On-line/On-site Education: the EDIT course for the educational use of telematics

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ABSTRACT The applications of network technology to pre-service and in-service teacher training are wide in scope but may nevertheless be grouped into two broad categories: the network as a source of assistance (or self-help) for teachers during the classroom transfer of knowledge which they have gained on an on-site training course; and the network as an environment where the training process actually takes place. This article describes the study of a mixed on-site/on-line approach adopted for a training course called EDIT (EDucating with Internet and Telematics); the topic of the course itself was the use of the Internet to support teaching. The distinguishing feature of the approach used is the alternation between complementary on-site training and on-line activities.

Introduction

It is becoming clear that in a number of fields, traditional training courses conducted face-to-face over a given timespan are no longer able to keep pace with the ever-growing demand for continuous training (Trentin, 1996). One area where this gap is being felt is in school teaching; today, there is a pressing need for up-to-date in-service teacher training, a need that can only be satisfied by routinely programmed initiatives for long-term cultural development.

Given the sheer scale of the education sector, it is clear that the problem cannot possibly be tackled using face-to-face approaches alone. In this light, educational technology in general and communication technology in particular can play a key role, offering resources that open up new opportunities for managing and actively participating in the learning process.
It is no coincidence that in recent years, researchers have been devoting increasing attention to the systematic use of computer networks for in-service teacher training (Trentin, 1997). In this respect, a number of possible approaches have been conceived, developed and tested; these range from using the network to support self-learning paths to running actual interactive courses based on third-generation distance education methods (on-line education).

After initially considering the ways that telematics may support pre-service and in-service teacher training, we will look at the EDIT course in detail and analyse its results.

**Telematics for Teacher Training:**
from on-line assistance to in-service training

In general terms, pre-service and in-service teacher training may benefit from telematics applications in two ways: by the network being used to assist teachers to transfer the knowledge they have gained in on-site training to a classroom situation; and by using the network as a location for the training process itself. We will now consider the first of these.

**On-line Assistance Following a Training Course**

Telematics can form a bridge between teacher training/in-service courses (whether conducted at a distance or face-to-face) and the classroom activities that teachers prepare in order to apply what they have learnt (Trentin, 1994).

Most training courses on educational technology are generally too short to train teachers adequately and in many cases supply information rather than training. A week or so is simply not long enough for teachers to acquire the skills they need to independently further their knowledge of the course subject and apply it to the educational context in which they work.

Returning to the ‘chalk-face’ after a training course, teachers are often left to their own devices when it comes to applying their newly acquired knowledge. The feeling of abandonment that inevitably results can lead to demotivation and, as a consequence, the economic and educational resources invested in teacher training may have gone to waste. So there is a pressing need to provide newly trained teachers with on-line support once they are ready to apply the knowledge they have acquired.

The form of interaction we propose is illustrated in Figure 1: each step in the training process is backed up by support for the teacher during the local transfer of the acquired knowledge (in their daily classroom activities). This support may be offered by the training course tutors or instructors, or may take the form of a self-help group comprising the course participants (Trentin, 1996).
Figure 1. Distance interaction supporting local transfer of knowledge/skills acquired in training.

However, this is not the only way telematics may support teacher training. There are at least two other approaches: the first is generally known as on-line education, while the second may be called mixed training (or on-line/on-site training) because it involves activities that alternate between on-site and on-line modes.

On-line Education

Over the past century, the steady evolution in communication technology (transport, telecommunications, etc.) has considerably influenced the parallel development of distance education (DE) systems (Nipper, 1989).

The earliest significant application of DE methods (first-generation distance education) dates back to the end of the nineteenth century, when new printing techniques and the development of railways allowed the production and widespread distribution of learning materials for students scattered over vast geographical areas. This largely consisted in correspondence courses based on printed material, and student-teacher interaction was conducted at a snail’s pace, if at all.

These first-generation DE systems were superseded in the 1950s by the so-called multimedia or second-generation DE systems, which incorporated various media, such as printed material, television programmes, audio recordings and, in some cases, educational software (courseware). Teacher-student interaction remained virtually unaltered from the first generation, even though it was supported by the telephone, face-to-face tutorials and, more recently, fax and email links.
So, first and second-generation DE systems are based primarily on the production and distribution of learning material for the learning community. Communication with the student (conducted bi-directionally) only plays a marginal role, while communication between students is virtually non-existent.

The driving force behind the development of third-generation DE systems is going to be the redefinition of learning as a social activity, albeit performed at a distance and with the inevitable mediation of technology.

