing training in order to make informed decisions regarding the technological needs of all students, including those with special needs*".

These findings are consistent with the results of the Teachers' View about new Technologies and Inclusion Questionnaire proposed by ITD-CNR [4] to approximately 300 Italian teachers in the framework of the national project "Nuove Tecnologie e Disabilità" [5].

The survey results show that the majority of teachers (75%) acknowledge that ICT tools and resources may have a great potential to foster and actualize inclusive practices in schools. They appear to be confident in the new opportunities offered by technology and declare their interest and willingness to personally explore its potential benefits.

Notwithstanding this, almost all of them declare that they still need specific information and guidance on how to choose and use the appropriate ICT products to these ends.

Particularly, the "accessibility" of ICT educational resources is considered of crucial importance: most of the involved teachers (77%) agree that they have very little information on this aspect. For instance, the majority of the interviewed teachers is not aware of the Italian regulation in force [6] about the accessibility of ICT tools; in addition, some of them admit not to be aware of the fact that technological tools (both hardware and software) may present technological barriers to some students, namely those with disabilities (Bocconi et al., 2007).

It is, conversely, well known that "*with the advent of the digital computer, and its broad penetration […], disabled and elderly people face serious problems in accessing computing devices*" (Stephanidis & Savidis, 2001).

Examples of such technological barriers can be easily found if we think to the shrinking size of the newest computers (PDAs, portable laptops etc…) and, for instance, to the related grouping of different functions (e.g. virtual keyboard accessed through the screen, buttons having multiple functions, etc.).

New barriers for people with disabilities are also created by some of the newest software products in that they rely more and more on images, motion, voice, special effects, three-dimensionality, leaving aside the basic principles of Universal Design (Burgstahler, 2006).

Assistive Technologies certainly play an important role in widening access to software products but they should not be regarded as a panacea; unfortunately, in fact, the wide range of existing disabilities is not fully covered by the available assistive devices (e.g. magnifiers do not meet the needs of all kind of partially sighted people, for instance of those with nistagmo, color blindness, etc.); in addition, some software applications are not compatible with all the available assistive devices (e.g. there are many products presenting full compatibility with mouse emulators but not allowing keyboard access).

In the educational field, software products for e-learning are rapidly evolving; while they become more efficient, sophisticated and appealing for the majority of the students, the ability of some categories of learners to effectively use them becomes more critical.

To take an example, Figure 1 shows a screenshot of a well known multimedia product [7] for foreign language learning; it is meant to involve the learner in a wide a range of various activities, which are, unfortunately, not easily accessible for a wide range of students with disabilities.
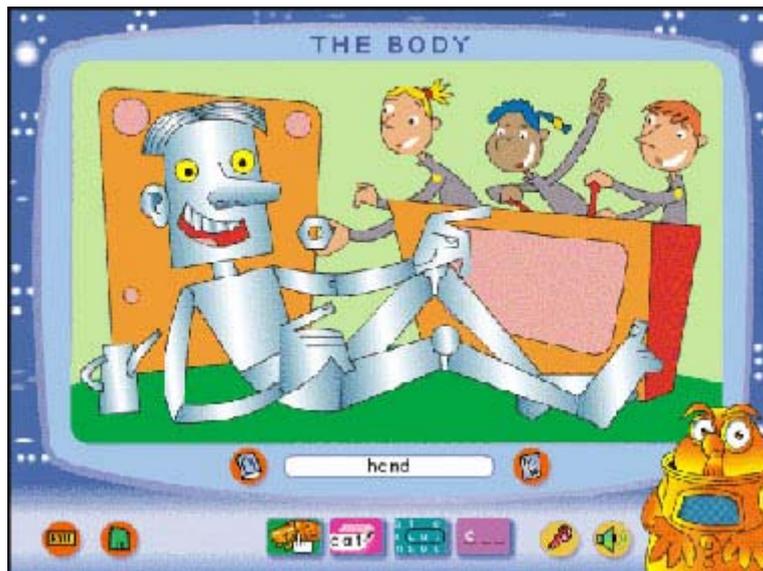
Fig 1. Screenshot of a multimedia educational software

