Empowering the Design and the Sharing of Learning Plans by Means of Net Technologies: The IAMEL System

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Abstract. This paper reports on the research work carried out by the authors in the framework of the IAMEL project, supported by the Italian Ministry of Education. The project was mainly aimed at enhancing the teaching/learning of mathematics by providing teachers with specific e-learning platforms endowed with a number of dedicated tools supporting the setting-up and the carrying-out of specific in-field experiments. One of the main results of the project was the development of a methodology to carry out the design of educational interventions; such a methodology was based on a conceptual goal-oriented framework and on different authoring tools among which the IAMEL system, an online tool fully described in the paper that allows both the production and the sharing of pedagogical plans and consents the design and the modeling of educational interventions with different levels of granularity and scope.

Keywords: Technology Enhanced Learning, Pedagogical Planning, Net – Technologies, Learning Innovation, Formal Education.

1 Introduction

Nowadays a new learning/teaching panorama is emerging [1]. A number of important novelties are around and deeply involve the main actors in the educational scene: learners and teachers. The learners of the new Knowledge society [2] are increasingly felt as being at the centre of the educational process and, as a consequence, the ways in which they tackle educational tasks appreciably change and the role of teachers is also being radically transformed [3].

Indeed, the teacher's primary role shifts from that of information giver, to that of facilitator and guide [4], the teacher's function incorporates mediation, modeling, and coaching, and this requires a high degree of adaptivity to new learning/teaching schemes, models and tools (e.g. managing technology may take up a great deal of time and intellectual energy).

Even in this emerging new learning landscape the relevance of a teacher-driven pedagogy cannot be questioned [5], and the pedagogical choices made by the teachers and the overall pedagogical approach they adopt are increasingly felt as having a concrete value to broaden the students' learning opportunities and foster learning [6].

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As a matter of fact, pedagogical planning intended as the process of producing "a blueprint for the enactment of learning activities" [7] or even "a description of the playing out of a learning situation or a unit of learning aimed at the acquisition of a precise body of knowledge through the specification of roles and activities" [8] continues to play a fundamental role in contemporary education.

In the new educational landscape, teachers and all those involved in designing and enacting learning processes (trainers, pedagogical experts, designers, researchers etc…) are increasingly required to take into account a huge variety of different elements, in an effort to ensure that these form part of a coherent, manageable whole that responds effectively to learners' needs and that consents the full attainment of the intended educational objectives.

Current research in the field of pedagogical planning mainly focuses on defining which tools and methods better serve the scope since a wide number of different tools and different approaches are adopted to assist "teachers in the thought processes involved in selecting appropriate methods, tools, student activities and assessments to suit the required learning objectives" [9].

ICT-based environments and tools aimed at supporting and backing the process of pedagogical planning are widely considered extremely useful resources and recently, a number of significant attempts to use ICT to describe and share pedagogical ideas have been carried out [10, 11]. The availability of such ICT-based tools has given strong impulse to the formalisation of pedagogical plans [12] and this fact, on the one hand, increases the possibility of sharing and re-using pedagogical ideas/methods, on the other, makes the process of pedagogical planning conceptually simpler and offers the possibility of better managing complexity [13].

This paper aims at giving a contribution to the research field by presenting an on line environment devoted to pedagogical planning. This environment was designed and implemented in the framework of the research project IAMEL, supported by the Italian Ministry of Education and Research under the PRIN 2007 (Research Projects of National Interest) programme, the main aim of which was that of supporting the teaching/learning of mathematics by enhancing the potential of e-learning platforms at these ends.

In this project pedagogical planning was broadly felt as a key aspect and a specific ICT-based tool was produced, following previous experiences [10] carried out by the authors, who were partners of the consortium.

In the following, an overall description of the IAMEL system is provided and its main features are illustrated by focusing on key innovative aspects.

2 The IAMEL System at a Glance

The IAMEL system was designed and implemented with the main aim of allowing the production and sharing of structured pedagogical plans; it is content and subject-independent although it was conceived and created to address the needs of researchers and teachers working in the field of mathematics.

In the following the structure and the main features of the IAMEL pedagogical plans are presented and subsequently the overall computing architecture of the system is briefly described by focusing on its main innovative characteristics.

2.1 The IAMEL Pedagogical Plans

Figure 1 shows the main screen of an exemplary pedagogical plan, called PLAN X, that gives a global idea of the overall structure and contents of the IAMEL Pedagogical Plans.

