Modelling online education

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Abstract: In this paper a model of an online education system is proposed. The proposed model involves three basic elements: a virtual community (composed of learners, tutors, technical support staff, experts and observers); a pool of learning materials, available on the web and sent via ordinary mail; and information and communication technologies used by the community to communicate, co-operate, and access and produce information. These elements and their relationships are described. The relations among the components become clear when developing and conducting online courses.

1. INTRODUCTION

Online education can be considered from different points of view (Harasim 1989; Kaye 1991). From the learner's point of view, it represents a new way of learning. In an online course the learner becomes a member of a virtual community composed of learners, tutors, technical support staff, experts and observers. In the context of this community they carry out individual and co-operative activities, which result in understanding a given topic and acquiring new skills. From the point of view of an instructional designer, online education is a learning system in which the learners interact with one another and with the tutors via computer network. Access and production of information in this system is strongly enhanced by information and communication technologies (ICT). From the point of view of an educational institution, online education is a new way of delivering distance courses in which tutors and learners interact with one another asynchronously via computer network. Finally, from the point of view of a

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researcher, it is a new social learning strategy in which knowledge is not only 'consumed' but also produced by learners, interacting at a distance.

This paper presents a model of online education that embraces all these points of view. It involves three basic elements and their relationships: a virtual community (Community) (Riel 1992), a pool of learning material (Material), a computer network and related services (ICT). See Figure 1.

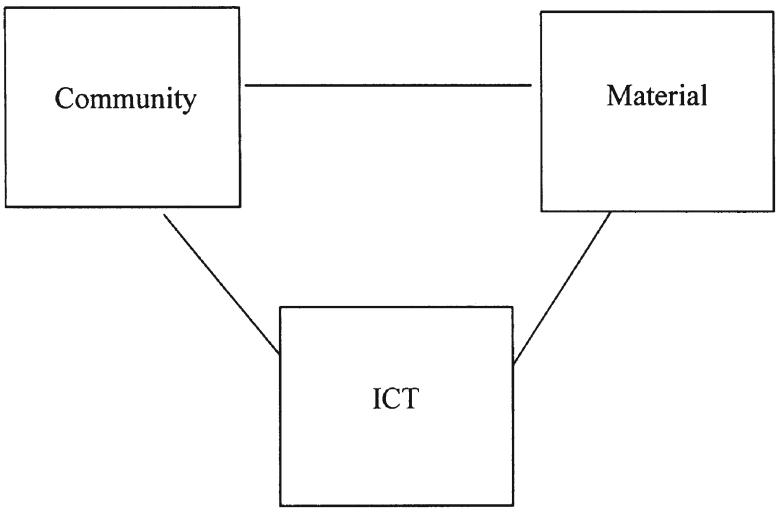

Figure 1. A model of an online course

Instructional designers and tutors create the Community and define the interaction among the community members and the ways to access the learning material. The Community uses ICT to communicate, co-operate and access the Material. Learners may receive and/or access Material (videocassette, books, learning kit, websites etc.) produced ad hoc for the course or access information sources pointed out by the tutors. In this paper each element will be discussed along with its relationships with other elements. These relations become explicit when designing and running online courses. The examples refer to online courses developed at Istituto Tecnologie Didattiche (ITD, Genova, Italy) in recent years.

2. THE COMMUNITY

The Community involves Learners, Tutors, Technical support staff, Experts and Observers.

2.1 Learners

Participants in an online course are either individual learners or groups of learners. In the case of individual learners, the interaction among the participants takes place mainly via the web. For instance, in the Polaris course (Trentin 97) addressed to online education designers, the participants are individual learners. In such courses, virtual groups can be formed to implement co-operative learning strategies. The interaction among members of these groups is based on First Class, a Computer-mediated Conferencing (CMC) system.

In the case of groups of learners, there are two levels of interaction and communication: inside the local group and among the virtual groups. The first takes place locally and is very dynamic, while the second is conducted via computer network and is rather low-key. Two examples of online courses addressed to groups of learners are MEDEA (Briano, Midoro and Trentin 1997) and EuMedea (Midoro et al. 1998), which deal with a methodological approach to environmental education in the classroom. The MEDEA groups, based in different Italian cities, are composed of teachers who belong to the same school and teach different subjects. The EuMedea groups are composed of teachers and student teachers, co-ordinated by a local tutor, spread throughout Europe. The local tutor is responsible for organising the work of the local group and co-operates with the remote tutors on all organisational problems.

There are also mixed cases, however, in which participants can be both individuals and local group members. This is the case in I Fiori Blu, an online course dealing with design methodologies for online education. This course not only addresses groups of practitioners operating in local environmental education labs but also individual researchers.

2.2 Tutors

The online tutor's role is quite different from that of a face-to-face tutor. Their work has two phases: course preparation and course management. In the first phase, online tutors may be responsible for designing the course, implementing the learning material, and setting the CMC system and course interface. In some cases, they are alumni of a previous run of the same course. In all cases, they are in charge of creating the Community, often by recruiting participants, contacting experts, accepting observers; making the Material available; and providing access to the CMC system.