In DE terminology, third-generation systems are also known as on-line education, a definition that gives a clear idea of how extensively the computer network is used in the learning process: participants interact in a fully-fledged learning community (Riel, 1990), which helps them overcome their isolation and enhances their contribution to the group.

In on-line education, phases of individual study alternate with remote interaction between one or more virtual classes (Figure 2). This is an approach that combines aspects of traditional distance learning (individual study and possible remote connection with tutors) with substantial interaction between participants (teachers, students and experts), a characteristic typical of face-to-face teaching (Harasim, 1989). However, there are no face-to-face events in on-line education, apart from an induction meeting lasting a couple of days.

Figure 2. The cyclical pattern typical of on-line education courses.

Participants in on-line courses are organised into learning groups, which not only helps to overcome individual isolation but more importantly exploits each member’s previously gained knowledge for the growth of the group as a whole. This method is particularly suited to adult education, where swapping personal experience about the topic under discussion can play an essential role in collective development (Eastmond, 1995).

Communication within virtual learning groups is largely carried out via computer conferencing, i.e. exchanging messages on a progressive series of themes (the course phases).

The teaching strategy most commonly adopted is collaborative learning (Slavin, 1990; Light & Mevarech, 1992), backed up by support from a team of tutors, who variously play the role of moderators in discussions, facilitators in exercises and organisers of groupwork, etc. (Kaye, 1992).
On-line courses often cover a longer timespan than traditional ones, thus requiring a complex, carefully structured organisational framework that usually produces high-quality results.

Among the more significant on-line courses in Italy are those developed within Polaris (Trentin, 1997), a project that comprised various distance courses conducted entirely on-line.

The Polaris model is not confined to single training events but includes follow-up on-line help for newly trained teachers so that the knowledge gained in the course can be more effectively transferred to the classroom (Figure 3).

In practice, the Polaris model is based on the two phases above: on-line education and on-line assistance. The former meets the need for in-service training, while the latter offers a form of ‘guidance’ for teachers who are applying their newly gained skills for the first time.

However, ‘purely’ on-line educational strategies such as those tested in Polaris are not always easy to apply. There are several reasons for this. One is that some subjects such as physics or chemistry are not particularly well suited to network communication. Another is that course participants might not be used to the particular communication dynamics of courses that are almost entirely based on written interaction (Mason, 1993).

Hence, there is a need for mixed on-site/on-line strategies that include complementary phases of face-to-face teaching and on-line work.

**Mixed Training (On-site/On-line)**

The term mixed training is used to indicate a form of training that draws on specific aspects of both face-to-face teaching (classroom lessons, basic introduction to technology, etc.) and on-line education (discussion, assisted distance exercises, etc.).
As Figure 4 shows, mixed training features a three-stage cyclical process: traditional face-to-face teaching; a self-study phase usually based on the reading of articles and books; and an on-line phase centred on discussion, exercises, collaborative work, etc.

Figure 4. The cycle of mixed on-site/on-line training.

We will now examine a mixed-approach teacher training course which focused on the application of network technology to education.

**Case Study: the EDIT course**

Sponsored by Pistoia City Council in Italy, EDIT was initially planned as a traditional-style course but following an agreement with the council’s Resource Centre for Educational Innovation, it was subsequently redesigned with the aim of testing a specific mixed approach for teacher training.

The designers of EDIT sought to avoid the shortcomings of both face-to-face training (usually limited to a series of meetings lasting just a few hours) and of on-line training (where it is assumed that the participants are willing and/or able to interact principally in written form). These shortcomings are even more evident when, as was the case in EDIT, the course objectives involve highly innovative educational methodologies and call for a degree of technological know-how.

**The Course Objectives**

The main objective of EDIT was to provide teachers with educational approaches to using network services to support their work in class. This embraced a number of secondary goals:

- acquisition of knowledge and skills in the use of the major network services;
○ acquisition of know-how in employing telematic resources to support teaching activities;
○ acquisition of basic knowledge for designing network-based education;
○ devising ideas and plans for the possible uses of telematics in collaborative learning.

Contents

The course topics were both technological and educational/methodological in nature, and included:
○ Internet services such as email, mailing lists, computer conferencing and the WWW;
○ ways of using the network to access and share information and knowledge;
○ aspects of planning network-based education;
○ the main strategies for using telematics in collaborative learning.