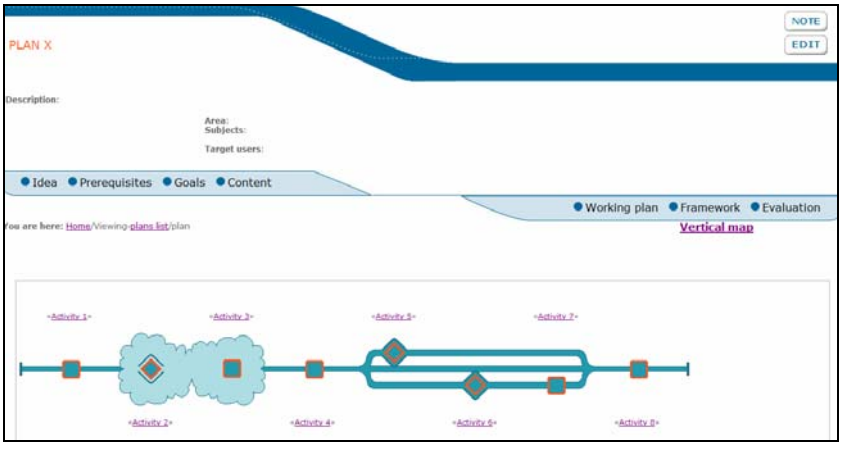

Fig. 1. Main screenshot of an exemplary IAMEL Pedagogical Plan

The main upper part of the screen contains some basic data (description, authors, target population…) aimed at providing key information about the plan; the map at the bottom of the screen shows, instead, the sequence of the different activities to be carried out. Each activity is then further described in detail in a separate section where its relevant functional aspects are highlighted.

Basic Data/Key Information
Key information provided in the upper part of the screen (Fig.1) mainly aim at providing a general overview of the plan by giving a basic idea of its features, constraints and overall feasibility. The underneath ribbon gives further general detail on the plan at hand by means of seven small tabs that can be expanded by clicking on them, thus providing access to a text box containing detailed information about: the underpinning *idea*, the *prerequisites* demanded to the students in order to perform the required activities, the *goals* to be achieved by the learner population, the specific *content* addressed, the *working plan*, the theoretical *framework* that has informed the process of the plan design and, finally, the methods, parameters and specific tools adopted to carry out the *evaluation* of the envisaged activities.

Activities: Flow and Description
The core of the whole plan are, nevertheless, the activities to be carried out; as shown in Fig.1, the map containing the flow of the activities appears in the main screen shot of the plan.

As to the type of the activities, the IAMEL system distinguishes among "mandatory/obligatory activities", namely those that are considered necessary to fulfill the intended educational objectives and "optional activities" or activities that are not to be carried out by all students in a classroom or discretionary activities non essential to the learning/teaching scope.

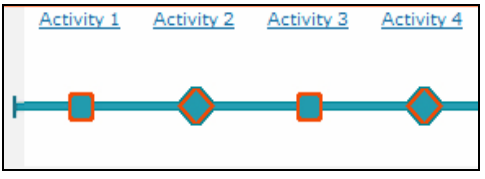

Fig. 2. Map of the activities (flow: obligatory-optional-obligatory-optional)

Figure 2 shows an exemplary simple map of activities. The represented sequence is composed by obligatory activities (squares) and optional activities (rhombuses). The actual flow is linear and sequential: an initial obligatory activity is followed by an optional one, subsequently the third activity is again obligatory while the last one is, once more, optional. IAMEL, nevertheless, allows the building up of very complex and articulated plans where the sequence of the activities can be far more variegated and diversified. For instance, as shown in figure 3, it offers the possibility of setting up "two routes" (Fig.3, left part) or even "three routes" paths (Fig.3, right part), where the user can autonomously choose among different alternatives. As an example, the flow represented in the left part of figure 3 envisages that after performing the mandatory "Activity 1" and before performing the mandatory "Activity 5" the users have the possibility to follow the upper route (where only one optional activity is foreseen) or to follow the lower route where one mandatory activity and an optional one (to be performed in a linear sequence) are foreseen.

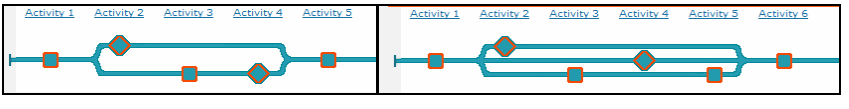

Fig. 3. Map of the activities: "two routes" and "three routes" flow

As a further opportunity the map also encompasses the possibility of defining a set of activities to be caried out in a random, not strictly sequential order.

