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NETFORM: an online support system for teachers

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ABSTRACT

The paper presents NETFORM a support system for teachers developed in Italy in the framework of a research project carried out by ITD CNR (Institute of Educational Technology of the National Research Council) in cooperation with the Ministry of Education. The system presents several innovative aspects both from an educational/methodological and from a technological point of view. The basic idea underpinning the whole project is that, in the field of education, experience, know how, efforts, ideas, in a word “best practices”, should not be lost and that net-technology may be of great help in spreading knowledge, promoting reuse, fostering exchanges and communication among teachers. NETFORM environment has been designed around the idea of “educational learning unit”, a sort of “educational itinerary” made up of a number of different steps or “educational activities” aimed at fulfilling the same learning objectives. As a result of the research project we propose here a flexible structure that encapsulate the complexity of any learning unit both in terms of number of activities to be performed and in terms of different types of links among the activities; we also account for the most interesting and innovative technological choices made.

Keywords: Education, Educational technology, Learning unit, Teacher training, Web database.

INTRODUCTION

To date, in order to foster the introduction and use of ICT in education many European countries, such as Italy, have focused on the provision of infrastructure and hardware to schools and other educational settings. Attention has turned, recently, to professional development of teachers in order to provide them with the basic competences; in this view, one of the main issues is now the production of online “content services” and communication spaces where teachers can find information, material and where they have also the possibility to meet each other in order to exchange ideas, experiences and educational material.

Strategic development of ICT policy in schools is also carried out within a number of research projects, aimed at fostering technical and pedagogical innovation and promoting collaboration and interoperability among actors in the field of education. NETFORM, the teaching environment we are going to describe in this paper, is, actually, one of the specific research projects in the field of ICT in education carried out by the Institute of Educational Technology of the Italian National Research Council; it aims at fostering teaching and learning processes by providing the school with new, flexible forms of digital contents. To date, digital contents for education had the form of educational CD-ROMs, but now net-technology provides us with new tools and environments. The newest learning/teaching resources are more complex and have different shapes and forms: together with educational CDs, we find specific online services for teachers, communication environments tailored on specific needs and also polymorphic educational resources including a variety of learning/teaching activities.

In this view, it seems worth spending a little time to understand what exactly NETFORM is and which is the place it holds in the wide panorama of the new tools for education.

WHAT IS NETFORM?

Several different types of answers to this question are allowed, each one underlining one specific aspect of the system:

- NETFORM is an online repository of “educational plans” or, if we prefer, educational “units”; NETFORM is an educational database providing full access to educational material via the Internet (both for viewing and implementing the contents);
- NETFORM is a powerful mean offered to teachers so that they may share with other teachers significant ideas, proved educational methods and even specific tools;
- NETFORM is an educational environment where novice teachers have access to educational material provided by other teachers, who can be considered “experts”, thus learning from experience;
- NETFORM is an example of how the use of technology, if appropriately embedded in an educational program, can enhance educational effectiveness.

Be the one or the other the preferred definition, NETFORM offers to teachers a highly customizable educational environment where they can create their own educational units and where they can access an increasingly wider number of units designed by other teachers.

The project’s main aims

As said before, the general aim of NETFORM was to foster the use of ICT in schools and to help teachers to make a good educational use of ICT tools.

The project is mainly aimed at helping the teacher that has no computer experience at all: he has been teaching for many years with much success, but he realises that sooner or later, computers will enter his classroom.
he is a good teacher, he is willing to let that happen...but how to start? In this view, the main specific objective of our research project was to produce a number of educational tools and resources tailored to the novice teachers' needs: guidelines, examples that could really help them to effectively introduce multimedia tools in their own educational project.

The resources provided in the framework of NETFORM environment take into account the fact that ICT should be not only "included" but "integrated" in the existing curricula and that traditional and new ICT tools should cohabit, should be linked and combined together in order to achieve the best possible educational results.

