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EUMEDEA: A EUROPEAN ON-LINE COURSE TO TRAIN EUROPEAN TEACHERS IN ENVIRONMENTAL EDUCATION

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Abstract
The paper starts by tackling the problem of how to train a "European teacher" in the field of environmental education (EE). It then points out how certain aspects of on-line education can benefit teacher training in EE subjects and how on-line education removes the time and space constraints, typical of face to face courses. In on-line education participants glean new knowledge from interaction with one another, and this factor offers enormous potential in environmental education. The paper presents MEDEA, an on-line teacher training course based on a methodological approach to EE projects, and examines the structure of the course, as well as how it was carried out. On the basis of the MEDEA experience, we have designed a European course and in the paper we show how lessons learned in MEDEA have been used to design EuMedea. Finally, we describe the EuMedea structure as an example of a new way for training future European teachers.

1. On-line education to experiment new ways to train European teachers in Environmental Education (EE)

In Europe, a constant process of harmonisation, integration and unification is in progress in various fields. How will it affect the European school systems? What will the European teacher look like? How will the European teacher be trained?

In the context of the T3 (Telematics for Teacher Training) project [2], carried out in the European Telematics program, we have designed EuMedea, an on-line teacher training course in the field of Environmental Education (EE), bearing in mind the idea to experiment a new way for training European teachers.

Topic of the course is Environmental Education. The sustainable development is in fact one of the common issues that our societies have to face. EE is a necessary tool to build a culture of sustainable development and is a common issue throughout Europe. Thus, EE seems a suitable interdisciplinary field where to experiment new ways of training teachers in Europe. Removing space constrains, on-line education provides suitable tools to implement new ways of training teachers acting in different countries. Furthermore, on-line education fulfils the requirements posed by EE. Some of these are listed in the following.

There is wide consensus that the study of EE in schools ought to be carried out through interdisciplinary projects addressing an environmental issue. Hence teachers will no longer work in

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isolation but must learn how to co-operate [8] within a project group and master the basic design
techniques common to any system. Therefore, training courses must cater for prolonged interaction;
the use of telematics can foster this by removing space and time constraints. Furthermore, in EE
projects there is a constant risk that the isolation in which teachers work will lead to fragmentation
and end up limiting project scope. An EE teacher should feel part of a wider community that, while
operating locally, has a solid general base. On-line education helps to overcome teachers' isolation
by linking them up in an on-going manner, even though they may work in separate geographic
locations. With on-line training courses, teachers involved in projects become aware of the
possibilities offered by interaction and collaboration not just with colleagues in their own school,
but also with those working elsewhere.

The isolation faced by teachers also hinders their access to information sources and to sites where
knowledge is generated. Participants in on-line training become aware of the possibility of accessing
authoritative sources (experts, professionals etc.) and information. Even when the course is over, the
teacher can keep a channel open with the tutor and other participants, thus reinforcing that sense of
belonging which is often lacking in conventional training courses.
The rigid scheduling of conventional school activities hinders group members seeking to work
together in a flexible manner. In this respect, on-line training courses present participants with the
means to tackle time restraints through the use of deferred written communication.

Computer-mediated communication is largely text-based and asynchronous (deferred time). This
purely technological factor has an enormous impact on the way communication is conducted. While
no in-depth studies have been carried out into this aspect, there is little doubt that, when working in
a group, the need to communicate in writing [6] in deferred time involves a much greater degree of
synthesis and clarification than in face-to-face oral communication.

An important aspect of environmental education is to reflect on what one is doing, bearing in mind
the implications this action may have on the process as a whole. Interaction that takes place in an
on-line course is constantly available in written form, presenting a potentially powerful tool for
analysis, review and synthesis; this fact alone would justify using telematics in teacher training.

Being able to address both educational and environmental problems, while taking the points of view
of others into account, is a vital factor for in-service training in the EE field. In conventional
distance learning this aspect has often been neglected, with little use being made of the know-how
and experience each participant brings to the course. In network communication, on the other hand,
this resource is fully tapped. In this light, on-line methods are most suitably applied in adult
education, where sharing personal experience related to the subject being studied could play a key
role in the collective growth of the group.