Such students may, in fact, encounter a number of different obstacles:

- those with hearing impairments cannot access explanations, instructions and feedbacks which are available only through the voice of the gold owl; infact, the audio information is, in this case, the only means available to learners for understanding the task and how to perform it. Correspondingly, due to the exclusive use of audio format, they are not able to receive feedbacks on their actions/performances;
- those with low vision may also encounter problems since some facilities such as larger fonts/icons and high contrast between foreground and background are not provided by this application; such features are not built in the program and, in addition, it doesn't maintain (rather, it completely overlaps) the specific selections eventually made by the user at the operating system level (i.e. those regarding display attributes);
- those with motor or visual impairments cannot access the program by using the keyboard or any other alternative input devices different from mouse emulators.

This educational product, in principle, could be useful to all students but actually it is not entirely accessible for a wide number of those with specific disabilities; in addition, its lack of full compatibility with the available Assistive Technologies contributes to leave most of the encountered problems unsolved.

The extensive classroom use of such educational products (which are not fully accessible) prevents students with special needs from using the same materials as their schoolmates; it also limits their educational opportunities and, finally, contributes to their "exclusion".

The choice of suitable educational software and of appropriate assistive technologies appears to be vital to avoid discriminations among students and the teachers' role is very important to these ends. While making this choice, they should, bear in mind that any educational resource should meet the needs of all students, with no exclusion.

Taking for granted that national health service units are usually committed to prescribing and providing useful information about Assistive Technologies (Maushak et al, 2001), teachers efforts should be mainly targeted at selecting the appropriate educational ICT resources.

In order to be able to make an informed and effective choice among the existing products, teachers themselves confirm they still require (Becta, 2004; Bocconi, 2006; Anderson, 2007):

- specific and detailed information regarding the *accessibility features* of each educational software product; this will allow them to eventually discard products not providing full

access to all their students or to understand how best use the resource within a wider learning and teaching context;

- detailed descriptions of significant *pilot experiences* and *best practices* focusing around the use of accessible ICT products as means to support inclusive practices (i.e. in a sort of "reuse and adaptation" perspective, they require information on what has already been done in this field and how).

In the following, two on-line services (i.e. Essediquadro and AEsseDi) are presented aimed at fulfilling the emerging teacher's needs mentioned above.

Essediquadro: documenting the accessibility features of educational software

The need for providing educators with appropriate documentation about the educational software products available on the market has been recognized since almost two decades ago. In 1999, in Italy, the Institute for Educational Technology (ITD) under the auspices of the Ministry of Education University and Research set up Essediquadro [8], an online service which provides comprehensive, up-to-date information on educational ICT software for all school levels and disciplines, from both Italy and abroad.

Essediquadro offers a clear panorama of the available products together with other relevant information (summary of contents, subject area, topic, target users, educational strategy, pre-requisites, etc.); it also provides support and guidance for integrating software and multimedia into the teaching/learning process by providing subject area surveys, classroom reports, and more.

From 2006, an "Accessibility" page has been added to the description of each educational product in order to bring to light and spread information about its accessibility features (Fig. 2); at present, about three hundred, both commercial and open source, products, have already undergone a standard accessibility test.

For each product, the accessibility evaluation process is carried out taking into account two different but complementary aspects:
  a) its compliance with the requirements of the law in force;
  b) its actual usability by students with disabilities.

