Teaching to teach with technology – An EACEA project to promote advanced technology in education

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Abstract

Educational research has generated many methodologies, tools and practices exploiting the potential of technology. Outside the laboratory, however, uptake of advanced techniques remains low. Despite technical and methodological advances, the majority of e-learning still consists of video-lessons and page-turning web sites. The main obstacles to take-up are constraints of money, time and knowledge that limit teachers' ability and willingness to apply new teaching techniques. Against this background, the "Teaching to Teach with Technology" project (www.t3.unina.it) will design and validate an innovative teacher trainer program, demonstrating realistic ways of exploiting advanced techniques within the real constraints facing teachers in their work.

Keywords: 21 st century education, educational policy and ICT, ICT and lifelong learning, educational gaming

Introduction

E-learning is rapidly entering mainstream education. Today, however, the majority of e-learning programs are based on video lessons or on page-turning web sites providing structured content and exercises similar to those available in conventional text-books. These teaching methods may be extremely effective for teaching hard technical skills such as the ability to use a piece of software or carry out a standard operating procedure, awareness of safety regulations and their implications for daily work, the ability to prepare a balance sheet, or the understanding of a specific product or service by sales people. However they are much less effective in teaching the cognitive, social and critical skills that have always been recognized as the hallmark of a good education.

This does not mean that e-learning is inherently unsuited for this task. More than twenty years of research in educational technology has generated a wide range of advanced methodologies, tools and practices to exploit the potential of technology. Much of this work has implicitly or explicitly adopted "constructionist" strategies, in which learners use technology to construct representations of the world they can use in their daily lives and work, while simultaneously acquiring new cognitive skills (Kafai & Resnick, 1996). Over the last 20 years, the effectiveness of this kind of approach has been demonstrated beyond any reasonable doubt. Simulation-based training on the use of specific equipment and procedures has taken on a key role in the aviation industry and in medicine (Beck, 2009). Programming, with languages such as StarLogo has been used to introduce children to

logical reasoning and problem solving (Resnick, 1997). Simulations of biological, physical and environmental processes have allowed children to conduct experiments that would not be possible in a physical laboratory or to introduce them to basic scientific principles, such as "natural selection". More recently, work in educational robotics (Lund et al., 1997; Miglino et al., 2007) has moved in the same direction. Simulation of social and group processes has been used to educate young people on issues related to public health (Thulin, Swendeman, & Zerilli 2003) and in management training. Several groups, including ours, have experimented with virtual shared environments as a way of teaching soft skills such as negotiation (Eutopia-MT, 2009; Miglino et al., 2007) or communication during emergency situations (TILS, 2009). Universities have experimented with the use of Web 2.0 technology (Wikis, social networking software etc.). Much attention has been given to so-called serious gaming (the use of commercial or ad hoc games for serious educational purposes) (Greitzer et al., 2007; Ives & Junglas, 2008).

Quantitative data on the way e-learning is effectively used in universities, schools and business is rare with the majority of surveys being limited to individual countries or specific sectors of the economy. However, there is general recognition among practitioners that uptake of advanced techniques remains low. This implies that the critical issue for e-learning today is not so much the development of new methodologies and new technologies, but take-up of those that already exist. As we will argue later in this paper, take up depends not so much on the learning or technical effectiveness of specific methods or technologies but on external constraints - money, teachers' time, knowledge. Promotion of advanced e-learning will only be effective if these constraints are taken into account. In this paper, therefore, we will describe the Teaching to Teach with Technology (T3) project, an EU-funded project in which a grouping of Italian, Spanish and British partners is developing an innovative teacher training program that takes account of these constraints.

The rest of the paper will be structured as follows. Section 2 examines some of the reasons why current take-up of advanced techniques is so poor. Section 3 provides a detailed description of the T3 solution. Section 4 concludes, identifying open issues requiring further work.

The problem: why is take-up of advanced techniques so poor?

Take-up of advanced e-learning decisions depends primarily on high level decisions by managers, administrators, and school principals and on lower level decisions by teachers and trainers. Any discussion on the reasons for poor-take-up has to depart from the premise that these decisions are made under severe constraints of money, time, and knowledge. In brief, e-learning has to be affordable, it should not require more time in preparation than other teaching methods, decision-makers (managers, school principals) and teachers should have the knowledge necessary to apply it in their own teaching environments. In practice, these conditions are rarely met.

Key problems often encountered by e-learning programs include the following:

- Universities, schools and businesses can only afford a small number of computers or computer labs for learners: the lack of computers makes it impossible to integrate e-learning with other teaching practices (e.g. by encouraging learners to make effective use of search engines and other web tools).
- Computers and Internet access are often available only in special computer labs. This again limits the use of e-Learning in everyday teaching practice.

- Very few organizations have the resources to purchase special equipment (e.g. educational robots) for large numbers of learners.
- Many well-tested techniques require large investments of teacher or trainer time to learn new tools and new systems or to prepare learning materials. With an ever-increasing workload, many teachers and training are neither willing nor able to invest this time.
- In general, there is very little awareness of the true potential of advanced e-learning techniques. When such techniques have been used it has nearly always been the work of trail-blazing pioneers, with a strong interest in technology and high personal motivation.
- The huge majority of teachers and trainers receive very little training in how to use advanced e-learning in the classroom. Given that much e-learning content is developed in English, this problem is especially serious in countries whose native language is not English or where general knowledge of English is poor.