These are some of the aspects that make on-line education attractive to teachers who are developing
EE projects. In this paper, we shall present a warts-and-all examination of a pioneering experiment
in on-line education, covering the technological and methodological context in which it was carried
out, the basic idea we set out to explore, some results and how we designed a course at a European
level based on the lesson learned in the previous experience.
2. What is new with on-line education

The driving force behind the development of on-line education is going to be the redefinition of learning as a social activity, albeit performed at a distance with the inevitable mediation of technology [4].

In on-line education participants interact in a fully-fledged learning community, which encourages individuals to overcome their isolation and enhances their contribution to the group [9]. Although on-line education is a recent development, it has already proved effective, especially in creating the continuity, which is often missing between individual study on the one hand and inter-student and tutor-student interaction on the other.

Through frequent inter-student and student-tutors exchange, tutors have the opportunity to monitor both the overall progress of the course and knowledge construction by each individual participant, more or less in real time. This allows a sort of running evaluation of the students and the course itself, permitting tutors to modify, reinforce and model educational procedures. In this way, tutors can meet the learning and cognitive requirements of each participant, requirements that can be gleaned on a daily basis from network discussion.

One particularly sensitive aspect of on-line education is evaluation. On-line courses are strongly focused on participant interaction via the written word [3]. This means that all network activities produce output, which may be utilised for evaluation of individual student learning or of the course as a whole. Evaluation usually comprises both quantitative and qualitative methods: on the one hand, assessment concerns the students' level of interactivity (frequency of exchanges), and on the other the quality of their general output and their end-of-module and end-of-stage papers; in rare cases, tests may also be set. A more informal evaluation takes place at the end of an on-line course in occasion of a final meeting in which both students and tutor have the chance to compare notes and talk matters over, each drawing their own conclusions about the progress made in the course.

Finally, as far as the grouping of participants is concerned, there are two possible ways of forming groups, which for simplicity's sake we shall call "network grouping" and "group of groups". In the former case, participants work separately at their place of residence and all exchanges take place via the network. In the latter case, local groups of 3-5 people are formed (learning group) and are given a supervisor and a computer conferencing link with the other participants (other groups, tutors and experts).

It is clear that the criteria for performing group activities and evaluating both individual students and the course itself vary according to which structure is adopted.

In the network group, communication and collaboration take place on one level only, i.e. the network context. Conversely, the group of groups works on two levels, the local context and the network context. In this case only the outcome of group work is available on line and local exchange remains invisible outside the local group, while the entire network group's communication is accessible to all participants. We shall now see how the notions examined thus far have found practical application in MEDEA (Metodologia Didattica per l'Educazione Ambientale) [1], an on-line education course for Environmental Education teachers, and how starting from MEDEA we have designed EuMedea, a European course for European teacher students and teachers. EuMedea was designed in the second half of 1997 and is now being run by an international team of tutors, including two of the Medea tutors and subject matter experts well known at European levels.
3. MEDEA: An on-line Training Course in Environmental Education

The idea behind MEDEA was to respond to the needs, constraints and structures of EE by adopting on-line education approaches. The course originated within the framework of LABNET, an R&D project carried out by the Italian Research Council's Institute for Educational Technology (ITD) under the INFEA Programme. This was one of the areas of study included by the Ministry for the Environment in its 1989-91 plan for the protection of the environment.

In MEDEA, computer network resources were utilised to support learning activities that involved groups of teachers living in various Italian cities.

The course was based on a methodological approach proposed by ITD for the development and management of EE projects. The chief objective was to give teachers the skills for designing and carrying out EE projects using this methodology. The approach comprises a number of phases [7] and examines the planning and management of EE projects by groups of teachers from various disciplines. Rather than dealing with individual teachers, MEDEA addressed groups of teachers, the aim being to encourage local face-to-face interaction as much as possible. These groups met up at local EE centres or in their schools in order to use the necessary network links. Ten groups of teachers located in various Italian cities were enrolled in the course.

Three tutors led MEDEA, who are experts in the specific subject matter involved. 5 observers who had an interest in the project also followed the course, although they did not participate in the work group.