The actual "Accessibility" page of Essediquadro comprises, then, four main sections:
  1. *Suppliers/author's self-declaration*
  2. *Evaluation of the compliance with legal requirements*
  3. *Evaluation of the level of accessibility with respect to the different types of disability*
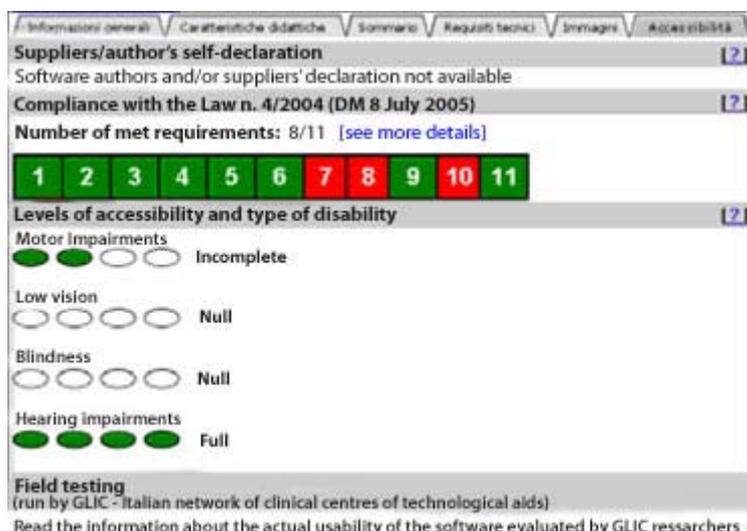 4. *Results of field testing*

Fig 2. The accessibility page in Essediquadro

1. Suppliers/author's self-declaration.
In this specific section, Essediquadro recalls directly what the authors/ publishers officially say about the accessibility of their products. According to the Riga Ministerial Declaration on Inclusion [9], in fact, software authors and/or suppliers are entrusted to clearly state whether or not (and to what extent) each software product responds to the accessibility standards (EICTA, 2006). Unfortunately, nowadays only very few multimedia educational developers provide such documentation.

2. Evaluation of the compliance with legal requirements.
In Italy, the accessibility of ICT tools is regulated by the Law n. 4/2004 (also known as "The Stanca Act") [10] followed by the Ministerial Decree (DM) 8 July 2005 [11]. Eleven requirements for both commercial/non commercial "on the shelf" softwares are indicated in the DM, following the main requirements outlined in Section 508 of the Rehabilitation Act of the US Federal Government [12]. Under this section, Essediquadro presents the data resulting from testing the compliance of the educational software products with the eleven accessibility requirements of the Italian Law. This analysis is carried out by expert evaluators using methodologies and tools (namely a specific evaluation grid [13]) designed and implemented by ITD-CNR.

The results of the evaluation process are expressed in terms of numbers of requirements actually met (out of the eleven indicated in the DM): for instance, a result of 8/11 means that the product respects only 8 requirements of the regulation in force; for a better understanding, details of which specific requirements are/are not met are also provided.

3. Evaluation of the levels of accessibility with respect to the different types of disability.
Assessing and documenting the compliance of each product with the regulation in force is, of course, important but it is not enough to give an effective answer to all Essediquadro potential users. Typically teachers ask for an answer to the question: "Is this product accessible for deaf (or blind, or dyslexic, or even…) students?" To answer this question, the methodology set up in Essediquadro draws on the correspondence between the law requirements and each specific type of disability: if a product is not fully compliant with all of the eleven accessibility requirements, further information is supplied about the specific target for whom that product is not accessible (and, conversely, the eventual full or partial accessibility for other categories of disabled students is underlined).

In this perspective, Essediquadro also highlights if there is a potential conflict between the educational goals of the application and a specific type of disability: this happens when using a product can be considered a nonsense for a specific category of disabled students (i.e. most products aiming at practicing colour recognition skills are *per se* useless for blind students and investigating their accessibility for this category of disabled students can only be a waste of time).

4. Results of field testing
Through the support of the Italian network of clinical centres specialised in the field of technological aids (GLIC [14]), the accessibility data provided in Essediquadro also include information about the actual usability of software products and about their compatibility with the principal assistive devices. In order to perform the evaluations, GLIC researchers constantly monitor the performances of some end-users while using (often in conjunction with assistive devices) specific educational software applications; during the working sessions, they constantly take notes about software compatibility with specific assistive devices, record the obstacles encountered and the possible solutions, if any.

The results of such a detailed user testing (made available through both a summary and the comprehensive checklist [15]) provide objective data about the actual usability of the applications and also about their compatibility with the main assistive devices.

