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Edited by

Sofoklis Sotiriou and András Szűcs
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Editors:

Sofoklis Sotiriou
András Szűcs

Editorial co-ordination:

Anna Zoakou
Anna Wagner

EDEN Secretariat, c/o Budapest University of Technology and Economics
H-1111 Budapest, Egry J. u. 1, Hungary
Tel: (36) 1 463 1628, 463 2537
E-mail: mailto:secretariat@eden-online.org
http://www.eden-online.org

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THE PATHWAY TO INQUIRY-BASED SCIENCE EDUCATION IN EUROPE AND BEYOND: CHALLENGES AND SOLUTIONS FOR IBSE ADOPTION

Mario Barajas, Anna Trifonova, Joaquín Giménez, University of Barcelona, Spain

Introduction

High-quality education is one of the principal objectives of all levels of education for EU and the Member States in the context of the learning society (EU, 2011). One of the factors to increase the quality of education is the incorporation of innovative educational approaches and renewal of current pedagogical practices.

Inquiry-Based Science Education (IBSE) has been considered as an important approach for improving Europe's science education (Rocard, 2007; EU, 2010a). It is believed that the adoption of IBSE will support not only authentic knowledge acquisition, but also will help to raise students' general interest in science and will promote scientific studies and carriers. However, a recent analysis of the European Commission shows that IBSE has not yet been adopted significantly in the Members States (EU, 2010b).

IBSE refers to the conscious use of inquiry as a pedagogical strategy where students engage actively with questions and problems associated with their subject or discipline. It is a pedagogical approach that has philosophical and theoretical roots in the constructivist educational paradigm. Five essential features characterise IBSE: 1) Learners are engaged by scientifically oriented questions; 2) Learners give priority to evidence, which allows them to develop and evaluate explanations that address scientifically oriented questions; 3) Learners formulate explanations from evidence to address scientifically oriented questions; 4) Learners evaluate their explanations in light of alternative explanations, particularly those reflecting scientific understanding; and 5) Learners communicate and justify their proposed explanations (NRC, 2000).

While definitions of inquiry might vary, there is agreement that its central feature is the emphasis on the inquiry question as the driver of students' learning experiences (e.g. Crawford 2000; Cuevas et al 2005; Deters 2004; Drayton and Falk 2001). Moreover, there is often an emphasis on students engaging in collaborative inquiry with peers (e.g. Hmeo-Silver, 2006, Bell et al, 2010). Furthermore, 'inquiry-guided learning, promotes the acquisition of new knowledge, abilities and attitudes through the investigation of questions, problems and issues using the ways and standards of inquiry in the disciplines' (Lee, 2011).

The project PATHWAY[1] faces the challenge of facilitating the wide adoption of IBSE in Europe and beyond. It involves 25 partners from 15 countries collaborating to propose a standard-based approach to teaching science by inquiry outlining instructional models that will help teachers to organise effectively their instruction. The project will produce a unique collection of open educational resources and teaching practices linked with the science curricula that have proven their efficiency and efficacy and that are expanding the limitations of classroom instruction. Moreover, PATHWAY will mobilize a community of active teachers, experts on science education, researchers from the field of pedagogy, policy makers and curriculum developers with the objective to promote inquiry based techniques and to motivate large number of teachers to adopt IBSE activities.

From March to July 2011 PATHWAY organised a series of 38 Visionary Workshops in 12 countries (Austria, Belgium, Bulgaria, Finland, Ireland, Italy, Germany, Greece, Romania, Russia, Spain and UK), involving 1024 participants. In these workshops PATHWAY explored current teaching needs and addressed specific curricular objectives in order to later enable the large scale introduction of IBSE methods. Teachers and teacher trainers, students, school administrators, curriculum developers and policy makers (in different combinations according to

[1] PATHWAY: The Pathway to Inquiry Based Science Teaching, www.bayceer.uni-bayreuth.de/pathway/

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each partner conditions) were introduced to PATHWAY and initiated discussion about the important needs, limitations, and barriers for implementing IBSE in the involved countries.

Current state of science education

PATHWAY Visionary Workshops revealed a rather low level of adoption of IBSE in the involved countries. Even though the adoption of IBSE is supported or at least not impeded by the curriculum of several countries, such as Belgium, Germany and Spain, only in some (e.g. Finland and Greece) stakeholders report good overall adoption. Teachers who implement IBSE activities are usually isolated cases. Often they feel alone, not supported neither by the curriculum, nor by the school and rarely collaborating locally with their colleague.

The workshops attendants in many countries (e.g. Bulgaria, Italy, Romania, etc.) report serious limitations and obstacles in the curriculum and the school practices that should be faced for a wide IBSE adoption. For example, in most countries, there is an expectation to use textbooks especially in the later years of schooling, due to an exam-based culture, where it is believed (by many teachers, parents and students) that learning can only ever be measured through exam results. There is considerable pressure to 'cover the content' in terms of subject knowledge which impacts upon teachers willingness and ability to engage in less structured activities, such as IBSE activities. This type of thinking is very closely linked to university entrance and is particularly volatile the closer a student nears the completion of compulsory schools and the last school year before university. There is a perception that IBSE would impede the completion of the curriculum. Furthermore, a change in the teaching approach generally starts fears amongst parents that their children are not taught properly.

Many educational systems (e.g. in Austria, Belgium, Italy, Spain and UK) have adopted student research projects including IBSE activities as a valuable modality within the advanced years of compulsory education. IBSE is sometimes implemented as hand-on science involving students in practical and experimental work, although pupils often just perform pre-scientific hands-on tasks without really formulating and revising scientific explanations. It is widely accepted that IBSE can be applied to many aspects of the major science strands – Biology, Chemistry, Geology and Physics. Apart from all natural sciences, inquiry based learning could be successfully applied to other school subjects as well, such as learning foreign languages and history. Research based learning can also be applied to all stages of the developmental curriculum.

Limitations were reported in terms of school organisation and school practices. Most importantly, teachers spoke about lack of time for preparing IBSE classes, too little teaching hours dedicated in science and too short time frames in the school scheduler for implementing such lessons (e.g. Austria, Belgium, Bulgaria, Germany, Romania, Spain, and UK). Large students groups were also reported as a challenge in the teachers daily activities. Small or poorly equipped labs and lack of material for experiments is an important obstacle that was revealed (e.g. Italy, Romania, Russia, etc.).

Regardless of the limitations and obstacles discussed, participants were optimistic and preferred to look for solutions to overcome the challenges. In all workshops, teachers expressed desire to implement IBSE.

Challenges and solutions for IBSE adoption

In general, it is believed that there is a need of improved quality of science education for all, both for future science graduates as well all students. Adopting IBSE wider might be a way to do so, although the wide adoption would be challenging and many problems should be overcome. Based on profound discussions, several such challenges were identified and PATHWAY Visionary Workshops participants discussed around the ways to overcome these difficulties in their context. Hereby we list (without ranking) some of the challenges identified:

- Incompatibility between current school schedules and time required for inquiry activities
- Large number of students per class
- Lack of teacher experience with IBSE and lack of good IBSE-related materials or knowledge about such
- Lack of time for preparation and implementation of innovative classroom activities
- No dedicated time in teachers' schedule for further professional training
- Heavily content oriented curriculum and strong dependence on textbooks
- Exam-based culture and pressure from university-entry exams in the last school years

- Teacher who currently implement IBSE are lonely fighters that rarely collaborate with other teachers and are not supported by the management

Several distinct strategies were proposed by teachers for solving the problems discussed.

Changes in the educational system and the organisation of educational activities

Changes in the educational organisation have been proposed within many workshops. For example, for overcoming the incompatibility between current school schedules and time required for inquiry activities participants propose changing the time and location of science lessons, thus allowing for longer sessions and blurring the boundaries between theory and practice. Furthermore, changes are needed in order to face the problem of the large number of students per group - a problem reported in several countries. However, some teachers were not confident such changes would happen, mainly because due to the economic crisis governments are planning costs cuts that might result in increase of the number of students per classroom.

In Austria, participants suggested exploring different timetable models that could allow more time for teachers to both be more creative within the curriculum parameters and also to have some professional development time in the school year without impacting on their scheduled classes. Furthermore, there is a need to explore different models for resource allocation and sharing within school regions.

Changes in the educational organisation might solve issues regarding the pressure of the exam at the end of upper-secondary school. More concretely, Spanish participants suggested changing the university entry-level examination contents and methods, which would give more freedom to teachers to cover the curriculum as they think it is more appropriate. Another possibility could be to allow two itineraries in the last two years of upper-secondary school, i.e. depending on whether the student wants to join university or not. Furthermore, IBSE activities could be made optional to students, thus "IBSE would be for the ones who are interested".

Italian participants see a way towards adopting IBSE in the possibility of working with student interest groups, i.e. students who stay longer hours at school or choose to do science as additional lab subjects in their free time or in student-project allocated time slots. In UK after school clubs and awards programs were also seen as opportunities for IBSE.

It should be mentioned that some teachers believe that a more positive and valued experience of science during the pre-16 educational course may impact upon uptake of science courses post 16.

Support from senior management

During some of the workshops it has been underlined that it is critical to get approval and support from senior management teams in schools as this creates a school climate in which there is 'permission' to take risks with classroom practice and explore new approaches to developing science knowledge. Some teachers also felt that they would need more support than what the currently receive from the headmasters in order to be able to successfully apply IBSE strategies. Participants also believe that school principals should be involved, but they also see that for successfully doing so the principles need to see a return. It was stated that schools (not individual teachers) set targets and receive resources, thus the importance of involving the senior management.

Having the support of a management figure such as a head of science was seen as critical to any shift in practice. Support or input from someone above them in the management structure was also seen as likely to enable and contribute to any real change. For shifting the extent to which IBSE is adopted in teachers' practices they see the need of a 'champion' or evangelist who is well versed with the techniques and the materials.

Increase coordination among teachers

One of the challenges in respect to the wide spreading of IBSE identified in the Visionary workshops is the lack of collaboration between teachers. With regards to this, participants suggested improving the communication flow between teachers and between the staff in their school in general. If teachers shared experiences and resources, it would be easier to prepare and carry out IBSE activities, and it could also spread more easily.