In addition, since the integration of ICT in the curriculum requires both technical competence and attention to a lot of methodological/educational aspects, the "integration process" poses specific methodological problems to non-expert teachers who may need help and the fact that a teacher has been trained to use ICT tools (= he is technically able to make a personal use) doesn't automatically mean that he is able to effectively adopt these tools in the school practice.

One of the basic ideas underpinning the whole project is that expert teachers can help novice teachers to effectively use ICT in their classroom: teachers having previous experience in the use of ICT in education can act as "trainers" of other teachers (trainees) who, on the contrary, have no specific experience, they can provide them with the needed help in order to make an effective use of technology in real educational settings [7-10]. The best means to support a training process involving teachers from different schools with different expertises passes through the building up virtual communities cooperating online and, in this view, ICT tools can be adopted to give the needed methodological support to teachers who have already mastered enough technical skills; these ICT tools can effectively be used both to foster the spreading of existing educational experiences and to support the communication between trainers and trainees.

Following these leading ideas, NETFORM has been built as a system of "best practices and examples of the integration of multimedia tools in different educational curricula". The resulting system is a database available online; it contains a number of educational units or modules.

NETFORM: the Laboratory and the Theatre

The NETFORM environment is divided into two areas (Fig. 1): the working area (Laboratory) and the viewing area (Theatre); the former is actually the place where teachers, following the given structure, implement each single unit, the second is the place where they can access and view the units created by colleagues (and this entails also viewing, accessing and downloading the available specific tools). NETFORM environment allows a double kind of access: as an author and as a simple user. As a user you have the possibility to navigate all over the system, exploring the entire amount of teaching/learning units while as an author you have the possibility to build and publish new units as well as to modify the existing units (of course each author can only modify his own units).

![Fig.1 Access to Laboratory and Theatre](image)

Laboratory and Theatre have different access points, and are oriented to different types of users: as an author you can access the Laboratory and here you'll find a very easy-to-use environment where you can insert, revise and publish your own unit (at the moment in order to access this part of the system you need a specific registration); as a user you can access the Theatre and view the implemented units in order to make a personal use of the available educational material.

THE MAIN FEATURES OF THE PROJECT

Two are the main aspects of the educational environment provided by the NETFORM project:
1. the general structure of the "teaching/learning units",
2. the computing architecture underlying the system.

From an educational point of view, in fact, the core of the project can be considered the definition of the hierarchical structure of the "units"; while, from a technological point of view, a valuable aspect can be considered the overall computing architecture of the system, which allows both the introduction of new units and the viewing of existing units, via the Internet.

The general structure of the "teaching/learning units"

The existing units are the result of a long-term process regarding both the definition of the main characteristics needed and the implementation.

How the unit's structure was defined

First of all it seems worth underlining that the whole environment has been built on the basis of the "cooperative" work of "virtual" communities of teachers; the entire process leading to the construction of the teaching unit's structure has been strongly based on the teachers' experience and educational competence.

A group of about twenty teachers with solid experience in the educational use of ICT was identified whose main task was to work together in order to define the structure of the "unit" and to build up a few prototype of web-based educational units [4].

These twenty teachers represented the first nucleus of the NETFORM community of practice [6-11] whose main
goal was to decide the structure of the teaching/learning unit. They had the opportunity to cooperate online via an asynchronous computer conferencing system, and, using this mean, they could share ideas, personal knowledge and opinions in a dialogic, social process where each participant's point of view became patrimony of the entire community [8].

This was the very first and the most critical phase of the project in that each teacher had to negotiate his own ideas inside the group both as to the general meaning and the specific features of the units. The work of the community became, then, much more constructive and, based on the contributions and comments of each single teacher, the project of the entire structure of the unit was performed.

Summarizing we can say that the present structure of the "unit" is the result of the virtual cooperation of the expert teachers who worked together exchanging materials, discussing and making proposals, implementing prototypes; at the end of the implementation process the twenty teachers reviewed and evaluated the whole work done and made the changes needed.