The course was organised into three major phases; each composed of a series of modules that ranged in length from 2 to 4 weeks. Considerable emphasis was given to practical work and inter-communication in each module: phases of individual and group work alternated with periods of interaction with other groups and tutors/experts (methods and contents). At the outset of the course, the students were sent a kit of materials that included articles, videotapes, publications, etc.

Each module was based on individual study of the material, discussion about the content, activities proposed by the tutor in each local group, communication of results obtained by the local groups to other groups, and inter-group discussion. Upon completion of MEDEA, the groups were to produce a final product, i.e. the design of an EE project. A final face-to-face meeting was held at the end of the course to discuss the whole experience.

4. A short report on the conduct of MEDEA

This section shortly describes how the course was conducted so that the reader can get a better idea of some of the key factors in this type of learning experience. One such issue is how the process of collective building of new knowledge [5] actually takes place. Other factors include the technological and organisation problems that invariably occurr, how group composition can affect the quality of the activities undertaken, and the potential need for on-going rescheduling of some activities.

Module 0

The purpose of this module was to familiarise participants with the communication technology used and to introduce the groups involved in MEDEA to one another.

Communication in this module largely concerned confirmation that the course material had been received, introduction of the groups, introduction of the observers, and some of the hitches the groups had encountered with their computer network links.
Module 1

Discussion in this module centred on how to go about choosing the environmental issue to be examined in the proposed EE project and also covered the selection of the issue itself. One group recognised the need to involve the students in the choice of the environmental issue and as a result drew up a questionnaire to find out what the most urgent problem was. This led to a discussion about student participation in all phases of educational planning. This module saw the overturning of the original decision to adopt a single environmental issue for all the groups, who instead opted for selecting the problem on an individual basis. It later became clear that this move undermined group interaction.

Module 2

The purpose of this module was twofold: to examine how to define the aims of an EE project, and to define the goals of an EE project, in terms of modification of knowledge, behaviour and values. On the one hand, these aspects are clearly related to the chosen environmental problem, but on the other they concern more general issues that are independent of it. As it turned out, the discussion focused on a number of key questions: how goals are defined and who should be involved in this decision-making process; what kind of goals an EE project should strive to attain; what general aims are common to all EE projects and which are specific to the individual project; how the attainment of goals can be evaluated; how the student's initial condition can be ascertained with respect to the stated goals; whether these goals are likely to require readjustment during the project.

Module 3

The purpose of this module was to examine ways to select a particular environment for study within the EE project. The key idea was that understanding of an environmental issue should arise from interaction with an environment that the students have a close link with, and that they should thus be keenly aware of the problems involved. Discussion highlighted several fundamental elements in the choice of environment, reflecting the differences in group composition. Groups made up of teachers from the same class were generally able to select an issue fairly effortlessly. One group came up with a series of preliminary steps: assessing student awareness, interviewing local residents, reviewing local press coverage, and surveying the students about their preferences. Another group made up of teachers from different schools did not single out a particular environment but rather outlined the requirements it should involve. Discussion also looked at the question as to whether it is better to begin with an environmental issue and then choose the environment to be studied on that basis or vice versa.

Module 4

The aim here was to represent the specific environment chosen for study. In this phase each group, assisted where necessary by outside experts, was expected to produce a model of that environment, identifying the basic elements that comprised it and the relations between them. This was a particularly challenging module, given that the teachers were unaccustomed with modelling techniques and that the process itself calls for special skills that they did not possess. We expected the teachers to tackle this task and confront the difficulties involved, while not demanding that they actually master modelling techniques. We touched on formal representation techniques like Petri nets but stressed that learning to use them was not one of the course objectives.
Nevertheless, many groups requested study material on this technique and duly set about trying to represent their chosen environment with Petri nets. As it was not possible to send graphics via e-mail, they sent in faxes and asked for feedback on their efforts. Several groups stated that they felt the need for fieldwork in their selected environment and made reports about these studies. At the final meeting many of the groups claimed that this module was the most interesting one in the whole course.