Increased collaboration and coordination was identified as a solution to several problems coming from school organization in Spain, such as the too short time for IBSE activities in the classroom. As one teacher put it, "I could steal time from other teachers and have, for instance, a 3 hour-long lesson". Teachers should share more what they are doing and try to reach agreements. IBSE would spread more easily if teachers saw that their colleagues are using it.

German teachers also suggest that working in a strong collaborative environment where staff support each other there are more opportunities to improve teaching and engage more students.

Italian teachers state that working with other teachers seems to be essential for increasing both the quality and quantity of IBSE activities. Teachers suggested working with other colleagues and each preparing different lessons/modules. There was also the suggestion of working with colleagues from different subjects, age and experience. Contact between senior and younger teachers should be encouraged, so that different learning styles could be integrated and shared. IBSE teacher committees could and should be created and encouraged within individual schools. Tight colleague collaboration could also allow an internal rearrangement of subject hours among teachers, ensuring more flexibility in the work schedule. Collective peer to peer programming is useful also when planning for summative and formative testing.

It was suggested that for high school teachers it would be interesting to see how primary school teachers work with their students. In fact they seem to be much more accustomed to having pupils (even those in classes of 30 children) work in small groups and on hands-on experiences.

Communication between teachers and textbook publishers

Regarding the textbooks, teachers suggested that the book editors took their opinions into account when designing books. This might allow inclusion of certain tested inquiry-based activities linked to the curriculum and thus wider adoption/acceptance of IBSE.

Filling the theory-practice gap

Teachers in several countries, such as Spain and UK agreed that the separation between theory and practice should disappear in science education. However, they didn't agree on whether the space to use should be the classroom or the lab. Whereas two teachers in Spain said that they "always bring instruments and physical objects to the classroom to perform experiments", another Spanish participant said that "all science lessons should be given in the lab.", which shows the lack of agreement on which is the best solution to the problem.

Production of ready-made IBSE packages

Most teachers acknowledged that existing resources could be utilised for IBSE. Teachers pointed out that this might be easier for some subjects than for others (for example, experimental materials seemed to be easier to find for physics experiences rather than for biology). However, there was general agreement that specifically designed resource banks and centres could assist teachers to find the appropriate resource to use with the methodology and thereby save time for the teacher in implementing the scenario.

Most participants said that having comprehensive and easy to implement IBSE resources would facilitate the use of this methodology among mainstream teachers. IBSE resources and experiments should adequately meet teachers' needs, such as time and cost of the activity, as well as the availability of resources and facilities. It was pointed out that there is certain perception that IBSE requires quite sophisticated facilities. We should avoid the feeling of many teachers stating that "I can do the same, more easily, with less means".

Providing teachers with case-studies of IBSE in action, detailing the positive impact on students' learning, was also requested as teachers feel more comfortable trying out a new approach if they have the advice and experience of other practitioners that tested it previously. It was suggested that in the development of learning scenarios, there should be a section that shows how the scenario links to the curriculum. Well-chosen and well-produced materials and resources can help enrich and build upon existing science teaching already taking place.

Participants in UK also suggested PATHWAY should create and publicise a resource bank of support materials and examples of IBSE in practice. It was pointed out, however, that the availability of good IBSE ready-made resources increased the risk of them being used in a rigid way, spoiling the very nature of IBS learning.

Furthermore, personal development programs should point to good repositories with relevant resources.

New professional development IBSE support

Teacher training and support in developing IBSE classroom practice has been underlined as essential in the process of IBSE adoption. Good teacher training is crucial, especially such that puts the teacher in the shoes of the student/learner. This is recognised as a very effective way to help change one's teaching style and practice.

Often, teachers believe to be familiar with IBSE, but when they are asked to discussed it, it is revealed that they see it more as problem solving approach or just hands-on education, where students perform step by step experiments, but are not required to formulate and revise scientific explanations. Some teachers are familiar with the concept of the initial challenging question but are probably less familiar with the notion of encouraging the students to develop their own research question. Furthermore, whilst teachers are familiar with the role of facilitator, there is a tendency for more teachers directed learning. Training on IBSE should trigger these issues. Developing a full and informed understanding of IBSE approaches, their benefits and ways to implement them is essential, i.e. a well-informed, trained and supported staff (with materials and other resources) can drive significant change in practice. Good technical support is also required as this can help/facilitate teachers to try new things.

New ways of assessing science knowledge

Regarding assessment, it was agreed that exploring new ways of assessing science knowledge is necessity. Assessment-based constraints often placed on schools and teachers by examination systems that value subject knowledge above other aspects of science education may limit the impact of any attempts to incorporate IBSE practices in science teaching. New approaches are needed that focus not only on facts and content, but also on processes and skills. For reconnect the testing process to the on-going classroom practice, it is important to build in a good self-evaluation process for students and work on other interim evaluation tools and methodologies.

The idea of using computer gaming as assessment was raised, whereby students pass through various levels of a game, with the levels being the assessment of their inquiry skills and science knowledge. Furthermore, other ways to reward inquiry (i.e. not only concentrate on assessment) should be explored.

Increase acceptance and support by the society

Some teachers pointed out the challenge of IBSE not being perceived as the correct way to teach students and that it takes too long. The prevailing in most countries exam-based culture leads to low acceptance of IBSE, including by teachers, parents and students, many of which expect and require textbooks to be used. There is an expectation from parents and students that the role of the teacher is to tell students what they need to know to pass the exam so there may be some initial resistance for adopting IBSE.

IBSE is understood to be best applied in physics or chemistry, not so much in other natural sciences. It would be an important challenge to show the wide possibilities of IBSE and extend the viewpoint about its appropriateness and positive characteristics.

It is very important to always strongly market one's methodology, strategy and real practice with the headmasters, parents and colleagues in order for IBSE to be widely adopted into the school practice. A better communication process about IBSE should be developed to show the advantages and results of such a process.

Next steps

In order to foster the wide adoption of IBSE in Europe and beyond, during 2012 and 2013 PATHWAY will implement a large number of teacher training activities facilitating the effective introduction of inquiry to science classrooms and professional development programmes. During the implementation teachers will have access to a

unique collection of open educational resources (linked with the science curricula) that have proven their efficiency and efficacy in promoting inquiry based education.

Furthermore, PATHWAY is bringing together a network of educational communities, science centres and museums and research centres in Germany, Austria, United Kingdom, Ireland, Spain, Italy, Greece, Finland, France, The Netherlands, Belgium, Israel, Switzerland, Bulgaria, Romania and Russia in order to act as a pilot group for the project activities. At a second level with the support of European Physical Society (EPS[2]) and the European Schoolnet (EUN[3]) a greater number of teachers training centres and schools will join the PATHWAY community in order to create a pan-European network and to validate the proposed approach. These training centres are already offering training and professional development opportunities to science teachers in the different European countries. Through the support of EPS (EPS coordinates the network of the National Physical Societies in all European countries) and in the framework of the implementation of the European Science Education Academy Initiative the PATHWAY methods and activities will be integrated to the training curricula of these training centres. The PATHWAY training practices will populate the Central Information Provider (Scientix Platform[4]) that will be set up to centralise and disseminate best practices in IBSE.

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[2] www.eps.org
[3] www.eun.org
[4] www.scientix.eu

USING ICT TO PROMOTE INQUIRY-BASED SCIENCE EDUCATION

Fani Stylianidou, Sofoklis Sotiriou, Ellinogermaniki Agogi, Greece

Introduction and Background

This paper presents various ways of promoting inquiry-based science education, using ICT. There will be a brief introduction to the model of 'inquiry-based science education' (IBSE) and a presentation of the standard-based approach to teaching science by inquiry developed by the EU project 'PATHWAY'; examples showing how technology-supported learning environments can be used for the professional development of teachers in IBSE and for the development of compatible teaching activities will be demonstrated. These solutions have been developed and evaluated by different European projects on formal and informal science education.

The participants, who will have the opportunity to have a first-hand experience of these environments in relevant workshops taking place as part of the conference, will be called to talk about their experiences in the use of corresponding teaching approaches, and critically examine the applicability and effectiveness of the solutions presented to them in their own educational contexts. Finally, they will be asked to draw on their expertise and share their opinions about the role of ICT in the teaching of science.

Questions to be addressed and discussed as part of this paper presentation are:

- How do teachers use inquiry-based teaching strategies in their everyday science teaching practice?
- What kind of support would teachers need to maximise the implementation and enhance the use of inquiry-based approaches in their science classroom?
- Which future challenges will science teachers be called to address?

Inquiry-based science education and ICT

Inquiry-based science education: some essential features

The idea of teaching science by inquiry has a long history in science education. There is an equally long history of confusion about what teaching science by inquiry means and, regardless of the definition, its implementation in the classroom. Inquiry-based learning has been officially promoted as a pedagogy from improving science learning in many countries (Bybee *et al.*, 2008; Hounsell & McCune, 2003; Minner *et al.*, 2010), and since the publication of the "Science Education Now: A renewed Pedagogy for the Future of Europe" report (Rocard *et al.*, 2007) as one of the top educational goals for Europe.

'Inquiry' is referred to in the science education literature to designate at least three distinct but interlinked categories of activity: *what scientists do* (investigating scientific phenomena by using scientific methods in order to explain aspects of the physical world); *how students learn* (by pursuing scientific questions and engaging in scientific experiments by emulating the practices and processes used by scientists); and *a pedagogy*, or *teaching strategy*, adopted by science teachers (designing and facilitating learning activities that allow students to observe, experiment and review what is known in light of evidence) (Minner *et al.*, 2010; Levy & Lameras, 2011). This polysemy of the term explains partly the confusion associated with the implementation of 'inquiry-based science education' (IBSE), a term in itself used as an umbrella for various educational approaches, characterized by the differing emphasis they put on these three distinct 'inquiry' activities.