**How the unit's structure appears**

Each "unit" has a step by step structure (Fig. 2) that may be more or less complex, but that, in any case, comprises a number of different educational activities aimed at reaching the desired educational objectives.

The screenshot shows the detailed structure of the "teaching/learning unit", as you can see it in the Theatre. The rectangles represent the different activities and the grid shows the suggested sequence, while the general information about the whole teaching plan is available in the main upper rectangle and by clicking the five small tabs at the bottom of it (idea, goals, contents, organization).

These general sections give a basic idea of the activity's features, constraints and overall feasibility; they aim at stimulating interest and curiosity of the user, and, at the same time, lead the teacher/user to understand if the current activity can easily be adopted in his own classroom.

The area named "Idea" contains the description of the main reasons why the author has chosen to implement such an educational unit, it explains the need for it, its importance and value in the educational context. This area is even more detailed: it is subdivided into two sub areas called the "Problem" and the "Proposal", (Fig. 3) the first one devoted to explaining which is the educational need for such a type of intervention and the second devoted to the explanation of which is the author's point of view of how the problem can be solved.

![Fig. 3 Idea: Problem and Proposal](image)

As an example, in one of units called "the Italian language for beginners" the main "Problem" can be considered the following: "How is it possible to help foreign pupils to use the Italian language to communicate with schools mates and to use educational material written in Italian?" and the "Proposal" was "To create a flexible educational plan, tailored on the different needs, according to the different levels of linguistic competence, aiming at fulfilling different educational aims including study, cooperative work communication".

The area related to the Organization is also subdivided into three areas related to the educational Method used, the Tools adopted and the Time (Fig. 4) needed to perform all the mandatory activities of the unit.

The core of the whole unit are, nevertheless, the activities, representing the different phases of the educational project; each activity can be both independent or related to other activities and it can also be considered as "mandatory" if it is considered necessary to fulfill the educational objectives or "optional" if it can be considered a marginal support activity.

![Fig. 4 Organization: Method, Tools and Time](image)

Each activity is presented in the form of a demonstration sheet and is divided into two parts: in the lower part of
the sheet we find the detailed description of the actions needed to perform the activity and while in the upper part of the sheet we see the detailed definition of what is important to know/understand in order to make a functional reuse of the proposed activity (Fig. 5).

As we can see in Fig. 5 the upper part of the sheet contains the information about what is required both to teachers and students, in order to carry on the activity in the right way:

- **Prerequisites**, that is what competences are required to the students in order to afford the proposed activity;
- **Objectives**, that is which are the activity's main goals;
- **Tools** needed be they paper or ICT based or anything else;
- **Preparatory Activities**, that is all the actions need to start the activity;
- **Time** necessary to perform the whole activity from the preparation to the end;
- **Working Method** strictly connected to the educational;
- **Documentation** oriented to spreading knowledge about what has been done and how the activity has been performed.

One of the mentioned fields of the sheet contains information about the tools used: each activity can be based, in fact, on different educational tools, which can be both traditional and ICT-specific, including, if necessary, multimedia educational software, communication tools and software tools not expressly created for education; ICT tools are represented in the sheet with the following different icons:

- Icon for hardware tools
- Icon for web based tools
- Icon for educational software
- Icon for application software

**The computing architecture underlying the system**

Regarding the software architecture of the system (point 2) the entire system is powered by Java Servlet/JSP Technology and based on a MySQL database. The web interface includes a graphical interface (Fig. 6) whose main tasks are data browsing and input, upload and publish of external resources and a login system for users authentication.

In a few steps the teachers can create or modify the tree structure of a unit simply interacting with the graphical interface and the user can immediately retrieve the new unit.