Module 5

The purpose of this module was to correlate the contents of the EE project with school curricula. Communication in module 5 chiefly concerned the subject areas that each group believed could be dealt with during the project. An interesting remark was made by members of the one group; having set out to analyse the national syllabus, they were then faced with the enormity of this task and realised that by starting out with the project contents instead, the job would be more straightforward: "starting from each element, we had to/we would have had to search through the various school subjects for contents and objectives relevant to the project".

Module 6

The aim of this module was to focus on the need to generate a product from the EE experience and to discuss how to set about choosing and designing that product. At this point the participants were informed that representatives of each group were to attend an end-of-course meeting in Genoa and that recognition of course participation would depend on each group presenting a final product that summed up their activities. Not only was there an exchange of ideas with the tutors about possible products and how to involve students in their creation. There was also an interesting discussion about the role the product would play in an EE project.

Module 7

The objective in this module was to examine how to plan group work during the project (choice of activity to be covered in class, definition of a schedule for the experiment, selection of tools and resources, forming of groups, tasks to be assigned to the various groups etc). The course concluded with a final meeting in Genoa. During the meeting the participants shared their experiences and took part in a lively debate on the subjects of on-line education and the methodological approach adopted for the EE projects in the course.

5. Building EuMedea on the experience of MEDEA

The EuMedea project was born from the idea of creating a synergy between the European project T3 and the experience developed at national level with MEDEA course. EuMedea will in fact involve teachers and student teachers from 5 European countries: Finland, Italy, The Netherlands, Portugal and UK, a significant subset of countries involved in T3. The design of EuMedea, besides trying overcome some of design of EuMedea, entailed a number of adaptations to the multinational and multicultural context of T3, as well as to the attempt to strike a balance between the different organisational requirements of various countries. In the following we briefly describe what are the differences and similarities between MEDEA and EuMedea, pointing out the reasons of changes.
Population

While MEDEA was addressed to local groups of teachers, EuMedea is addressed to local groups composed of teachers and/or student teachers co-ordinated by a local tutor. On-line courses depend on the ability of participants to build new knowledge based on the experience of each member. In EuMedea we will study the effectiveness of this kind of learning with student teachers with no or little experience of teaching. To increase the knowledge of each group, we suggest the local groups to enrol a local tutor (usually a teacher trainer) and/or give the group the possibility to consult an in service teacher via CMC. Another important issue is the language. We have been forced to choose a common language, English, which is the mother tongue of only one group. We will study how this will influence the remote group communication and what can be done to minimise problems related to the language. Finally, contexts in which the local groups act are very different. We will study the impact of these differences on the effectiveness of the course. The co-existence of in service teachers and student teachers can give rise to problems but it also have significant advantages in that it facilitates tackling of pedagogical problems from different points of view.

Timing

MEDEA lasted six months. Not only the modules lasted noticeably longer than predicted, but also went over the module closing dates reset by the tutors during the course. While this is perfectly natural in such courses, the technology used (e-mail) does not seem to suit this situation and we will discuss this topic in the next point, Technology. The EuMedea partners required reducing the overall duration of the course to three months. As a consequence we have rearranged the content in three modules, in which the main points of the seven MEDEA modules are dealt with.

Technology

In MEDEA we used electronic mail and all messages ended up in a single mailbox: personal messages, those regarding the course, various exchanges from other mailing lists, etc. For this reason, contributions that were sent in after the deadline fixed for the various module activities got mixed up with messages dealing with the current discussion topic, creating "noise" in overall exchange. This problem has been solved in EuMedea thanks to the use of a computer conferencing system; which provides ways to structure the discussion in "folders" and is 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 s/he would post or remove a message from a notice board.

There is a further consideration to be made about the technology used in MEDEA; when opting for the Internet's e-mail service, the course designers were aware that they had not chosen the optimal tool for managing the on-line course. However, the choice was dictated by practical considerations: computer conferencing would not have been viable in this case, and activating and handling interest group communication was simple with e-mail, given that it does not entail special hardware or software requirements.