For example, Linn *et al.*'s (2004) definition of inquiry as

> *"the intentional process of diagnosing problems, critiquing experiments, and distinguishing alternatives, planning investigations, researching conjectures, searching for information, constructing models, debating with peers, and forming coherent arguments".* (p4)

seems to put the emphasis on *what scientists do*, whereas the US National Research Council's definition as

> *"a set of interrelated processes by which scientists and students pose questions about the natural world and investigate phenomena; in doing so, students acquire knowledge and develop a rich understanding of concepts, principles, models and theories...and learn science in a way that reflects how science actually works"* (NRC, 1996: p214, cited by Krystyniak & Heikkinnen, 2007).

shifts the emphasis to *how students learn*, highlighting however the close connection between inquiry as scientific practice, and inquiry as student learning.

Inquiry-based science education has also been described as teaching and learning science *as inquiry* and *by inquiry* (Tamir, 1985; Chiappetta, 1997; Zion *et al.*, 2004). Learning science *as inquiry* includes learning about the way in which the scientific endeavour progresses, and analyzing the inquiry process performed by others, sometimes using historical perspectives (Bybee, 2000; Schwab, 1962). Learning science *by inquiry*, on the other hand, involves the learner in raising research questions, generating a hypothesis, designing experiments to verify them, constructing and analyzing evidence-based arguments, recognizing alternative explanations, and communicating scientific arguments (Tamir, 1985).

The EU-funded project PATHWAY (short for 'The Pathway to Inquiry Based Teaching'), on which this paper draws has as one of its foremost objectives to develop a standard-based approach to inquiry pedagogy that outlines instructional models that help teachers organise their instruction effectively. In it our focus is on inquiry as an active learning process engaged in by students and modelled on the inquiry practices of professional scientists (Anderson, 2002), and as a pedagogical approach that has philosophical and theoretical roots in the work of theorists including John Dewey and Jean Piaget and in the constructivist educational paradigm (Levy & Lameras, 2011). Moreover, the PATHWAY's approach is concerned mainly with learning and teaching science *by inquiry*, and is based on the fundamental principle that the best teaching strategies are those that help accomplish the learning outcomes that a teacher has set for his/her students. Therefore and in line with much of the contemporary literature on IBSE, the framework adopted by PATHWAY identifies three broad categories of learning outcomes for IBSE practices:

- Understanding of subject matter;
- Development of competencies necessary to do scientific inquiry (at less and more advanced levels);
- Development of understandings about the nature of scientific inquiry.

The latter category has arisen to the top list of learning outcomes only in the last 10 years, as the science education community had to rethink the priorities of science education in the 21st century. However, it is a set of goals, still not typically encountered in all European science curricula, or at least not encountered in a systematic way in terms of how they are pursued and assessed. The PATHWAY framework acknowledges the need for science teaching to bestow students with the knowledge and ability to engage in inquiry but also with an understanding of inquiry and of how inquiry results in scientific knowledge.

The PATHWAY approach therefore supports the prevailing view that inquiry is a flexible pedagogy that allows teachers to tailor their approaches to the desired learning outcomes and specific circumstances of different classroom contexts. And because these learning outcomes are diverse and vary according to the age of the learners, highly structured and more open-ended inquiries both have their place in science classrooms.

Having defined inquiry in part as a set of student learning outcomes, the US National Research Council report on *Inquiry and the National Science Education Standards* (NRC, 2000), also identified five essential features that characterise learners' behaviour in an inquiry-oriented classroom and that apply across all grade levels. These are:

- Learners are engaged by scientifically oriented questions.
- Learners give priority to **evidence,** which allows them to develop and evaluate explanations that address scientifically oriented questions
- Learners formulate **explanations** from evidence to address scientifically oriented questions
- Learners evaluate their explanations in light of alternative explanations, particularly those reflecting scientific understanding
- Learners communicate and justify their proposed explanations. (p25)

Teaching approaches and instructional materials that make full use of inquiry include all five of these essential features. However, each of these essential features can vary and the NRC report describes variations across a continuum of increasing amount of structure and guidance a teacher or the instructional materials provide for learners engaged in inquiry, or, in other words, of decreasing amount of learner self-direction (NRC, 2000: p29).

As previously mentioned PATHWAY is also concerned with outlining instructional models for teachers to help them organise and sequence inquiry-oriented learning experiences for their students effectively.

> *"An instructional model incorporates the features of inquiry into a sequence of experiences designed to challenge students' current conceptions and provide time and opportunities for reconstruction, or learning, to occur"* (Bybee, 1997, cited by NRC, 2000).

All such instructional models should incorporate the essential features of inquiry. The US National Research Council's report (NRC, 2000) once more specified that the common components shared by instructional models of inquiry are:

- Phase 1: Students engage with a scientific question, event, or phenomenon. This connects with what they already know, creates dissonance with their own ideas, and/or motivates them to learn more.
- Phase 2: Students explore ideas though hands-on experiences, formulate and test hypotheses, solve problems, and create explanations for what they observe.
- Phase 3: Students analyse and interpret data, synthesize their ideas, build models, and clarify concepts and explanations with teachers and other sources of scientific knowledge.
- Phase 4: Students extend their new understanding and abilities and apply what they have learned to new situations.
- Phase 5: Students, with their teachers, review and assess what they have learned and how they have learned it. (p35)

Designing ICT that promotes inquiry-based science education

Successful inquiry learning flows from purposeful engagement with inquiry tasks, in a challenging and supportive learning environment. Moreover, there is strong and consistent evidence across many studies that provision of appropriate support is essential for productive inquiry learning. Technology-supported learning environments have provided interesting solutions in this respect. An article by Bell *et al.* (2010) offers a useful overview of these solutions at secondary school level; it reviews a range of computer environments and tools that have been developed, and summarises beneficial impacts on student learning. In this paper we will present an online learning environment, which has been developed in the framework of recent European projects [COSMOS (2007-2009); Learning with ATLAS at CERN (2008-2010); OpenScienceResources (2009-2012)] for designing structured educational scenarios of inquiry by science teachers.

More precisely, this learning environment provides science teachers with a template for designing and describing inquiry-based learning activities. This template provides a structure of steps which directly refer to the above five essential characteristics of desired pupil behaviour shared by all the instructional models of inquiry (Table 1):

Table 1 Template for Describing an Inquiry-based Educational Scenario

Phase 1: Question Eliciting Activities	**Exhibit curiosity** The teacher tries to attract the students' attention by presenting to/showing them appropriate material. **Define questions from current knowledge** Students are engaged by scientifically oriented questions imposed by the teacher.
Phase 2: Active Investigation	**Propose preliminary explanations or hypotheses** Students propose some possible explanations to the questions that emerged from the previous activity. The teacher identifies possible misconceptions. **Plan and conduct simple investigation** Students give priority to evidence, which allows them to develop explanations that address scientifically oriented questions. The teacher facilitates the process.
Phase 3: Creation	**Gather evidence from observation** Teacher divides students in groups. Each group of students formulates and evaluates explanations from evidence to address scientifically oriented questions.
Phase 4: Discussion	**Explanation based on evidence** The teacher gives the correct explanation for the specific research topic. **Consider other explanations** Each group of students evaluates its explanations in light of alternative explanations, particularly those reflecting scientific understanding.
Phase 5: Reflection	**Communicate explanation** Each group of students produces a report with its findings, presents and justifies its proposed explanations to other groups and the teacher.

The rationale is that the use of this template promotes inquiry-based science education, since if science teachers are to use it to construct and describe their scenarios, they have to re-structure their lessons in ways which promote inquiry-based science learning. So as a tool, by itself, supported by the necessary supporting material, this template is seen as encouraging the adoption of IBSE by providing support to science teachers and scaffolding their use of IBSE in their classrooms.

Furthermore, the online availability of this template and of the educational scenarios produced with it, in repositories of digital content (http://www.cosmosportal.eu/cosmos/en; http://www.learningwithatlas-portal.eu/en; http://www.osrportal.eu) which has been annotated with standardized educational metadata, encourages the creation of communities of practitioners of IBSE, thus strengthening the sharing of good practice

Finally, the inclusion in these repositories of learning objects originated in major research science centres and/or science museums greatly enhances the role of these learning environments in promoting IBSE, as they help establish links between the science classroom and the worlds of scientists and informal learning respectively.

Future questions and challenges

We all know that teachers hold the key to the implementation of any educational change. Inquiry-based science education however, poses unique and complex challenges for the teacher. It is very important that teachers change their traditional roles and adopt successfully their new roles. What kind of difficulties however teachers face in this change? How do teachers support a deep understanding of the basic concepts of science by their students? How do they create learning environments, which support inquiry-based learning? Finally, how do technology-based learning environments facilitate this adaptation? These questions will be posed and discussed as part of this conference paper.

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SCAFFOLDING IN MATHEMATICS AND SCIENCE HIGHER EDUCATION

Konstantinos Korres, Sarantos Psycharis, School of Pedagogical and Technological Education – ASPETE,
Evi Makri-Botsari, M.A. in Education, Greece

Abstract

Scaffolding provides support to learners in narrowing the gap between what they can do themselves and what they can do under guidance. A very powerful idea is the concept of computers as cognitive tools that can be used as intellectual partners of the students in creating scaffolding towards meaningful thinking. Software–realized scaffolding includes conceptual aspects of scaffolding and different scaffolding techniques implemented in software. In this paper we study the issue of software-realized scaffolding in Mathematics and Science Higher Education, using the methodology of the computational experiment implemented in Mathematica. Also we present a case study concerning the application of the computational experiment at the School of Pedagogical and Technological Education (ASPETE) in Athens, Greece. Research results are discussed concerning the computational experiment's impact on students' learning performance. Also the students' views on Mathematica's characteristics and on the characteristics of the computational experiment are discussed.

Keywords: Computational experiment, Cognitive tools, Mathematica, Higher Education, Mathematics Education, Science Education

Introduction

According to de Jong [1], inquiry based learning is defined as "an approach to learning that involves a process of exploring the world and leads to asking questions, making discoveries and rigorously testing those discoveries". Research indicates that computer learning environments can support constructivist and exploratory learning [2]. A very powerful idea is the concept of computers as cognitive tools, where as pointed out by Jonassen [3], computer–based tools can be used as intellectual partners of the students, in creating an intellectual scaffolding towards meaningful thinking.