In addition to meeting standards, it is important to provide teachers with as much information as possible about how best to use the resource within a wider learning context. Research findings show that teachers' positive attitudes towards inclusion depend strongly on their education, experience with learners having special educational needs and the availability of support. Below we explore the research experience set in AEsseDI project intended to serve as a platform to share voices of reality.

AEsseDI: providing access to pilot experiences and best practices in the field of e-Inclusion

As said before, the building up of an inclusive classroom is a considerable challenge, mainly because it entails bringing change and innovation to teaching and learning processes: an overall innovative educational approach is required and new aspects of the educational resources need to be taken into account.

Key to facing the challenge of innovation is also an adequate planning of the educational activities. Such planning is a long consolidated element of teaching practice and it continues to play a key role in contemporary education (Koper et al, 2004).

Computer-based pedagogical planners have already proved to be of great help for improving collaboration, exchange of ideas, information, knowledge, know-how and practicalities among teachers (Benigno et al, 2004).

In the following a web-based authoring system called AEsseDI [16] is briefly depicted, which aims at supporting the construction of structured pedagogical plans describing in detail the educational activities to be carried out in view of specific educational objectives. AEsseDI aims at instantiating pedagogical ideas and documenting best practices carried out in the field of school e-inclusion. Its ultimate goal is spreading knowledge about the use of ICT as a means for avoiding exclusion and discrimination.

AEsseDI presents two different environments: the first one is conceived to support the design and the building up of a pedagogical plan; the other one is used for viewing, examining and commenting on existing pedagogical plans. Pedagogical plans (also indicated as teaching/learning units) can be designed by some teachers/authors, and then subsequently adapted and re-used by other teachers, in different educational settings. Accordingly, the system provides the teachers/authors on one hand with the possibility of producing structured pedagogical plans reflecting at the same time on the activities to be carried out and on their educational value; on the other hand, it provides the teachers/readers with concrete examples and practical clues on how to carry out comparable educational activities.

Differently from other such tools, AEsseDI is expressly designed to shed light on the use of ICT as a means for fostering educational inclusive practices; above all, in fact, it aims at giving possible answers to specific problems related to school "inclusion".

Fostering the development of more flexible curricula, the pedagogical plan structure and its contents allow the provision of as many details as possible about:
- the overall idea of inclusion underpinning the whole plan;
- the learner's specific needs to be met;
- the accessibility features of ICT tools at hand;
- the use of ICT tools as a means for inclusion;
- the inclusive practices to be adopted.

When the building of a plan is followed by actual classroom experimentation, authors are encouraged to report also on the outcomes of field experiment, addressing in detail any problems encountered during the learning process by students with disabilities and the eventual solutions.

The further added value lies in the possibility offered by the system to add outcomes and reports of multiple field experiences as well as to view any external comment.

AEsseDI pedagogical plans are organized around a well defined tree-like structure and encompass a high number of descriptors which bring inclusion and accessibility related issues to the fore.

Firstly, an overview of the whole plan is available and then the educational activities to be carried out are detailed.