In order to allow full comprehension and, possibly, reusability and modifications/adaptations, each activity of the plan is further described in details in a separate section, where its relevant aspects are highlighted. A full description of the activity at hand is provided, together with its main learning objectives and the needed prerequisites. The tools and resources needed (or even suggested) to perform the activity are described and, possibly, made available, linked or provided for downloading; detailed information about the educational method adopted is given as well with a specific focus on the evaluation methods, tools and measures to be used. An accurate description of

the teaching methodology, the work organization, the teaching/learning strategy adopted, the overall time required etc...is also provided and, in addition, all relevant documents and reports are available in the "Documentation" section.

3 The IAMEL System: Relevant Technical Features and Key Innovative Aspects

The IAMEL system can be defined as a multi-environment providing different kinds of users with different facilities; it is based on advanced database technologies and exploits the potential of a powered graphical interface; it also allows customized access by the users and was designed and implemented in accordance with the "Design for All" [14] principles.

To date, the pilot experiments conducted seem to confirm that the IAMEL system is endowed with a number of significant features that contribute to make it a widely usable and accessible tool. Among these features it is worth highlighting:

Data-Base Facilities
IAMEL is powered by PHP and based on a MySQL database whose structure is the result of the common work of the researchers involved in the project.

Increased flexibility and augmented search facilities are some of the key added values provided by the fact that the pedagogical plans are in a database compatible format.

Multi-Environment Features
The IAMEL system encompasses two different environments: the "authoring environment" and "viewing environment; it allows direct and immediate "commuting" between the authoring and the viewing environment, thus *de facto* functioning as a multi-environment system; this represents a relevant novelty with respect to other systems where the environments are not directly linked one to the other [15].

Graphical Interface Assistance
The system includes a graphical interface which greatly enhances the system usability. Thanks to this feature the users, in a few steps can modify the map of the activities of a plan (flow of the activities)

Customization Features
The system comprises a number of features allowing a high degree of customization and personalization. This aspect is particularly important to sustain and improve the software accessibility by persons with special needs.

The architecture of the entire system is fully compliant with the required accessibility standard (use of validated XHTML and CSS) and meets the requirements of the Italian law in force (law 4/2004 or Stanca Act[1]).

[1] Italian Law 4/2004 Provisions to support the access to Information Technologies for the disabled `http://www.pubbliaccesso.gov.it/normative/law_20040109_n4.htm`

4 Conclusive Remarks

Pedagogical plans and wider learning scenarios of different levels of granularity and scope can be designed, modelled and retrieved by means of the IAMEL tool: e.g. scenarios modelling the specific articulation of a learning activity, scenarios modelling a set of learning activities, scenarios modelling the orchestration of different learning activities or sets of activities, etc.

The approach adopted to build up the IAMEL system differs from the standard approach adopted for instance by the IMS-LD main stream movement [16]; IAMEL, in fact, defends the idea of providing teachers with means to build high-level models rather than offering a ready-to-use modelling language.

We can see the pedagogical plan approach as a potential answer to the complexity and intricacy of the issues inherent to "educational design". We also hope that it can foster new practices and cultures of describing pedagogical practice, thus also allowing making further steps in the direction of concretely building a shared "knowledge culture" [17].

This research line appears productive and opens perspectives related to the introduction of intention-based modelling and seems crucial, in particular, in TEL research since is strictly linked with the idea that the design of new technological tools is always to be complemented with the design of specifically designed pedagogical plans to specify how those tools are to be integrated in the teaching and learning processes.

The first results of the in-field experimentations of the IAMEL system, carried out in the framework of the above mentioned research project, suggest that pedagogical planning, which is actually a traditional practice for educators, when it is mediated by new technologies and in particular by net-technologies, acquires new potentialities for the propagation of innovation among teachers. The success of tools of such kind depends not only on their ergonomic quality but also on the appropriateness of underlying concepts of users practice and representation. IAMEL has been designed taking into account pre-existing practices but it is also a flexible system that can be adapted to users' specific needs. From one hand, it offers a more systematic approach to the design of pedagogical plans, an activity often suffering of a low degree of formalization, and, on the other hand, it supports the modification and reuse of previously developed plans.

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