Scaffolding provides support to learners in narrowing the gap between what they can do themselves and what they can do under guidance. Software–realized scaffolding, as introduced by Guzdial [4], includes conceptual aspects of scaffolding and different scaffolding techniques implemented in software.

In section 2 a theoretical framework is presented including the principles of the computational experiment and the concept of scaffolding. In section 3 scaffolding using the computational experiment is presented. In section 4 the methodology of a case study is presented, concerning the application of the computational experiment at the School of Pedagogical and Technological Education (ASPETE) in Athens, Greece. In section 5 research results are presented concerning the computational experiment's impact on the students' learning performance and the students' views on Mathematica's characteristics and the characteristics of the computational experiment.

Theoretical framework

Computational science is a quickly emerging field at the intersection of Science, Computer science and Mathematics because much scientific investigation now involves computing as well as theory and experiment [5], [6]. According to Sloot [7], one of the crucial components of that research field is the correct abstraction of a physical phenomenon to a conceptual model and the translation into a computational model that can be validated. This leads us to the notion of a computational experiment where the model and the computer take the place of the "classical" experimental set-up and where simulation replaces the experiment as such.

Sloot [7] identifies three major phases in the process of the development of a computer experiment:

1. The modelling phase: The first step to simulation is the development of an abstract model of the physical system under study.
2. The simulation phase: This refers to methods that make the underlying physical models discrete in time or stochastic.
3. The computational phase: In this phase we concentrate on the mapping of the simulations techniques to source code including algorithms.

Landau, Paez and Bordeianu [8] suggest an approach similar to Sloot's approach, which takes the form:

1. Problem (from science)
2. Modelling (discrete, continuous)
3. Simulation Method (time driven, event driven, stochastic)
4. Implementation (Mathematica, Fortran etc)
5. Assessment and Visualization/exploration

Scaffolding provides support to learners in narrowing the gap between what they can do themselves and what they can do under guidance [9]. Scaffolds, taking many formats, provide assistance taking into consideration the individual characteristics of each learner, as the amount of assistance he / she needs or the specific difficulties he / she faces.

According to Rogoff [10] and Palincsar [11] there are three critical types of support which are combined to provide scaffolding:

1. The communicating process: The expert–agent communicates a process to the apprentice by demonstrating the process with verbal annotation to highlight key points, creating specific presentations which take on many formats (e.g. a simulation environment), in such a way that the master is providing necessary knowledge for the apprentice who is about to undertake the very same process.
2. Coaching: When the apprentice is attempting the action or goal, the expert-agent watches and makes comments, provides hints etc [10].
3. Eliciting articulation: The expert–agent occasionally asks the apprentice to articulate key concepts about the apprentice's action or goal in order to enhance the cognitive activity of reflection [12].

Scaffolding using the computational experiment implemented in Mathematica

Computer learning environments, if appropriately designed, can support constructivist and exploratory learning [2]. Especially simulation–based learning involves learning performed in a computerized environment, in which the learner interacts with the entities of the environment and gradually infers the features of the concept model whilst he/she proceeds through the simulation, which may lead to changes in his/her original concept [13].

According to van Joolingen and de Jong [13], simulations designed for education should have scaffolds to assist students in making the learning experience effective. Scaffolding can take the format of step-by-step directions, small assignments that break the task down in order to help students while they work with a simulation, etc. This could lead to effective experimentation through the simulation, to the expression of hypotheses, the development of predictions etc.

A cognitive tool that can be used as scaffolding software is Mathematica, mainly because [14], [15]:

1. Its operations' notation and objects are similar to the standard mathematical and science notation.
2. It has a function–based structure, which allows to define and study objects and quantities as real functions and
3. It offers possibilities in plotting graphs easily, quickly and precisely and in making complex calculations accurately.

Shunn and Klahr [16] and Klahr and Dunbar [17] in order to describe discovery learning as a search process, introduced spaces in scientific discovery learning that include the hypothesis space and the experimental space. In their model the hypothesis space contains all rules and variables describing the specific domain while the experiment space consists of all experiments that can be implemented within this domain.

The design and implementation of electronic worksheets in Mathematica containing the phases of the computational experiment are proposed in Kyriazis, Psycharis and Korres [18]. These electronic worksheets should include:

4. The hypotheses space, where the students in cooperation with the teacher, decide, clarify and state the hypotheses of the problem to be studied.
5. The experimental space, where the computational experiment actually takes place that includes simulation-based discovery learning activities that students construct for the problems under negotiation.
6. The prediction space, where the results, conclusions or solutions formulated in the experiments space are checked with the analytical (mathematical) solution.

Scaffolds in all three spaces may have the format of static and dynamic representations (animations), hints and explanations concerning theory, the software programs and commands and the mathematical methods involved, questions by the students, activities that the students should be involved in individually or in groups etc.

Methodology of the case study

Thirty first-year or second-year students of ASPETE participated in the case study, attending the course "Pedagogical Applications of Computers". The students' participation was on a voluntary basis and the questionnaires were answered anonymously, with the only personal data filled in at the questionnaires being the registration number of the students, for the correspondence of pre and post questionnaires for each student.

Regarding gender, 40 % of the students were males and 60 % females. The students had mean age 20.11 with standard deviation 2.097. The students were experienced in using computers, since 63.3 % stated that they make use of computers for more than three years, 26.7 % one to three years and only 10 % less than one year.

The students attended the experimental program in two groups of fifteen students. The program for each group had duration 6 hours. The lessons took place in the computer laboratory, with the students working in groups of 2 students per computer.

The cognitive subject selected is oscillation synthesis, a subject that all students have been taught both in high school, but also in the students' studies in ASPETE. In this way differences in students' scores in the two tests before and after the application of the approach can be attributed to the approach.

Two questionnaires were designed and implemented, being handed out to the students the first before and the second after the application of the approach.

The first questionnaire included two parts: The first part aimed at gathering general information regarding the students that participated (in particular gender and their experience in using computers). The second part aimed at evaluating students' understanding of the cognitive subject taught before the approach (given a score from 1 to 10).

The second questionnaire included three parts: The first part aimed at evaluating students' understanding of the cognitive subject taught after the approach (given a score from 1 to 10). The second part aimed at gathering information regarding students' views on Mathematica's characteristics concerning its easiness to use, its formalism (symbolism and commands), its dynamic potential and its transferability (including four questions graded in a 5–point Likert scale). The third part aimed at gathering information regarding students' views on the characteristics of the computational experiment, concerning the students' interest and attention, the supporting of students' active engagement (active participation, discussion with their peers and the teacher) and the qualitatively enhancement of the lesson compared to narration based instruction (including seven questions graded in a 5–point Likert scale).

Results

The students' scores before and after the application of the approach present significant differences since the students before the approach had mean score 3.30 with standard deviation 2.806, while after the approach they had mean score 6.03 with standard deviation 2.512 (see Table 1). These differences can also be validated by the results of the Inferential Analysis and specifically via the Paired Samples t–test. The paired samples t–test has as a precondition the differences of the values of the students' scores before and after the approach to come from a population with normal distribution. One Sample Kolmogorov–Smirnov test for the differences di = Score(post)i – Score(pre)i, i=1(1)20, showed: Z = 0.903, p = 0.389, so the precondition of paired samples t–test is satisfied.

The paired samples t–test showed that Pearson's correlation coefficient is r = 0.865, p < 0.001, so there is a strong linear correlation between the two variables. The mean value of the differences between students' scores equals to –2.73, with the corresponding 95% confidence interval to be from –3.26 to –2.21. Since the confidence interval does not contain the value 0, there is difference in the mean scores of the students, with 0.05 probability of error. The value of t–test is t = –10.598, df = 29, p < 0.01, with the negative sign stating that the mean value in students scores before the approach is lower than the mean value of the scores after the approach.

By observing the students' scores distributions (see Table 2), we can conclude that the approach had a positive impact in students' passing grades (5 and above), in particular 36.7 % scored 5 and above before compared to 60 % of the students after the approach. Also the approach had a positive impact in higher grades (8 and above), showing percentages 6.7 % compared to 33.3 % and in excellent grades (9 or 10), with percentages 0 % compared to 13.3 %.

Table 1 Descriptive measures for students' scores.

	N	Min	Max	Mean	St. dev.
Score (pre)	30	0.0	8.0	3.30	2.806
Score (post)	30	2.0	10.0	6.03	2.512

Table 2 Distribution of students' scores.

Students' scores	Score (pre) (%)	Score (post) (%)
0	36.7	0.0
1	0.0	0.0
2	0.0	10.0
3	3.3	3.3
4	23.3	26.7
5	13.3	3.3
6	10.0	6.7
7	6.7	16.7
8	6.7	20.0
9	0.0	0.0
10	0.0	13.3
Total	100.0	100.0

Students' views on the characteristics of Mathematica were positive. The students' views were positive at higher percentage regarding the software's dynamic formalism (76.7 %). At lower percentages the students' views were positive regarding the software's simple formalism (56.7 %), whether it is easy to operate (53.3 %) and whether it is generalizable (53.3 %). We must note the extremely low percentages of students' negative views on the characteristics of the software, varying from 0 % to 16.7 % (Table 3).

Table 3 Students' views on the characteristics of Mathematica.

	1 = Not at all	2 = Barely	3 = A little	4 = A lot	5 = Very much
1. Is the software easy to operate?	0%	0%	46.7%	50%	3.3%
2. Are the software symbolism and commands simple?	16.7%	0%	26.7%	56.7%	0%
3. Can dynamic representations be constructed, that can change easily accordingly to the change in parameters?	0%	0%	23.3%	36.7%	40%
4. Can the software be used in more than one cognitive domain?	0%	6.7%	40%	43.3%	10%

Students' views on the characteristics of the computational experiment were very positive. The students' views were positive at higher percentage regarding their support by the approach in discussing with their teacher (100 %). At also very high percentages the students' views were positive regarding drawing their attention to the lesson (86.7 %), providing support in discussing with their peers (86.7 %), offering more than narration–based instruction (83.3 %), provoking their interest for the concepts taught (80 %), providing support in better understanding of the concepts taught (80 %) and supporting their active participation in the lesson (70 %). We must note here also the extremely low percentages of students' negative views on the characteristics of the software, varying from 0 % to 10 % (Table 4).