As shown in Fig. 3 the overview of the lesson plan, contains:
- some basic data (i.e. unit title, author(s)' name, date);
- a brief description of the plan;
- a number of meaningful information for didactic purposes (such as *subject area*, *school level*, *students age* and eventual *type of disability* involved);
- six attributes fields which represent the core of the plan; they specify the basic educational idea, the educational goals and contents underpinning the whole plan (*idea*, *objectives*, *contents*). They also provide information on the type of setting/organization needed to carry out the plan in real educational contexts (*procedures*), give an insight into the main problems regarding the inclusion of students with special needs (*focus on inclusion*), report data from experience, if the plan has been experimented in real classrooms (*experience*).
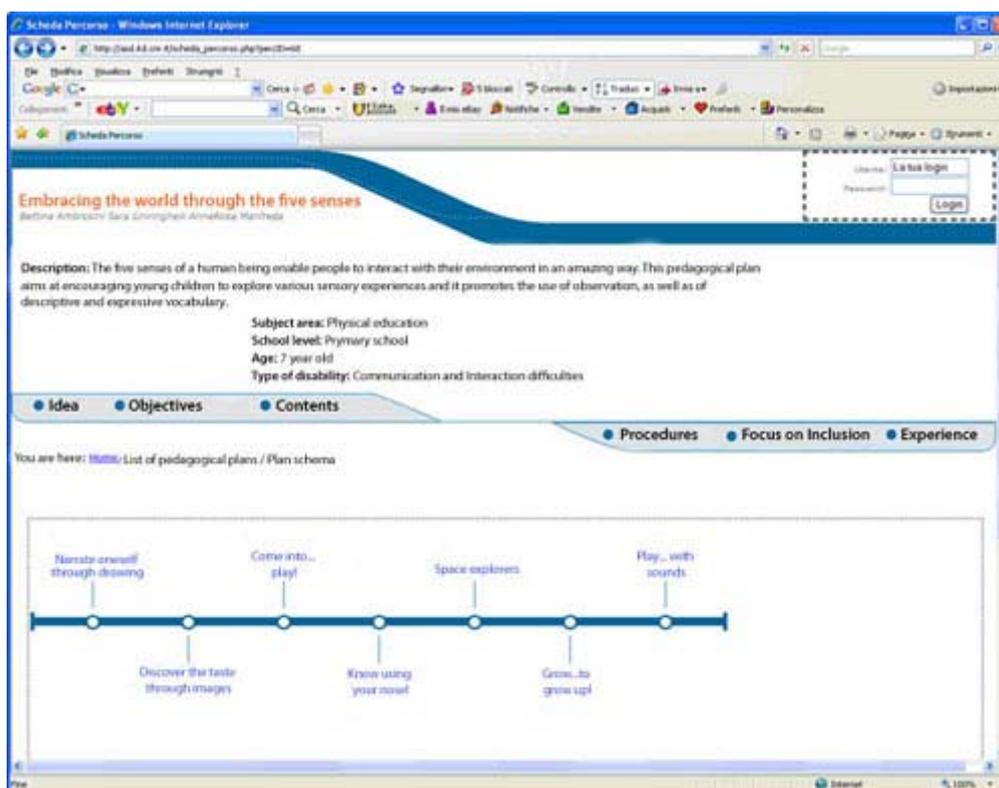
Fig. 3 AEsseDI Learning plans: main page

Following the general overview of the pedagogical plan, a detailed description of each educational activity is provided. As an example, the plan in Fig. 3 comprises seven different activities, graphically represented as seven small circles on the line at the bottom of the screen. The line also shows each activity (distinctly named) in proper sequence.

Although the inclusive plan is primarily conceived to be carried out by all the students in the classroom, without distinction, nevertheless some activities can also be 'personalized' for addressing specific students and their specific needs. Fig. 4 shows an activity line which

comprises both mainstream and personalized activities (even graphically, the activity line shows two different paths, i.e. a bold line for the mainstream activities and an empty line for the personalized activities).

Fig. 4 AEsseDI: example of an educational plan including three personalized activities.