Participants

Following a call for participation, 20 teachers of various subjects were accepted on a ‘first-come, first-serve’ basis. Of these, 17 taught at upper secondary level and three at lower secondary. They all had some basic knowledge of computers and network services. It should be noted that when the teachers signed up for the course they had no idea about the methodology that would be adopted, and hence did not know what type of effort would be expected of them.

| Use of the Windows environment | 3.2 |
| Use of the word processor      | 3.8 |
| Use of spreadsheets            | 2.6 |
| Use of databases               | 2.4 |
| Use of hypermedia environments | 2.6 |
| Use of email                   | 2.0 |
| Use of the Web                 | 3.0 |

Table I. Participants’ level of familiarity with computers and telematics.

Participants’ Previous Knowledge

Before the course began, the teachers were given a questionnaire to gauge their level of familiarity with computers and telematics and to find out what access they had to the network (at school or possibly from home).
The results are shown in Table I, averaged out on a Likert scale of one (little/no familiarity) to five (high proficiency). The questionnaire also revealed that only 16% of the participants had access to the Internet, a problem which was overcome thanks to the Pistoia City Council Resource Centre, which offered a number of hours of on-line link-up.

The Learning Methodology
As stated earlier, the methodology adopted for the course was mixed: four face-to-face events were held at intervals ranging from a week to a fortnight, during which exercises, group discussions and self-study were conducted on-line.

In accordance with the overall approach, the on-site events held at the Resource Centre centred around the subsequent on-line activities. There were lessons on theoretical/methodological aspects, as well as practice with the tools and network services to be employed in the distance activities.

EDIT was a ‘project-based’ course, meaning that the participants were engaged in the production of educational projects to be implemented after the course had ended.

All the teachers were provided with a course guide and an information pack containing the reading material related to the learning activities within the course.

Course Structure
EDIT was held over a 5-week period and comprised four face-to-face events and three periods of on-line activity managed by the course participants themselves (Table II).

Between events, the participants were called upon to engage in a computer conferencing session at least once every 2 days. As each taught at a different school, albeit located in the same city, they were unable to get together to discuss course issues outside of those events.

Table II. The EDIT course timetable.
Over the whole span of the course, individual work (reading, exercises, etc.) alternated with periods of interaction with the other participants (colleagues, tutors) both in face-to-face and distance mode.

Group communication was achieved using the FirstClass computer conferencing system, which has a simple graphic interface and offers users a series of functions for interpersonal communication (synchronous and asynchronous) and file sharing.

Phase 1 (On-site). The topic of the first meeting was an overview of the main network services that can be used in education. After the introduction, the teachers were divided into work groups and explored the basic functions of the computer conferencing system that would later be used to handle network communication. Each participant was provided with individual FirstClass access and those who were able to link up from their school or home were given a client interface.

Phase 2 (On-line). This covered a period of 2 weeks. The teachers were set two tasks: to become more familiar with the computer conferencing system, and to explore several network services. The latter was managed by opening up two secondary conferences on the FirstClass system to discuss the use of the WWW and email.

Work with the Web involved visiting a number of scientific and non-scientific sites to get an idea of the WWW environment. Activities with email focused on organising communication within an interest group (or study group) using mailing lists.

Phase 3 (On-site). The second face-to-face meeting dealt largely with theory. The focus was on two areas: the use of telematics as an auxiliary technological support in teaching; and the special characteristics of on-line courses, in particular design considerations and collaborative learning strategies.

During this theoretical study, frequent mention was made of the projects and research activity carried out by the National Research Council Institute of Education Technology in Genoa.

Phase 4 (on-line). Given that this phase lasted only a week, activity was limited to reflection about what the participants had seen so far. This included suggested reading on the methodological approaches to the work and to on-line collaborative learning. In addition, the teachers carried on with the practical telematics exercises they had begun in previous phases.

Phase 5 (On-site). The aim of this face-to-face meeting was to consider what kinds of network activity the teachers could adopt in the classroom after their training was completed. Consequently, the meeting began with explanation and discussion regarding the key aspects of collaborative learning, with special attention to the management of the on-line learning
process. To these ends, the teachers were divided into three work groups, one for lower secondary level and two for upper secondary.

This phase proved to be particularly interesting in that it gave the teachers the opportunity to discuss shared educational issues and to collaborate on the design of a common educational project. The work groups produced two draft projects, one for lower secondary level and another for upper secondary.

The former was very tightly structured from an educational design standpoint. The idea was that four classes in four different schools in Pistoia would work together via network to produce a “telematic magazine”.

The upper secondary project was a study of plant and equipment in a chosen industry (types of machinery, internal organisation, etc.) and involved collaboration with other schools outside the region.