Since EuMedea takes place in the context of a European project, dealing with telematics, its visibility through the web is an important requirement. On the other end, in our course, we have the need to restrict the interaction to the registered participants. The first need requires that all Internet users can access EuMedea to observe it, while the second one calls for an Intranet approach which restrict the communication inside a given community. We have chosen to support EuMedea using
the more recent release of FirstClass, because it allows to implement a system offering both these features.

On-line courses usually start and end with face to face meetings, where participants familiarise with one another. In our experience these events are very useful to create a friendly environment for the course interaction. In the context of EuMedea, face to face meetings would be too expensive. In alternative we have planned an initial and a final multipoint videoconference as a surrogate of face to face meetings.

Messages

Three hundred and eighty-three messages were produced during the MEDEA course. The significant fact is that 55% of messages were created by the tutors, 41% by the students and 2% by the observers, who contributed comments on course organisation and content. This means that the tutors "talked" a lot. In on-line courses, tutors are generally seen as mediators, who summarise the subjects under examination, clarify them, encourage participants and suggest new topics for discussion. Tutors are also there to indicate what is to be done, the way in which it should be done and according to what schedule, as well as periodically gauging progress made [3]. In this perspective, therefore, the share of messages generated by the tutors should be much smaller than that of the students.

Nevertheless, only 25% of messages sent by the MEDEA tutors can be interpreted as purely tutoring messages (in the sense described above). The rest are educational messages related to EE methods and contents, the tutors also being experts in the subject matter. In addition, as the course was addressed to groups rather than individual students, most of the debate about contents was conducted at local level. Communications travelling through the network primarily concerned the outcome of work carried out by the local groups. This led to a reduction in inter-group communication and an increase in feedback about accomplished tasks. What's more, it should be remembered that the groups worked on similar but not identical tasks, since each had chosen a different environmental issue for the course. There were thus fewer topics for inter-group discussion and the number of messages exchanged with the tutors increased.

To improve the interaction among the remote groups, in EuMedea we propose that all groups work on the same environmental issue, instantiated in a local environment, exchanging their approaches and ideas. Furthermore, to stimulate the interaction among the remote groups, we will propose common issues to be discussed together during the course. Finally we will encourage activities related to the reflection on the ongoing course, according to the research-action techniques.

Educational impact

As discussed above, on-line courses can foster participant learning through collective conversation on a given knowledge domain, which is also the subject of individual study. In on-line education, learning is therefore the result of both individual studies of materials and conversation/negotiation with course peers and leaders. This includes a number of related activities, like composition of written messages for other participants, reflection on other people's messages, negotiations on controversial matters, and so on. In MEDEA, these activities were complemented with debate within the local groups and co-operative development of a final project. But there was a limited reflection on the activities in progress and there was no structure for systematic data collection. On the contrary, in EuMedea we have specific discussion areas for stimulating reflection on the learning processes set in motion. In addition, in order to collect data for the formative evaluation of
the course, we are setting up a partially automatic system that supports a classification of messages based both on their quantitative and qualitative features.

In terms of learning, MEDEA's chief aim was to allow teachers to design and carry out EE projects using the proposed methodology. From an analysis of the final output, we can safely state that the groups who completed the course acquired excellent planning skills in EE; they demonstrated awareness of crucial issues, mastery in tackling them in an original and creative fashion, and motivation and willingness in applying the acquired knowledge.

The various messages and the debate held in the final meeting revealed that the teachers had indeed worked in a co-operative manner, a new experience for many of them; they co-operated with their colleagues from different disciplines and had a chance to relate with other groups, breaking the isolation in which they generally operate.

In EuMedea, we will evaluate the above aspects and compare them with what has been achieved in MEDEA. Given that the duration of the course is limited, there might be a lower degree of achievements. Nevertheless, we expect that the international setting, the mixed population (in service teachers and student teachers) and the more complex structure including local tutors and the support of an international staff will favour a wider range of discussions and points of view, therefore enriching the course and its results very much. This tool will help us to perform both a formative and summative evaluation.

6. EuMedea structure

Here we describe how EuMedea has been designed on the basis of the requirements posed by the European context and lessons learned in MEDEA.

EuMedea aims and objectives

In particular, we have in mind two main aims:

- To experiment new ways to train teachers at a European level
- To create a network of people sharing common educational methods in Environmental Education, who can continue to co-operate after the course.