As a first step, the author has to decide whether he wants to "edit" one of the learning/teaching units in order to make changes (and, of course, he has access to modify only his own units) or if his present task is to build a new unit.
As a second step the author has to define the general information sheets that is idea, goals, contents, organization. The third step entails the building of the unit’s structure in terms of activities, their links and priorities. To help authors the system shows a five x five grid representing the order and the links among the activities. Clicking on one of the slots of the grid, each author has the possibility to work on a single activity introducing the title, the characteristic and the overall information about each activity; the system, of course, accept the work on the activities in a random, not sequential way, but at the end it should result clearly which is the structure of the whole unit in terms of logical and time links among the activities.

After the work in the Laboratory has been completed, the unit can be published and then it becomes available in the Theatre where the five x five grid appears slightly different in that the empty slot do not appear (Fig. 7). At first the system eliminates the empty cells in each column and then the empty columns are deleted.

![The activities' grid in the Laboratory and in the Theatre](image)

Some of the material (software as well as articles or working sheet) are available to the community of users: it is possible to upload them directly from a special repository which is part of the system. The database’s fields can be filled both with text or HTML code; HTML is required if the author needs to implement simple editing features, to insert images, to add links to documents in the repository and to external sites (a few examples of the use of HTML code are available, and some specific tags are suggested). When the use of HTML code is required, some specific and very simple rules have been defined in order to maintain an homogeneous layout in the Theatre (ex: it’s forbidden to use the tag FONT).

THE QUALITY CONTROL

The quality control of the resources available in the field of education should be considered a key issue; which is or could be the best way to evaluate the quality of educational resources is, actually, not clear enough; the matter appears quite complex and the debate inside the scientific community is still open. Nevertheless, an open system such as NETFORM, requires a careful process of quality control and evaluation of the contents; no doubt that, in order to be really and effectively reusable, the educational units published need to be assessed [2-5].

Who, then, should be in charge of the units’ assessment and which are the best criteria to evaluate them? The basic idea is that the evaluation process should be performed by teachers, that is by the potential users themselves. To date, the existing NETFORM educational units have been, in fact, controlled by the expert teachers who had previously cooperated to build up the architecture of the whole system. The evaluation criteria have been discussed and approved by the entire working community of twenty teachers, following the same cooperative working method and using the same communicative tools used before; a specific evaluation grid has been created.

The basic criteria underpinning the evaluation grid created/used by the expert teachers during the evaluation process are:

- Accuracy: Are the contents correct and up-to-date?
- Appropriateness: How does the resource support the short-term and long-term lesson planning?
- Clarity: Is the information presented clearly and logically?
- Completeness: Does this resource allow to fully reach the educational objectives?
- Motivation: Can we say that at least part of the activities stimulate the pupil’s creative abilities?
- Organisation: Is the resource logically organized?

CONCLUSIONS

NETFORM is, actually, an open web database of educational units; it provides a specific environment for teachers where they can create their own units following a specific structure. Each unit can be published and then it becomes common patrimony of the NETFORM community.

The most interesting and innovative features of the NETFORM environment can be considered the general architecture of the “teaching/learning units” and the global structure of the database which is now available via the Internet.

The structure of the NETFORM’s teaching units is a very specific one and it is the result of the cooperation between researchers in the field of educational Technology and teachers working in the schools.

The structure of the web database is, in fact, very flexible so that existing units can be easily enlarged or modified and that new units can be easily introduced and published.

NETFORM database is not a “product” but should better be considered as a cooperative educational environment where the participants are involved in active way to solve common problems and to exchange resources, ideas, educational methods and experiences; the contents of
NETFORM's teaching units have been produced by a virtual community of teachers, interacting and cooperating online, acting in a sort of mutual "cognitive apprenticeship".

Summarizing: the NETFORM database can be considered an "open educational platform" strongly based on the virtual work of teachers because:

- The "teaching/learning units" have been produced by teachers for teachers and are therefore based on their personal educational attitude and skills; they are available through the net and can be considered the result of the work of "distant" authors who have cooperated mainly by means of ICT communication tools;
- The contribution of other teachers is possible and welcome. The results and follow up of widespread testing and real classroom experiences will become part of the database, thanks to the potential that the net offers for communication and cooperation.

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