In the second phase, the functions they perform include the following.

- *Socialisation.* They operate to create a friendly climate using several means. They may invite participants to introduce themselves online and

sometimes organise face-to-face social gatherings to break the ice. Most of our online start with a kick-off meeting held either face-to-face or online, in real time, using video-conferencing. Thus participants get the chance to meet personally. In the first edition of EuMedea, a multipoint video-conference was organised, as the participants were unable to afford the travelling costs. Furthermore, tutors can propose or accept online ''chats' with participants in real time or send personal messages to individual learners. A good online tutor should be able to choose the most suitable initiatives and tools for creating motivation, group spirit and enthusiasm among the participants.

- *Stimulus.* Tutors propose activities and materials and help the participants reach the course objectives.
- *Online help.* Tutors help students in carrying out the activities. They intervene either when learners require help or when they think that the learners' activities are not converging towards meaningful results. They can either ask experts for help or invite learners to help their peers. With problems, they encourage and motivate the participants.
- *Response.* They respond to the learners' specific questions, dealing with areas like content, course management or the technology.
- *Feedback.* They give the learners feedback about the way they have carried out the proposed activities.
- *Explanation.* They can either explain unclear topics or suggest material that can help learners understand these topics.
- *Moderation.* They moderate discussions among the participants, discouraging aggressive or inappropriate behaviour and encouraging the conversation when it flags.
- *Planning.* They can modify the course plan, changing modules' starting or ending dates, or adding or deleting entire modules.
- *Evaluation.* They gather data to evaluate the results, both during and at the end of the course. The online tutor's role requires a commitment in the social interactions, interest in participants' learning progress, a capacity to cope with unforeseen situations, ability to negotiate, and savoir faire that puts participants at their ease. Most of these qualities can be acquired with experience, but some of them are part of the individual's personality.

2.3 Technical support staff

Technical support staff (TS) help participants who have problems with technicalities. In our courses TS provide the groups with technical support on the CMC system installation procedure; the CMC system functions and

facilities; and technical problems that cannot be solved at local level with the support of the local tutor.

2.4 The experts

Experts are people with competence in one or more course topics who offer online help to both tutors and learners. Experts are not necessarily involved in the whole course, but rather in given modules. Their role is to explain unclear topics, help participants in solving problems, point out suitable material, correct misconceptions, give feedback on learners' activities, propose new activities, and so on. Tutors can ask experts to provide new stimuli for the participants, for example presenting interesting cases or open questions.

Some experts can be asked to conduct a module or part of one. For instance in the first edition of EuMedea, an expert was called upon to help groups design web pages that described their project. Often the same person can play the dual role of expert and tutor.

2.5 The observers

These are people who are interested in observing the course, but who are not allowed to intervene. Tutors can ask an observer for his/her opinion during the course or for informal evaluation at the end of it. An observer can act as a tutor's helper, but in some cases they may be an external course evaluator. A description of the EuMedea Community is at http://paradiso.itd.ge.cnr.it/english/projects/t3/eumedea/community.html.

3. THE MATERIAL

The learning material of an online course concerns organisation and management, the technology used, and the content domain.

3.1 Materials related to organisation and management

In all courses developed at ITD, participants receive a course guide with aims, contents, structure, schedule and available materials. In EuMedea, a publicly accessible website is available with the course guide, a description of the community, the links to the learning environment and other interesting sites, questionnaires for the participants and anything that may give a picture of the course and its state of progress.

3.2 Materials related to technology used

Almost all the courses developed at ITD use First Class (FC) as the CMC system. In these cases, participants receive the FC user manual and some notes on how to download the client from the web.

3.3 Materials related to content domain

These are materials the learners use either for individual study or for carrying out the suggested activities. For example, in EuMedea, these are printed material, a videocassette and links to relevant websites.

4. THE TECHNOLOGY

In online education, ICT is used to perform four main functions – communication, information sharing, information access, and co-operation.

4.1 Communication

In the first edition of MEDEA, members of the community used email. This has several drawbacks. In electronic mail, all messages end up in a single mailbox: personal messages, those regarding the course, various exchanges from other mailing-lists, etc. In these conditions, contributions that are sent in after the deadline fixed for the various module activities get mixed up with messages dealing with the current discussion topic, creating 'noise' in overall exchange. Such problems can be solved using computer conferencing systems; these are far more reliable in that the user in a sense 'hands over' the message, i.e. has to log on to the conferencing server in order to deliver/pick up the mail, in exactly the same way as they would post or remove a message from a notice board. At ITD, the CMC system First Class is used to deliver online courses.

First Class is much more suitable than email for running online courses since CMC systems offer the following advantages.

- They clearly reflect any ongoing changes in the structure of online courses.
- It is easy to understand which module the activities belong to.
- Overlap on the timing of one module and another does not lead to confusion, as happens using email.
- Tutors keep control of the course more easily, since messages are written directly on the server in conference areas they can manipulate. For

example tutors can intervene at any time to redirect messages the participants have sent to the wrong area.