As to the specific objectives, at the end of the course we hope the participants will be able to:

- Design an environmental education project using the proposed approach
- Use Internet to find information, share knowledge and co-operate in designing environmental education projects
- Use a Computer Mediated Communication (CMC) environment to work with other teachers co-operatively

The learning environment

The learning environment consists of:

- A computer running FirstClass (FC), a CMC software which we will make available to participants
• Printed and video material
• Documents available on Internet pointed out by the tutors or even suggested by the participants
• The other members of the local group whom participants will work with.
• The physical environment considered in participants’ project
• The other European groups, the local and remote tutors, and experts to be consulted at a distance.

This environment reflects a “learning through project” approach, which we consider very important for carrying out environmental education processes in school. In this course each local group will design a structured interdisciplinary project centred on an environmental topic. The participant will learn to co-operate in the context of a working group to design an environmental education project. Therefore EuMedea is based on a deep interaction among the participants. A CMC environment allows this strong interaction removing space and time constrains.
We will have two kinds of interaction: with the other members of the local group and with the other European groups. An access to the system will be available for each group.

The metaphor for the CMC

When participants enter FirstClass, the chosen CMC system, they find a mailbox for incoming personal mail and an icon “EuMedea” to enter the course. As to the course we have chosen the school metaphor where participants find:
• 3 icons representing the classrooms stand for the 3 modules of the course.
• A lab, dealing with the technological aspects. Here participants are assisted about the technical problems if needed.
• A library, where participants find the documents useful in this course.
• A Café, where participants socialise.

EuMedea course plan

In the following the course plan is shortly described.

Module 0: Familiarisation (one week)

This module aims to help participants in being acquainted with the CMC system and introducing one another. Participants can log on to first-class and to our server and the course tutors provide any necessary technical support. Participants will then learn how to receive and send messages, attach files to messages, and so on.

Module 1: how to define the requirements of the learning environment (3 weeks)

Here we discuss our learning through projects approach to environmental education. This is where participants start studying the material and actively participate in local and remote group discussions about the following issues.
• Choosing an environmental problem. We will discuss on how to choose an environmental problem to be dealt with in the project. To maximise the discussion it should be chosen one problem, as for example biodiversity. "Euroturtle" site could be discussed as case study, which shows how the net can be used to deal with environmental problems.

• Defining the aims. Here we will discuss what kind of aims are suitable for environmental education, how to define them, how evaluate whether learners have achieved the aims, how to detect the learners' believes, how to tune the aims during the interaction of the learners with the learning environment.

• Choosing a physical environment. This is where we discuss how to choose a physical environment where the learners will carry out their project. The key idea is that understanding an environmental issue result from interaction with a real environment near to the students.

Module 2: how to define the specifications of the learning environment (4weeks)

To understand an environmental issue we have to understand the elements relevant to the given issue and the relations among these elements. This implies dealing with the complexity of the given environment and defining a model of that environment related to the studied issue. Here each group will define a model of a selected environment and then discuss it with the other groups. Then we will discuss how to link the subject areas to an environmental education project.

Module 3: how to design the learning environment (4 weeks)

In this final module participants will discuss how to create conditions in which children can learn co-operatively, how to choose activities for the students to perform when interacting with the environment, in other words participants should discuss how the children are supposed to interact with the select environment and how to evaluate the results of this interaction.

7. Conclusions

We started this paper mentioning the problem of how to train a "European teacher" in the field of environmental education. Then we have seen how certain aspects of on-line education can benefit teacher training in EE subjects and how on-line education removes the time and space constraints, typical of face to face courses. In on-line education participants glean new knowledge from interaction with one another, and this factor offers enormous potential in environmental education. We have presented MEDEA, an on-line teacher training course based on a methodological approach to EE projects, and have examined the structure of the course, as well as how it was carried out. On the basis of MEDEA experience, we have designed a European course and in the paper we have shown how internationalisation and lessons learned in MEDEA have informed the design of EuMedea. Finally, we have described the EuMedea structure as an example of a new way for training future European teachers.

8. References