Table 4 Students' views on the characteristics of the computational experiment.

	1 = Not at all	2 = Barely	3 = A little	4 = A lot	5 = Very much
1. Did the approach provoke your interest for the concepts taught?	0%	3.3%	16.7%	36.7%	43.3%
2. Did the approach draw your attention to the lesson?	0%	6.7%	6.7%	60%	26.7%
3. Did you participate actively to the lesson?	0%	0%	30%	50%	20%
4. Did the approach support you in discussing with your peers?	0%	0%	13.3%	60%	26.7%
5. Did the approach support you in discussing with your teacher?	0%	0%	0%	43.3%	56.7%
6. Did the approach support you in understanding better the concepts taught?	0%	10%	10%	60%	20%
7. Does the approach offer more than narration–based instruction?	6.7%	3.3%	6.7%	43.3%	40%

Conclusions

Based on the theoretical analysis and the results of the case study, we can conclude that Mathematica can be characterized as very powerful scaffolding software. Also we can conclude that the computational experiment, implemented in well established software as Mathematica, can provide the necessary scaffolds to Mathematics and Science students, in order for them to develop both knowledge and skills more effectively.

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A RELIABLE, EFFICIENT, AFFORDABLE AND USER-FRIENDLY APPROACH FOR ONLINE ASSESSMENT IN DISTANCE EDUCATION

Haleh Mardanian, Peter Mozelius, Stockholm University, Sweden

Abstract

In the assessment of the students in higher education, cheating and plagiarism have always been of major problem. This problem is also a rapidly growing phenomenon in Sweden. The number of students suspended from courses in tertiary education increased by 56% in 2010 and the plagiarism has been the most common violation. Online distance courses with students spread out geographically need online assessment approaches to save time and avoid travel expenses. E-learning and distance education have during a long period been criticized for the overuse of *"True/False tests"* and Multiple Choice Questions (MCQ) tests. To assure deep learning we want to promote the idea of open ended project assignments where students can practice techniques from the course content in real world applications. To verify authentication and avoid plagiarism we have developed a low cost approach that we have tried to make user-friendly and efficient. The aim of this article is to describe and discuss how our video conference presentation approach for online assessment in distance courses could be conducted in a reliable, efficient and affordable manner. Course content and the assessment approach were developed in parallel iteratively during the first half of 2011. Ideas and techniques have been discussed with colleagues and students before the course starts. Technically the presentations worked perfectly, but on slow Internet connections the video transfer was not clear and the voice was not synchronized with the video. From a psychological perspective the presentations were a bit stiff and formal but that is often the case in other forms of assessment and authentication as well. Findings show that the approach is a very reliable and accurate way of assessment in a sense that the teacher can see and hear the student while he is presenting his work and also saves time and travel costs for students and teachers. We do not think that any courses ever will be 100% protected from plagiarism and no model for assessment will ever make all students happy. But we find our approach to be secure enough for university courses and that it does not make the students more uncomfortable and stressed than what the case is in traditional written exams.

Keywords: Online assessment, Plagiarism, Distance education, E-learning, Technology enhanced learning

Introduction

Cheating and plagiarism in higher education assessment are global problems and rapidly growing phenomena in Sweden. In 2010 the number of students suspended from courses in tertiary education increased by 56% and the most common violation is plagiarism (Tenfält, 2011). But plagiarism is not the only problem of dishonesty in assessment (Rowe, 2004) and new technology has opened up new ways of cheating. Internet connectivity is not only a problem in online assessment and small handheld devices are often found at traditional written exams (Tenfält, 2011). In distance-learning programs traditional paper-and-pencil assessment of students can be the choice but with the fast expansion of online tools and virtual learning environments it is appealing to think that technology can be both the teaching medium and the examination tool. (Rowe, 2004) Traditional written exams at universities are nearly always supervised but in distance courses there is often no full equivalence.

Statistics reported in a study that was conducted in the United States shows that 70% of American high school seniors have been cheating at least once and out of that group 95% were never detected (Dick et al, 2003). In the United Kingdom a study done amongst students at two pharmacy schools shows that 91% in one pharmacy school and 80% in the other school had taken part in at least one case of what could be classified as academic dishonesty (Hart and Friesner, 2004). Cheating in education is not a new 21th century phenomenon (Cizek, 1999), and neither it is an unusual behavior (Lathrop and Foss, 2000). It seems to be in the human nature that almost everyone lies occasionally (Ford, 1996) and various forms of assessment need their specialized control mechanisms. Neither in e-learning frequently used, are Multiple Choice Question (MCQ) tests without fraud risks. (Rowe, 2004)

E-learning and distance education have been criticized for the overuse of *"True/False tests"* and MCQ tests. True/False tests must be seen as poor assessment since it leaves the students with a 50-50 guessing opportunity (Dikli, 2003). MCQ tests in combination with minus marking can improve the test quality but one main reason for the overuse of this kind of exams seems to be that:

> *"They are fast, easy, and economical to score. In fact, they are machine scorable." (Dikli, 2003)*

MCQ tests and True/False tests are also available as built-in features in learning management systems as Moodle, Blackboard and Web CT, and could be seen as time and money savers for teachers in time trouble on e-learning programmes with limited budgets. To solely rely on this kind of auto-assessment is not a good guarantee for the provision of deep learning that always must be an objective in higher education. Online virtual learning environment platforms often provides features with a systematic approach to assessment but the online assessment techniques should be used to support variation and an overall assessment strategy for the specific course. (Runyon and Von Holzen, 2005)

Built-in online auto-testing is a handy opportunity but to assess a project assignment entirely with MCQ testing is not consistent with the basic principles on deep learning and quality assurance in tertiary education. In this paper we will try to analyse how the different sections in a distance course on web programming could be assessed in a reliable way without being too costly, time consuming or violating the student's integrity.

Aim

The aim of this paper is to describe and discuss how online assessment could be conducted in a reliable, efficient and affordable manner for projects in distance courses.

Extended Background

E-learning has for different reasons been expanding rapidly in many regions around the world in the 21st century. But a fast expansion is hard to combine with high quality and individual student adaption. Quality assurance in traditional learning has never been implemented without efforts or costs, and the same goes for high quality e-learning. (Mozelius and Hatakka, 2009) In some countries e-learning has been promoted as a model to increase the intake to secondary and tertiary education (Mozelius et al., 2011) and in other parts of the world with the main goal to make profit. In Sweden, a large country with a small population, one of the main objectives has been to create a big national *smorgasbord* where students from all over the country can search, register and take courses in a lot of different subjects from different Swedish universities. The Swedish *Nätuniversitet/The Net University* has its own web portal called *Studera.nu*. The usability and the user-friendliness of the web portal have been criticized but the distance courses are a popular alternative to traditional learning. (Studera.nu, 2011)

Distance Education

Measured by academic standards, the 150 years of distance education theory and practice is not an old discipline, but studying at a distance is far older than the use of e-learning and the Internet (Anderson and Elloumi, 2004). Neither is the idea of technology enhanced learning concept in 21st century. Media like radio, television and video have been widely used in 20th century learning. But it is now in this century, in the so called *5th generation* of distance education that the individual one-to-one communication between students and a teacher can be extended to web based mass discussions and collaborative learning. New platforms like learning manage systems and virtual learning environments with digital content and e-learning tools have made the field of distance education complex and in a state of constant development. However the new increased complexity could never be an excuse for inaction. (Anderson and Elloumi, 2004)

Systems thinking in distance education have a long tradition but in the new computer and internet based e-learning there are improved opportunities to provide multimedia content with individual opportunities for students with different learning styles (Moore, 2007). A clear structure is seen to be more important in distance education than in traditional face-to-face learning and the natural dialogue between teachers and students in traditional learning needs new web based counterparts. Regarding structure and dialogue distance education programmes can be categorized into:

1. Programmes with no structure and no dialogue
2. Programmes with structure but with no dialogue
3. Programmes with structure and dialogue
4. Programmes with no structure but with dialogue (Moore, 2007)

Most people involved in modern distance education would definitely prefer 3).

Online Assessment

The theory of distance education has thoroughly been scrutinized and evolved by skilled researchers where issues like pedagogy, technology, content development and student support have got their own chapters in thick exhaustive books. But there are seldom any chapters on online assessment or web based examination. (Moore, 2007) (Anderson and Elloumi, 2004)

However, assessment is a crucial issue in e-learning instructional design and in the educational community teachers, students, parents, administrators and policymakers, will have different ideas regarding assessment strategies. Some believe in traditional assessment methods and others think that alternative assessment tools are superior. (Dikli, 2003) Online assessment must not necessarily follow the typical methods of traditional campus assessment. If course instructors in a virtual learning environment should have the role as mentors as well as content deliverers there is a need for new assessment techniques. (Runyon and Von Holzen, 2005) Consider the main characteristics of distance learners, alternative assessment techniques seem to be more beneficial (Dikli, 2003) and in Swedish distance courses with students spread out in a country that measure 1800 km from South to North traditional campus examination could be a complement but not the default assessment.