The latest release of FC allows the creation of a closed community (Intranet) that can be observed by Internet users on a read-only basis; in other words, these observers are unable to intervene. The client that the tutors provide to the participants can also be used by those without Internet access. However in some courses, such as MEDEA and EuMedea, Internet navigation facilities are required to access the learning material.

The user-system interface plays a key role in an online course, since an effective interface allows the participants to understand where they are at any given moment and to focus on the contents, without being distracted by the interaction with the system. Thus choosing a suitable metaphor is very important. For instance, in EuMedea, a school metaphor is used, with several classrooms, a lab, a library and a café.

4.2 Sharing information

The information shared by the community is stored in documents produced or chosen by the course designers. These are available as texts, printed material, video, etc., mailed to participants or available on the web. Some online courses like MEDEA and EuMedea point to learning material available in several websites. In our courses, a virtual library is created, containing both the documents for accomplishing the activities and those produced by the participants. In EuMedea an ad hoc site has been developed containing all the information the community may need, and this is also a course showroom for Internet users.

4.3 Accessing information

In some courses information stored in existing websites is required. In this case, learners have to be able to access Internet using a web browser such as Netscape or Explorer.

4.4 Co-operating

Participants can co-operate with other remote learners or, in the local groups, with local group members. Local groups usually work together face to face. However, in EuMedea, the Exeter group worked both locally and at a distance to overcome space and time problems. In our online courses, participants co-operate through the CMC system. In some cases, however, video-conferencing or other groupware systems can also be used. Co-

operation is often aimed at developing a product (an essay, a project). In EuMedea, the participants developed several websites describing the environmental projects they had designed for their school pupils. In this case an HTML editor and a net browser were required.

5. DESIGNING AND RUNNING ONLINE COURSES

The relationships between Community, Material and ICT become evident in designing and holding online courses. In the following, the relationships between Community-Material, Community-ICT and Material-ICT are discussed. The life cycle of an online course is similar to that of any Open Distance Learning (ODL) course and comprises the following phases.

- Definition of requisites – the educational needs are identified and aims and content are defined.
- Definition of specifications – the subject matter structure is defined.
- Design – the subject matter structure is divided into modules, and microdesign, in which the individual modules are designed.
- Implementation – where the individual modules are implemented and the user-system interface is defined.
- Course management – in which the course is run.
- Validation – in which the quality of the course is assessed.
- Maintenance – in which the course is updated.

The definition of requisites and specification is the same as in all ODL courses. In the other phases, instead, the three fundamental elements of online education and their relationships should be taken into account. The community has to be created, the materials have to be developed and made available, the technology has to be chosen and configured and learning activities have to be identified. In the following, the relationships between the fundamental elements are discussed.

5.1 Community-material relationship

The community uses material to increase the level of shared knowledge. In practice, the course designers define an initial body of material. During the course, tutors point out when and how participants should use this to accomplish the suggested activities. This pool will be enriched with new material produced by the participants as they carry out their activities. For example in EuMedea, the participants produced web pages describing their own project; in I Fiori Blu, the student designers produced text documents describing their own environmental education project; and in Polaris, learners produced text documents summarising some proposed papers.

These new products are discussed by the general community. In this way a dynamic self-generative process is triggered which reinforces the community's shared knowledge and sense of identity. In addition the material produced can be reused in a later edition of the same course.

5.2 Community-ICT relationship

ICT is used by the community to access information, to share knowledge and to create new common understanding through co-operation. More precisely, ICT is used to send and receive written messages from the Community members (Feenberg 1989; Mason 1993) in an environment of computer-mediated communication (CMC); in our courses we use First Class. As far as access to information is concerned, WWW plays a key role in making available a wealth of material for use in the participants' activities.

5.3 Material-ICT relationship

In online education, ICT is used to produce, access and work on Materials. Most of these materials are available in the CMC system or at websites. In some of our courses, however, a package of learning material is sent to the participants via ordinary mail.

6. CONCLUSIONS

Models describe the fundamental elements of systems and their relationships. The model of online education presented in this paper features three basic elements: a Community (comprising learners, tutors, experts and observers), a pool of Material (available on the net or sent by post) and ICT (CMC system and Internet). The Community uses ICT to interact (communication and co-operation) and to access and produce information. Online courses have proved extremely effective in collaborative learning, where the experience and knowledge of each participant represents a learning resource for the whole community. In addition, co-operation within the course community results in the production of new knowledge and materials and in this way the social nature of learning becomes clear.

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BIOGRAPHY

Vittorio Midoro, a researcher fellow at Istituto Tecnologie Didattiche, CNR, has been responsible for research projects dealing with both methodological issues, (definition of methodologies, prototypes and tools for courseware production), and theoretical issues (applications of Pask's conversation theory to instructional processes). The project manager of LABNET, a developing network of environmental education laboratories, his present activity embraces on line education, co-operative learning and use of telematics in environmental education.