Each activity is further described in details in a separate section, where its relevant aspects are highlighted (Fig. 5).
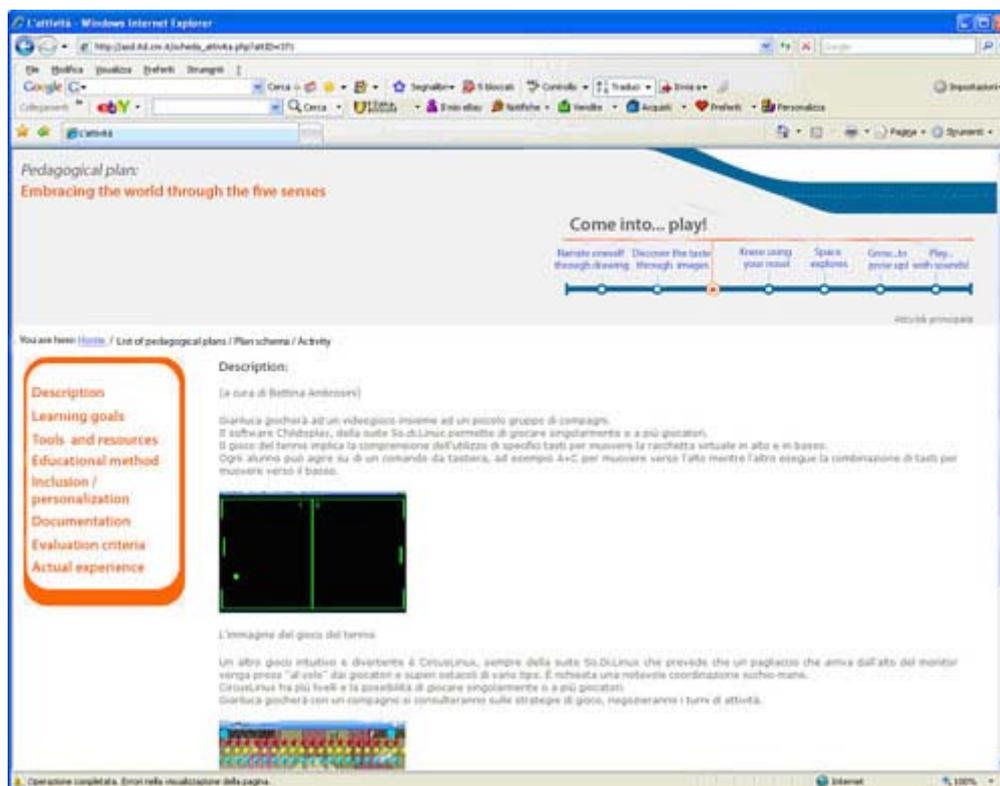

Fig. 5 ASD learning plans: the learning activity page

The *learning goals* of the specific activity are indicated as well as the *tools and resources* needed (or even suggested); information about the *educational method* adopted is also available (it entails an accurate description of the *teaching methodology, work organization, teaching/learning strategy, time required etc...*). In addition, all documents and reports related to the whole educational plan are available to be downloaded (*documentation*).

As far as issues related to 'inclusion', these are specifically addressed by providing information on:
- accessibility features of the software products in use and its compatibility with assistive technologies;

- possible obstacles and problems to be faced;
- eventual software adaptations required;
- personalization of some activities for students with special needs;
- teaching method adopted to foster the inclusion of students with special needs.

This list shows once more how AEssedi has been designed having in mind that the actual development of a new approach to inclusion in the educational context should be well grounded on teachers' specific competence and field experience.

At present it offers a few dozens of different educational plans designed around the idea of inclusion and accessibility; it is still open to new contributions in the perspective of becoming a reference point for all those teachers that ask for information on "best practices" in the field of inclusion in education.

Conclusions

Many children are still excluded from, and within, education for a variety of reasons. In this paper we have addressed the issue of promoting *e*-inclusion through *e*-learning by reporting on two research projects aimed at helping teachers to make effective use of ICT educational products.

Such research projects have given birth to two specific online services: the first one provides detailed information on the accessibility features of educational software products, the second aims at bringing to light best practices in the field of school inclusion.

Since inclusion requires new approaches to teaching and learning (Lacey, 2006) as well as the use of valuable, new, suitable and barrier-free tools it's fundamental to give teachers appropriate advice and support to face this challenge.

The basic idea underpinning the two projects is, in fact, that the process of inclusion can be fostered by means of new technological tools: it requires, in turn, changes and modifications in educational contents, approaches, structures and strategies.

Teachers play a key role at these ends: innovation cannot cross the school's threshold without their deep and active involvement and the educational effectiveness of any technological means mainly depends on the choices they make (Moseley et al, 1999); in order to take a significant step forward, e-tools need to be carefully selected and their use needs to be appropriately planned and conceptually well integrated in mainstream activities.

Notes

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