Online assessment should not only be a one way process where the students get grades and feedback. The process should also be a channel for feedback to the course instructors. Traditional and new methods could be combined in a diverse array of assessment techniques that are aligned to the learning outcomes of the actual course. (Runyon and Von Holzen, 2005) Summative and formative assessment in an online course could be a combination of:

- MCQ tests automatically handled by a virtual learning environment
- Term papers or essays analyzed by the course instructors
- Individual or group assignments sent by email or posted in digital dropboxes
- Oral or written tests conducted in the presence of the instructor or through videoconferences (Dikli, 2003)

Cheating and Plagiarism in Online Assessment

Cheating is not a new phenomenon in education and probably has always been the case but there are some reports indicating that cheating increased significantly during the second half of the last century. (Cizek, 1999) A wide variety of illegitimate activities can be classified as cheating but plagiarism has been defined by Jude Carrol as when: *"someone else's work should be passed off , either intentionally or unintentionally as one's own in order to gain some benefit."* (Hart and Friesner, 2004)

To combine distance education with traditional assessment is not the optimum when the course participants are widely spread geographically. In online courses the assessment is often executed online and with constant Internet access there are new and increased channels for cheating and plagiarising. There seems also to be a relation between the distance and the tendency to cheat. In distance education with students living far away from the university, the feeling of being distant and anonymous increases and so does the tendency to cheat. (Rowe, 2004) In the new computer based learning environment there is a new faster way for plagiarising by copying and pasting large chunks of text (Hart and Friesner, 2004). On the other hand there are new digital detection tools as well but it can be discussed if "*the catch and punish approach"* is the best model in the long run. (Carrol, 2000)

A less punishing and more prophylactic manner could be to individualise assignments and project should have multiple solutions where the result could be seen as a personally created artefact (Carroll and Appleton, 2001). In courses on software engineering this is an accepted standard but still the problem of plagiarism remains. The present challenge in e-learning could be seen as how to use new online technology to develop new patterns of

teaching and assessment (Hart and Friesner, 2004) and at the same time try to design new environments for virtual learning that are less anonymous and distant.

The Skype Software

Since the introduction in 2003 Skype has gained a world-wide popularity with millions of users (Chen et al., 2006) Skype is a peer-to-peer application for online communication that originally was based on the use of *instant messaging* (IM), *Voice over the Internet Protocol* (VoIP) and with functionality for file transferring. Later the software has been extended with different features where video conferencing by web cameras might be the most popular functionality. The software was initially designed and developed in Sweden and Denmark by Nicklas Zennström and Janus Friis. Part of the success can be explained by the user-friendliness of the product and that provides better voice quality than similar communication tools (Baset and Schulzrinne, 2004). Skype is relatively easy to download, install and use and once the Skype client is installed on the computer the system enables free online conferences and calls between Skype users.

In 2005 Skype was sold to the American company eBay for $2.6 billion in cash plus additional eBay stock shares (Skype Online, 2005). Six years later Skype was bought by Microsoft for $8.5 Billion and one of the main reason for the purchase might be to use the software in the mobile operating system *Windows Phone 7*. (Gigaom, 2011) Under the present ownership various Skype versions for use in mobile phones are sold as subscriptions and the earlier free functionality for group video conferences is only available in the Skype Premium edition where the monthly fee currently is €5.99. There are also nation based prices for sending SMS and possibilities to have *Skype Credit* linked to your credit card. But still it is possible to download and use a free version with features for:

- Skype-to-Skype calls
- Screen sharing
- One-to-one video calls
- Instant messaging (Skype.com, 2011)

But that the present free version of Skype contains several menu items for non-free features.

Web Development with C# and .NET – A Summer Course at the Stockholm University

Nowadays most companies aim to provide different types of services to make higher profit and customer satisfaction. Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM) systems and a lot of other kinds of web services and systems that are being developed are helping organizations to attain their goals and objectives. Therefore a high demand for web application development in the industry exists and due to the dynamic nature of the industry innovation responsiveness of the web applications are of importance. This has been the main reason that the web development with C# and .net course was planned and designed at Stockholm University and the main goal was to prepare the students for greater programming challenges, plan for their desired occupation and enable them to enter the industry.

All lectures and tutorials in the course have been recorded and provided as streaming videos in the course virtual learning environment (Moodle). In the course outline every week has its own theme with a lecture, some examples and two aligned assignments. The summative assessment is in most course sections a MCQ followed by a programming assignment for the formative assessment. Students are recommended to watch the videos of each of those topics, read the relevant chapters from the course literature, complete the quiz and finally solve and hand in the assignment. In this way they will step by step be prepared for a larger and more complex challenge in the final project. The final project is also the examination that sets a course grade between A to F according to the Bologna model.

For their final project the students should use and combine all the techniques that they have learnt earlier in the various course sections. Before implementing anything they must deliver a proposal explaining what type of web application they want to develop and describe its features and functionalities. This proposal should be approved by the teaching team to ensure that it meets the minimum requirement for a final project. After the approval they can start to develop their web application. They will have to submit their final project before the specified deadline and prepare for the presentation of their project. All teaching and learning activities are conducted by distance since the student group consists of persons living all over Sweden.

Methodology

The course content and the assessment approach were both developed and tested iteratively during the first half of 2011. Ideas and techniques have been discussed with colleagues and students before the course start in early June. The described assessment approached were presented early in the course and discussed with students in the Moodle built-in discussion fora before we decided to make it the default model for the project presentations. The Skype software has been tested and compared with other tools for online video conferencing. Students have been asked questions in the virtual learning environment during the course as well as in the official questionnaire for course evaluation after the presentations were done.

The Online Assessment Model

Final projects are important components in some courses of ICT programs as part of the course assessment. One of the reasons that students have to complete these projects is to assess the level of their gained knowledge and skills in applying the knowledge to produce a good quality project. Most of these final projects demand a presentation in which students exhibit their expertise and proficiency in the work that was assigned to them. Student presentations in the C# course have three aims: *first* to ensure that the student has achieved the required knowledge to complete the final project and *second* to make sure that no plagiarism has been involved in the accomplishment of the work. The *third* aim is to provide an opportunity for the students to improve their presentation and discussion skills.

To provide the online presentation in the C# course we utilized the Skype video conferencing software. As it is explained in section 2.4 Skype provide voice and video conferencing facilities that due to its high quality of sound and video transmission has been selected as a tool for the online assessment of the final projects. To present their final projects students has to fulfil these activities:

1. **Book a presentation time slot.**
   The first step to present the final projects is to book a presentation time. For this purpose we have created a wiki which contains a table of available time slots on specific dates and times of the presentation week. The students can easily pick a time slot and register their names for their presentation.
2. **Make sure that they have minimum required internet connectivity for video conferencing.**
   To present their final projects, students should make sure they have minimum required internet connection to be able to use online video conferencing software without any interference and disconnectivity.
3. **Make sure that they are equipped with good web camera, microphone and speakers.**
   Beside good quality computer and internet connection, video conferencing requires equipments such as web camera speakers and microphones to be able to interact with the teacher, show their face, their identity, answer questions and present their project. Most of the students are equipped with web camera, speakers and microphones. But in case they miss one or more of these devices, they can borrow from the school and the device will be sent to their home address without any fees if the device is returned in good condition
4. **Install and test Skype application on their computers.**
   The application which is recommended to be used in the course is Skype and the students should download this application and install it from: http://www.skype.com/intl/en-us/get-skype/ It is recommended that the students test the installed application and customise its settings to be ready to use it for their presentation.
5. **Prepare a valid identity card or passport.**
   In order to check the student's identity they need to show their identification card or passport to the teacher via the web camera.
6. **Prepare to present their work and answer the questions in their selected time slot.**
   Presenting large and complicated projects in short time slots is a hard mission. The students need to be prepared to present their work and answer the questions that the teacher will ask them. They need to be time efficient in the matter of presentation and discussion.

The Skype presentation starts when the teacher sends a short message to the student that has booked the current time slot for his/her presentation checking if the student is ready to present. When the teacher gets the approval from the student they start the video call. The duration of presentation is 20 minutes for each of the students and they should allocate 10 minutes for presenting the application and 10 minutes for questions and discussions.

The conversation starts with the student identification followed by the project explanations. After the explanation the student will be asked some questions where he/she needs to defend and explain his/her solution. This kind of presentation was new for all of the students who presented their final project in the course. The remaining 10 minutes the teacher is asking more detailed questions about the specific solution and the students have to answer and defend their solution. This ensures that the solution has been developed by the students themselves and that he/she has a good knowledge about the structure and the techniques in the application that he/she has developed.

Findings and Discussions

The first 10 minutes when the students were explaining their project seemed to be comfortable and easy for most of them. During that time slot they were explaining how they have developed their application and what kinds of features and functionality the application has. This was giving them confidence to speak and made them very comfortable and at the same time they were getting used to the presentation environment which was Skype video conferencing in this case. However the presentations were very strict and the students were trying to follow the structures and respect the rules. Some of the students were speaking in a formal way and their presentation was very formal to be a video conferencing meeting and some other students were presenting their work in a more informal way where the self-confidence and awareness about their work could be observed in their attitude and way of presentation. It was also observed that in the beginning of the presentation very few of the students felt stressful and it could be seen and heard in their intonation and way of speaking but it still is in the teacher's role to melt the ices. Moreover stress has often been the case in traditional face to face presentations in a class room and in comparison we don't find that the Skype tool has put any extra pressure on the students when they are presenting.

90% of the students had high speed and good quality internet connection which facilitated their presentation with excellent video and voice transfer. The video and voice in their case was understandable and clear. A technical issue regarding bad Internet connection was experienced with one of the students. In his case the screen that he was sharing was not clear and his voice was not synchronized with his video. To solve this issue to choose a better connection was the option for him. These cases reveal that Skype presentation is only applicable for those who have access to high quality/speed internet connections. None of the final presentations showed any signs of plagiarism except for the fact that it is hard to verify if students from other universities are reusing earlier project ideas from other course assignments. But what is clear here is that as long as the student has good knowledge about what he has provided, it is acceptable to re-use other's codes in the case of this course as the new trend toward reusing the wheel instead of inventing the wheel is becoming popular in programming courses. Throughout the Skype presentation the teacher could get the feeling that which student has done what part of his code himself and if the teacher was suspicious about a code section, he could ask for explanation to make sure if the real author is the student that is presenting it or not. But plagiarism has not been experienced in the final project of this course. However in the mandatory assignments aligned to the thematic course sections some students had plagiarized other course participants' solutions from the same university (Stockholm University).

Initially there were some objections on the distance presentation approached from a few students posted in the discussion forum of the course webpage. But in the course evaluation the only drawback pointed out was the problem with slow Internet connections. With eBay and Microsoft as owners the Skype software has been commercialized and so has its GUI. The earlier very clean and intuitive interface and menu system is now mixed with advertisement but for a Swedish target group it is still quite easy to install and use in a comparison with other video conferencing software systems.