For many companies, universities and schools, the only e-learning techniques that are genuinely feasible are techniques that are simple or that require no more effort than conventional teaching. In reality, many modern techniques match this description. But they are not well known. Worse, the tools teachers would need to use the techniques, while often theoretically free, are hard to locate, configure and install. In brief, the key issues are knowledge and training. As the European Commission recognized as early as 2001:

"Lack of appropriate training for teachers and trainers is a major obstacle to the use of new technologies in education. Moves to train teachers or trainers in the use of the new tools have not always been reflected in any significant progress in teaching practices. Strenuous efforts need to be made in this field." (Communities, 2001)

This situation is more or less the same today. In other words, better take-up of e-learning technology requires better training for teachers, allowing them to recognize how they can use technology within the real constraints that face them in their work. The goal of the T3 project is to provide a novel teacher training program that meets this need.

Teaching to Teach with Technology

Teaching to Teach with Technology (www.t3.unina.it) is a research project funded by the EU Leonardo Da Vinci Life Long Learning Program. The Consortium managing the project involves university and industry partners in Italy, the United Kingdom and Spain, all with long experience in advanced e-learning.

The strategic goal of the project is to develop an innovative teacher trainer program to promote the use of advanced learning technology by university teaching staff; secondary school teachers; and trainers in industry. Key features will include theoretical classes to discuss the features and advantages of new technologies, practical workshops, in which university teaching staff, school teachers and trainers simulate learning sessions and familiarize with technologies, and project work, in which learners will prepare learning projects for use in their own classes.

T3 will validate its program in three pilot sites in Italy, Spain and the United Kingdom. Participants in the pilot projects will be introduced to a broad range of teaching techniques and technologies that have already been shown to work in an experimental setting, but which have yet to win broad acceptance in mainstream education and training.

The project will begin with a rigorous analysis of user needs. The study will focus on the methodologies and technologies teachers and trainers have already used, their usefulness,

usability, and cost, reasons for acceptance or rejection, and external obstacles to the adoption. The survey will incorporate results from previous research by the partners, a systematic literature review concerning teacher-responses to the use of educational technology as well as in-depth interviews with teachers and trainers.

In parallel with this effort, T3 will conduct a survey of candidate technologies. These will include tools and content already developed by the partners (educational games, simulators of biological, physical and social phenomena, novel communications tools, shared virtual environments) as well as relevant third party products and tools. For each technology the partners will develop a demo and a "product sheet" describing the tool, the purpose for which it was built, technical requirements on users, cost (if any) etc. On the basis of this survey and the needs analysis the partners will select the technologies to be used in the T3 teaching program.

Once technologies have been developed, the project will define its teaching methodology and a detailed teaching program. This work will involve the formal definition of general learning goals and the specific goals for the 3 pilot projects, and the identification of quantitative success criteria. Specific criteria will be defined both for primary beneficiaries (lecturers, teachers, trainers) and for indirect beneficiaries (university students, school pupils, industrial trainees). A key goal will be to ascertain how far the use of specific technology or method is compatible with critical constraints facing teachers and trainers. The learning program will be defined in a Teacher's Handbook, produced in English, Spanish and Italian.

As already mentioned, one of the key obstacles to uptake of e-learning, is technical complexity and the work it imposes on teachers. To resolve this problem, T3 will bring together the tools and documentation used in the program into a pre-tested, integrated "kit", that teachers can use "out of the package" (a CD-Rom or DVD). The project will set up and manage the central servers required by specific tools, and a Web Site providing technical support and allowing users to exchange their experiences.

Once the "kit" has been successfully developed, the three pilot projects will begin. The trial with university teaching staff will take place in Spain; the trial with secondary school teachers in the U.K; the trial with trainers in Italy. Each trial will involve 15-20 learners who will participate in the program over a period of 9 months (1 academic year). Classroom teaching and workshops will be interspersed with projects in which learners try out new technologies with their own classes. A key feature of the program will be joint discussion of these experiments and their results. The final output will be a set of freely available tools, designed to encourage uptake of new learning technologies for use in universities, schools and professional training. The tools will be accompanied by a handbook ("Teaching with technology") and accompanying DVD promoting the use of innovative technology in teaching. The book will be released in paper and PDF format under a creative commons license. Separate editions will be prepared in English, Spanish and Italian.

"Teaching with Technology will be designed to appeal to potential users of innovative technology in universities, secondary schools and vocational training. It will thus be relatively short (approximately 120 pages). The general approach will be practical rather than academic. The first section will describe the general rationale for use of innovative learning technology in education and training. The second will discuss specific technologies used in T3 and introduce the use of these technologies in teaching practice. The third section - the main body of the work - will present 5-8 case studies of teaching practices developed and tested by participants in the T3 program. The case studies, presented in a narrative style, will be selected to cover a wide range of practices addressing different target

populations, using different technologies to achieve different learning goals. The book will be accompanied by a CD or DVD containing the text of the book (in PDF format), and the T3 tools.

Conclusions and open issues

To the knowledge of the authors, there have been attempts to create dedicated teacher training programs on advanced e-learning techniques. The T3 project is an attempt to meet an increasingly urgent need. We hope to have many imitators.

We are nonetheless aware that even if our program and its successors fully achieve their goals, key issues will remain open. The pioneers who first experimented with e-learning claimed it could open minds, teaching skills that cannot be taught with traditional methods. The promise is still valid. But even with advanced methodologies and tools, effective teaching will still be a difficult and expensive task, just as it has always been. Fulfilling the promise of advanced e-learning requires a willingness to invest not just in technology but above all in skilled human resources. So long as e-learning is seen first and foremost as a way of reducing costs, the promise of advanced techniques will remain an empty one.

Acknowledgement

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