Phase 6 (On-line). The aim of the last network-based phase was to discuss and clarify the draft projects developed at the previous face-to-face meeting. Consequently, a separate FirstClass conference was devoted to discussion and delivery of the participants’ draft projects. By the end of this 2-week period, before the final face-to-face meeting, three draft projects had been submitted; the two mentioned above and a third one which was drawn up after the deadline.

Given that they were submitted just a few days before the following face-to-face meeting, the expected network discussion on these projects did not actually take place as there was not enough time remaining.

Phase 7 (On-site). During the last meeting, group discussion and clarification of the draft projects finally took place. The focus subsequently shifted to the planning of measures for putting the projects into action.

**Evaluation of the Training Course**

Evaluating a distance training course poses a series of problems at different levels, but two in particular stand out: evaluation of learning and evaluation of the participants’ level of involvement, seen in terms of time and activity carried out at a distance (Torpe, 1993).

This problem is less critical for mixed training courses as there are opportunities for face-to-face interaction in which the participants’ performance can be monitored. Furthermore, basing distance communication on the computer conferencing system means that one can access the automatic recordings (log files) that the network server makes of each participant’s activity (messages written, messages read, level of interaction with other participants, the time and duration of on-line connection, etc).

Evaluation of the EDIT course was therefore based on these two evaluation techniques, as well as analysing the results of an end-of-course questionnaire that sought the participants’ evaluation and general feelings.
about the experience as a whole. Without a doubt, the most interesting of these techniques from a research standpoint was the monitoring of the on-line activities the participants engaged in between one face-to-face meeting and another.

The Participants' Level of On-line Activity

With the exception of more exercise-oriented activities, general on-line participation was lower than expected. In short, discernible interactivity did not take place. By and large, the participants confined themselves to the tasks set by the remote tutors, rarely engaging in meaningful on-line exchanges about their different opinions and/or proposals.

Presence On-line

During the experiment, the intensity of message exchange increased as the face-to-face meetings approached.

In some cases, this prevented the group from launching a fully fledged on-line discussion before the meetings took place.

The likely cause is the fact that only 16% of the teachers had access to the network in their school; the others had to go to the Resource Centre to take part in the on-line activities. In the latter case, the fact that face-to-face meetings were held in close proximity (at least once a fortnight) may have created the impression that the distance communication with tutors and colleagues was not strictly necessary and discussion could quite simply be put off until the next meeting. It must also be recognised that this innovative learning method calls for a far greater effort than traditional on-site courses, especially given the more proactive, initiative-taking role that the participants are required to assume in the process of their own training.

Computer Conferencing Communication

When making quantitative evaluation of computer conferencing communication, we must take account two factors: the types of activity that the participants have engaged in (exercises, discussion, groupwork, collaborative production, etc.); and the management strategy consequently adopted by the tutors. This is especially true where on-line training is concerned.

These two factors can strongly affect the message flow produced by both the tutors and the participants.

For instance, the ratio of tutors’ messages to participants’ messages in the EDIT course was roughly one to three. It is safe to say that this is a fairly well-balanced ratio, considering that the course included both exercise/tutorial activities (requiring greater tutor ‘presence’) and
discussion/exchange activities (where the tutor acts as moderator and is less directly involved).

By contrast, the tutor/participant message ratio for the conference devoted to educational web sites was one to one. This ratio can be explained by the exercise-type learning strategy adopted, which usually leaves little room for participant interaction. The exchanges consisted of alternation between the tutors’ suggestions on which sites to visit and the participants’ feedback.

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<tr>
<th>End-of-Course Questionnaire</th>
<th>Categories</th>
<th>Average</th>
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<tr>
<td>General aspects</td>
<td>1 Course evaluation</td>
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</tr>
<tr>
<td>Contents</td>
<td>1 Correspondence between contents and participant expectations</td>
<td>3,6</td>
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<td></td>
<td>2 Comprehensiveness of the contents</td>
<td>4,1</td>
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<tr>
<td>Educational methodology</td>
<td>1 Extent to which the methodology supported collaborative learning</td>
<td>4,1</td>
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<td></td>
<td>2 Consideration given to the participants’ viewpoint</td>
<td>4,5</td>
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<td></td>
<td>3 Effectiveness of interaction with colleagues</td>
<td>4,1</td>
</tr>
<tr>
<td>Conclusions</td>
<td>1 Suitability of the course for other colleagues</td>
<td>3,0</td>
</tr>
<tr>
<td></td>
<td>2 Effectiveness of on-line/on-site education</td>
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</tr>
<tr>
<td></td>
<td>3 Willingness to attend another course of this kind</td>
<td>4,4</td>
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Table III. Some quantitative results from the end-of-course questionnaire.