Conclusions

The presentation via Skype had several advantages, and one of the most important ones was that it could save great amount of time for students who could present from their homes instead of taking the final examination in school rooms located in Kista, Stockholm. This approach is a time saver for the teaching team as well since the examination could be conducted anywhere at any time. Some students also appreciated that there were no travel expenses and that everything could be completed in distance mode. However some students living close to Stockholm asked for a traditional face to face presentation instead of the online version. In comparison with authentication techniques like *Keyboard Biometrics* and identification by matching fingerprints we find this presentation model to be very affordable and without additional overhead and expensive costs for extra devices. The web cameras used are purchased for about €10 each and the videoconferencing is done with the free Skype version. Students in Sweden have less money today compared with the situation some decades back and we find it fair that the university should provide web cameras for students that do not have a camera themselves.

This examination model could be seen as cost efficient and reliable in the sense that the teacher can make sure if a specific student has the knowledge or he/she has been committing some sort of plagiarism without too much violation of the personal integrity. No courses will ever be completely protected from plagiarism and no model for assessment will ever make all students happy, but we find our approach to be secure enough and not to make the students more uncomfortable and stressed than what is the case in traditional written exams.

Future Work

The described approach for online assessment has only been tested in the course that it has been developed for and in a limited batch of students in a summer course with Swedish students only. It would be interesting to test this model in a larger student group connecting from different countries from all over the world. Deep interviews with some selected students could be a way to get a better understanding of the students' perspective.

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BRIDGING THE GAP IN RURAL LIFE-LONG LEARNING AND DIGITAL DEVELOPMENT

Frederique Frossard, Mario Barajas Frutos, University of Barcelona - DOE, Spain

Introduction

In 2010, the European Commission agreed on a new typology of predominantly rural, intermediate and predominantly urban regions based on a variation of the previously used OECD methodology. According to this definition, 28% of the EU population live in regions classified as "predominantly rural" (European Union, Directorate-General for Agriculture and Rural Development, 2010). However, rural communities are still considered one of the disadvantaged groups in Europe, due to their physical distance and isolation from larger communities. Indeed, the rate of growth and employment, as well as the level of education, is lower in rural than in other areas. Furthermore, many services are physically located in urban areas, adversely affecting rural development. Consequently, the gap between rural and urban areas has increased over the last years.

According to the 2010 Report on Rural Development in the European Union (European Union, Directorate-General for Agriculture and Rural Development, 2010), human potential is a key factor for the development of rural areas. Furthermore, life-long learning is considered *a good instrument to improve the skills of workers and favours economic development. However, it is often less used and progressing more slowly in rural areas*.

In 2010, in the context of the RUENTER[1] project, a study was conducted in four countries (Austria, Greece, Romania and Spain) in order to analyse the situation of rural areas regarding life-long learning opportunities and ICT services deployment. First, national workshops were conducted with rural training institutions, in order to analyse adult communities' current level of ICT awareness and training needs. Furthermore, national surveys collected the point of view of different stakeholders linked to the rural world regarding the status of adult education. Finally, a desktop research was conducted in order to identify the status of the information society in European rural settings.

This paper presents the results of the study. It first lists the training needs identified in adult rural communities. Second, positive and negative aspects that characterize rural areas are pointed out, that should be taken into account in order to develop successful training programmes. Finally, a set of recommendations is provided, regarding the way life-long learning initiatives should adapt to the identified opportunities and challenges.

Methodology

Three focus groups have been organized in three EU countries (Greece, Spain and Romania) with different training institutions (e.g. Chamber of commerce, training providers, telecentres, etc.) in order to gather in-depth data about rural communities characteristics, and to identify the current level of ICT awareness, as well as the training needs of the adult population.

In order to obtain data on a broader level, a national user needs questionnaire was developed with the purpose to collect the point of view of different stakeholders linked to the rural world, and especially connected to adult training. The aim of this survey was to map the current training opportunities available for the rural adult populations, as well as to identify training needs in rural areas regarding digital technologies. The questionnaire

[1] RUeNTER - Capacity Building through ICT in Rural Areas – is a project funded by the European Commission, Lifelong Learning, GRUNDTVIG Multilateral programme (2010-2011). It aims to improve the quality and accessibility of the opportunities for lifelong learning for rural citizens. In this objective, the project proposes an innovative approach in which adult populations can acquire and reinforce skills and knowledge so that they make best use of the new opportunities offered by the ICT technologies. The project supports the development of innovative ICT-based content, services, pedagogies and practices for lifelong learning for adult population in rural areas. The project consortium consists of seven partners in six different countries: Austria, Greece, Romania, Spain, Switzerland and Belgium.

was distributed in four countries (Austria, Greece, Romania and Spain) to more than 180 institutions. In total, 45 questionnaires were gathered.

A desktop research was conducted in the same countries, and provided comprehensive reviews of the characteristics of rural areas and populations, as well as the Internet deployment and life-long learning status. Moreover, local initiatives for promoting life-long learning and ICT deployment in rural settings were identified.

Identification of training needs for the adult rural communities

The results of the workshops and national surveys show, for each country, users training requirements, most of them common to all the countries. The most common ones are listed below:

- *Digital literacy* – acquire basic ICT skills and become aware of the possibilities offered by the Internet in specific rural contexts;
- *Awareness regarding e-services* – learn about such as e-government, e-commerce (e-agriculture, e-tourism) and e-health in order to improve life quality and opportunities;
- *Awareness regarding 2.0 social networking tools* – learn how to use tools such as blogs, Facebook, etc., to open to the world and promote their local activities;
- *Multiplication of job opportunities* – become aware of professional opportunities, as well as the ways to reach them, by effectively searching for and accessing the necessary information on the Internet;
- *Professional and economic development* – acquire knowledge necessary to enlarge local businesses and support the economic development;
- *Flexible learning opportunities* – access courses adapted to rural space-time constraints;
- *Training for trainers* – learn about social software and issues related to rural context specificities;
- *Specific goal-driven scenarios* –contextualize the use of ICT tools to specific rural contexts;
- *Contact and exchange of experiences and practices with other cultures* – collaborate with other telecentres / communities that face similar situations and needs, in order to exchange good practices;
- *Stimulation of a new learning culture* – be involved in learning activities throughout life;
- *Access to public services* – access to ICT equipment and public administration offices.

Thus, the main training needs are related to basic digital skills, as well as Internet awareness: e-services on one side (with a high level of interest regarding e-government and e-administration), and social networking tools on the other side. Regarding professional development, rural adult communities need to acquire skills on how to look for job opportunities on the Internet. Moreover, the surveys enabled the formulation of more specific needs in each country, such as access to flexible learning opportunities, specific goal-driven scenarios, and training for trainers, all of which appeared be adaptable to the reality of other countries.

Opportunities and challenges for rural development and LLL

On the basis of the results mentioned above, as well as the ones of the desktop study, this section describes critical aspects that characterize rural areas, identified as opportunities or constraints, which should be taken into account while developing life-long learning initiatives.

Characteristics of rural areas

Opportunities

In spite of their physical isolation and the particular challenges they face regarding growth, jobs and sustainability, rural areas offer real opportunities in terms of their potential for growth in new sectors, the provision of rural amenities and tourism, and their attractiveness as a place in which to live. Moreover, they preserve the social fabric and traditional way of life. The following positive characteristics of rural areas can act as facilitators for their local development:

- *Diversification of the economy:* Recently, the EU rural economy has undergone major changes. The new dynamics of today's society affect the configuration of the rural economic system, which has become more diversified.

- *Development of the tourism sector:* Due to the tourism rural areas currently generate, this sector is constantly developing, and constitutes an important source of economic diversification in many EU countries. Indeed, some rural areas presently enjoy intense tourism, such as the Austrian alpine region.
- *Momentum of the agrarian sector:* In spite of the diversification of rural economy, agriculture remains dominant in EU rural settings, providing a stable source of employment. As an example, in Spain, the farming sector comprises one quarter of total rural workers. Moreover, the growing interest in ecological agriculture offers significant commercial opportunities.
- *Development of the service sector:* Services are constantly growing, thus participating in the economic diversification of rural areas. This sector is the most important in Austria and in Spain.

Due to these opportunities, rural areas cannot be classified as economically and structurally weak areas. For example, in Romania, the unemployment rate is much lower in rural (5.2%) than urban areas (8.8%).

Challenges

The following critical aspects towards rural development were identified as barriers to growth, jobs and sustainability:

- *Low density:* Rural areas are characterized by low population density, especially in Romania, limiting economic development potential.
- *Progressive ageing:* EU rural areas are generally characterized by ageing populations. For example, the percentage of the Spanish rural population over 65 years of age is 22.3%. In Greece, young people leave rural areas, so most of the population living there is 55 and over. In Romania, the rural population corresponds to 9.7 million inhabitants, of which 2.4 million are aged 60 and over. Moreover, the birth-rate is especially low in these areas.
- *"Masculinization" of the population:* In Spain, it has been observed that the number of men is higher than women in rural areas, due to the migration of women to urban areas where there are more professional opportunities.
- *Unemployment (especially for women and young people):* In most countries, the unemployment rate in rural areas is higher than in urban areas, which contributes to their slower economic growth.
- *Migration to urban areas:* Generally, the population, especially young people and women, tends to go to urban areas where the employment opportunities increase and the cultural offering is wider. This is also due to the lack of sanitary, educational and telecommunication infrastructures available in rural areas.
- *Grouping of the population in the agrarian sector:* In spite of the progressive economic diversification of rural areas, the agrarian sector remains dominant in some countries.

Profile of adult rural population

Opportunities

The gap between EU rural and urban populations is getting smaller due to the following factors:

- *Bridging the digital gap:* Rural populations feature an important growth rate compared to the past with respect to Internet literacy and computer usage.
- *Bridging the educational gap:* In Austria, the educational gap between rural and urban areas is getting smaller, as there are almost no differences in the participation rate in adult education.