As mentioned earlier, a questionnaire was given to the participants at the end of the course for the purposes of collecting their self-evaluations and general impressions of the training course. Answers to the questions were either open or graded numerically from one (very negative response) to five (very positive). There were also open questions to give participants greater freedom in expressing their views. The quantitative results are shown in Table III.

As the table shows, the course received a very positive response both in general and in specific aspects. There was only one question that got a different response: “Do you think that the course would be suitable for your colleagues?” By contrast, somewhat surprisingly, the question “Would you repeat a course of this kind?” got an almost unanimously positive response with clearly defined reasons.

This apparent contradiction was also found in the on-line courses of the Polaris project, suggesting that the course participants consider themselves more willing than their colleagues to get involved in training processes that are demanding and that follow a tightly packed schedule.
We will now briefly summarise the answers to the open questions.

There were two main answers to the question “What aspect did you like the most?”, which were groupwork with other teachers and the exercises. The least-liked aspects on the other hand were more often than not related to the participants’ technological skills: some stated that they needed more time to absorb the subject matter covered, while others would have liked to explore the tools and on-line services in greater depth. Those who felt they had a weak grasp of the technology were also less enthusiastic about the theoretical-methodological side of the course; although they considered it important, they would have preferred to spend more time at the computer instead. However, the aim of the course was to train teachers in the educational use of telematics, not in the technical side of network technology. It should also be remembered that a basic grounding in computers and telematics was a prerequisite for course participation.

Variation in the teachers’ attitudes may therefore be a reflection of the different levels of pre-course knowledge, despite the fact that the teachers’ pre-course self-evaluation suggested a greater level of uniformity.

**Conclusions**

In this article we have outlined several scenarios for using network resources to support in-service teacher training. It was pointed out how telematics may serve as an instrument for giving continuity to the training process, and as an environment for the implementation of fully fledged training courses based on strong interaction between all the actors involved (trainers, tutors, participants, experts, etc).

We have subsequently singled out one of these scenarios, mixed on-site/on-line training, for more detailed examination. The aim of pairing face-to-face and distance activities is to overcome the limitations of both approaches.

The case study we have reported is an experimental course called EDIT on the educational use of telematics. In this course, telematics was used simultaneously as a study topic and as a tool for conducting the on-line part of the training process. This allowed the teachers who participated in the course to get first-hand knowledge of the potential and limitations of telematics applied to education.

We have also reported the results of evaluation conducted during and after the course to gauge the teachers’ levels of participation and impressions of their performance.

While the overall results of the project were satisfactory, the pacing and content of some areas of the course need to be adjusted. For instance, the training course would benefit from a longer timespan, and greater effort should be made to ensure that at the outset of the course the participants all have a similar level of technological competence.
From the standpoint of the approach adopted, the project has undoubtedly yielded positive results. This is borne out by the positive feedback from the participants and by the successful surmounting of problems often faced in on-site training (the lack of communication and support offered to teachers between one meeting and another) as well as in on-line training (the difficulties posed when communicating solely in written form).

Finally, it was interesting to observe that, in comparison with traditional courses with exclusively on-site lessons, the relationship between tutors and course participants was much friendlier. The reason for this lies in the fact that all parties kept in touch via computer conferencing between one lesson and another.

In any case, it is clear that we are witnessing a new dawn in learning practice, one for which teachers in Italy are essentially unprepared.

Early pilot projects like EDIT and Polaris have provided the opportunity to test some methodological approaches, albeit in quasi-lab situations where the activity is run by research bodies and involves populations that are predisposed to innovation. Consequently, future efforts should focus not just on perfecting existing models but also on the organisational and structural aspects of the learning system in which these models are to be implemented.

Models will certainly evolve as ever more sophisticated technologies become available and as costly systems like video conferencing and virtual reality grow more affordable. However, future research is likely to concentrate on the transferability of new distance education systems, and consequently on the obstacles that hinder the widespread adoption of the proposed models. What is at issue here are the regulations governing the running of and participation in on-line courses, reconciliation of the different demands posed within work and learning (spaces, tools, materials, etc), finding the time to dedicate to learning and so on.

In conclusion, the development of in-service training systems is increasingly reliant on striking the right balance between pedagogical factors, organisational-management aspects, and specific needs in various sectors of education.

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