Challenges

Life-long learning and ICT deployment still constitutes a challenge in rural Europe:

- *Persistence of the digital gap:* In Greece, the digital gap has broadened for the elderly and less educated people. However, it remains almost unchanged with respect to inactive people, women and middle-aged people. Also, most of the EU rural adult communities still have low ICT skills.
- *Low level of adult education:* In Spain, the levels of literacy and education are strongly linked to the size of the municipalities. According to 2001 Census data, within rural municipalities, the illiteracy rate was 3% and the percentage of population with no education 16%, while in urban municipalities, these data

were, respectively, 2% and 8%. Romania is among the last countries in Europe for indicators such as the participation of 25-64 year olds in education and training, and the early school-leaving rate.

- *Space-time constraints:* It is sometimes difficult for trainees to access training institutions. Furthermore, training providers have to adapt their activities to the rhythms of life and work of rural citizens.

Life-long learning status

Opportunities

Thanks to several governmental and non-governmental initiatives, there has been multiplication of training opportunities for adult rural populations, both provided by public and private institutions, such as specific institutions for adults, telecentres, social initiative institutions, unions, neighbourhood associations, local corporations, etc. As a consequence, the following aspects were observed as opportunities for rural development:

- *Multiplication of national policies and programs:* : In Austria, as a strategy for life-long learning and regional knowledge management, a dedicated national support program, called "Learning Regions", is part of the Programme for Rural Development 2007-2013. The goal of a learning region is to build a network to develop and implement in the regions. Moreover, Ländliches Fortbildungsinstitut[2] (LFI) is one of the major providers of adult education in rural areas. In Spain, significant programs for the rural economic development, as well as for bridging the digital gap, are being conducted, such as the Avanza plan[3], PEBA[4], Telecentros program[5], and the program for sustainable rural development. In Greece, a digital plan for 2006-2013, which aims at realizing a "digital leap", is creating a prolific ground for the development of e-services. This particular digital plan takes into account relevant European and international policies (e.g. i2010[6]). In Romania, several programmes, such as the Knowledge Economy Project – KEP, the Sistem Educational Informatizat[7] - SEI (IT-Based Educational System) and the Rural Education Project - REP, can enhance learning in rural areas.
- *Growth of the participation rate in training programs:* The number of adults involved in training activities is growing in all the participating countries. For instance, Austria presents almost no differences in the participation rate in adult education between rural and urban areas. According to a 2003 micro census, more than 20% of the adult population participate in education activities.
- *Increase of the adult training offer:* Generally, training offers are widely available and regional training institutions are already well positioned. The Spanish and Romanian telecentres offer a wide range of training courses, both face to face and virtual, on different topics, including digital literacy. In Greece, training is offered from Schools of Second Opportunity (for those individuals who have not completed their obligatory education), Adult Education Centres, Schools for Parents, Committees of Prefectures for Popular Training (for trainees regardless their education level), and Institutes of Vocational Training.

Challenges

Many needs are still to be tackled in order to provide training offers specifically adapted to rural adult populations.

- *Lack of local training opportunities:* In Austria, there should be a stronger distinction between professional and personal courses. In Spain, in spite of the diversification of the adult training offer, many needs are still to be tackled, such as access to ICT courses adapted to professional development. In Greece, there is no identified training offer / ICT services targeting specifically rural populations. In Romania, there are few possibilities for physical access, precarious learning conditions, poverty, and relatively high costs of education, all constituting obstacles to training in rural settings.

[2] http://www.lfi.at/
[3] http://www.planavanza.es/
[4] http://www.bandaancha.es/Englishinformation/Paginas/PEBAInformation.aspx
[5] http://www.telecentros.es/
[6] http://ec.europa.eu/information_society/eeurope/i2010/index_en.htm
[7] http://portal.edu.ro/

Technical aspects

Opportunities

In the participating countries, there is generally a priority to stimulate supply and increase access to broadband communications and adapted equipment in rural areas.

- *Internet deployment:* Both in Spain and Austria, the Internet connectivity and broadband access is developed throughout the country, thanks to significant efforts from the governments. Indeed, 99% of the Spanish population has broadband coverage. 70% of Austrian households have access to the Internet and there are almost no discrepancies between rural and urban areas.Also, penetration of broadband internet access is relatively high. In Greece, some initiatives are being developed in order to expand broadband coverage, such as the 'Broadband Action Plan' and the 'Broadband Access Development in Underserved Territories' plan.
- *Access to ICT equipment:* Telecentres enable rural citizens to use computers and offer free Internet access. They are generally equipped with ADSL, WIFI, scanners, printers, etc.

Challenges

- *Slow deployment:* In spite of the efforts of the governments, ICT equipments and Internet connection remain of low quality in many EU remote areas.
- *Access to basic ICT equipment:* In some cases, training institutions are still equipped with low quality computers and Internet connections.

Recommendations for successful LLL in rural areas

Below is a set of recommendations that life-long learning initiatives should take into in order to be in line with the potential and weaknesses in rural areas, thus ensuring successful training opportunities adapted to the EU rural picture.

Characteristics of rural areas

Economic diversification of rural areas should be encouraged by providing training resources related to different professional sectors, such as agriculture, services and tourism.

- Young people should be trained in skills needed for the diversification of the local economy, which can tap into demand for tourism, environmental services, traditional rural practices and quality products.
- A proactive approach to training and retraining farmers should be developed, particularly regarding transferable skills and encouraging the take-up and diffusion of ICT. Furthermore, special attention should be accorded to ecological agriculture, which can bring significant opportunities and sustainable solutions.
- E-skills training (related to e-business and e-commerce) should be proposed through community structures in order to facilitate IT take-up by local farms and rural businesses.
- The entry of women into the labour market should be promoted.
- Solutions for social and e-inclusion for all profiles should be proposed, including elders, who constitute an important part of the EU rural populations.

Profile of adult rural population

- Dedicated solutions should be proposed to each rural target group, including immigrants and the long term unemployed.
- Given the low level of digital literacy identified in EU rural areas, training initiatives should include basic ICT courses as a basis for more specific and contextualized ICT courses.
- Rural adult populations generally show a preference for face to face training. However, models that combine traditional and new training practices such as blended learning could be used.
- Training programs should be designed and organized according to the rhythms of life and work of rural populations.

Life-long learning opportunities

- Training topics should be in line with the training offers available in rural communities. Training should aim to raise rural citizens' awareness of the opportunities offered by ICT tools, both at personal and professional levels.

National policies and programs

- Many governmental and non-governmental initiatives aim to promote sustainable rural development. Training initiatives should take them into account, informing the related policy makers in order to use the relevant channels to disseminate the project objectives, reach the relevant target users in an adequate way, and use the resources that these programs offer.

Technical aspect

- E-learning solutions should be compatible with low quality ICT equipment (e.g. low power hardware and software) and weak internet connections.

Conclusions

This paper has described the results of a study conducted in four European countries in the context of the RUeNTER project, including national workshops with training institutions, national surveys with different stakeholders linked to the rural world, as well as desktop studies aiming to identify the status of life-long learning and digital development in European rural communities.

This process has provided insight into the current level of ICT awareness in European adult rural communities, as well as into the status of currently offered digital services and training available to citizens in rural areas. Furthermore, the study highlights various positive aspects that characterize rural areas, as well as critical aspects that deter rural development. Finally, a set of recommendations are given that life-long learning initiatives should take into in order to ensure successful training opportunities adapted to the EU rural picture.

Generally, a picture has emerged of the importance of improving the quality of life in rural areas and encouraging diversification of the rural economy, by encouraging the entry of women into the rural labour market, and by training young people in skills needed for the diversification of the local economy. Moreover, the take-up and diffusion of ICT and digital services appear as essential for diversification, as well as for local development, the provision of local services and the promotion of e-inclusion.

There is a need for initial training in order to popularize technologies by teaching their uses. Indeed, community members need to become aware of the possibilities that digital technologies offer them, according to the rural context and interests, both at personal and professional levels. This need is partially fulfilled as several initiatives have tackled it. However, as ICT proficiency develops, there are new emerging needs for more specific goal-driven training offer. Therefore, it is important to integrate technologies into the daily life of rural communities, in order to promote their rich resources and give them a better position in the information society. This constitutes a further step for rural life-long learning.

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USING IEEE LOM STANDARD FOR THE PROVISIONING OF TRAINING SERVICES ON THE EGOVERNMENT PARADIGM TO RURAL SMES

Axel Maroudas, Pantelis Karamolegkos, John Stoitsis, Nikolaos Marianos,
Greek Research & Technology Network, Greece

Introduction

It is widely acknowledged that Small and Medium Enterprises (SMEs) constitute a critical aspect of the overall production process in liberal economies. Hence, it becomes evident that the optimization of their productive processes and the minimization of their operating costs are in the interest of the greater business ecosystem.

However, although significant provision has been taken in terms of motivating the foundation and sustainability of SME's there are yet criticalities pertaining to each enterprise's distinct idiosyncrasies that need to be addressed. One of these issues is the low penetration degree of innovative tools and technologies by SME's residing in rural areas. The side effects stemming from such a deficiency are more or less evident; however they become more dominant under the specific circumstances that characterize the operation or rural enterprises, i.e. the physical distance between their premises and central public authorities, which make the respective transactions cumbersome and costly. Away from the central public authorities rural enterprises do not have direct, physical access to a variety of services that governmental or public agencies offer. Very often, these services are essential in order for the enterprises, mostly small and medium ones (SMEs) in such areas, to perform their business operations.

Furthermore, even in cases of well-organized local authorities and administrations with physical representation nearby rural areas, SME's failure to alleviate the cost of their administrative transactions, through the effective adoption of technology, can significantly undermine their everyday operation and, in long term, their economic growth and prosperity. The impact of the cost induced by transactions between SME's and public authorities is further highlighted by EU's determination to address this issue by setting a target of administrative burden reduction of about 25% by the year 2012.

Inevitably, the eGov concept finds extended applicability when it comes to rural settings, where specific challenges such as the physical distance between citizens' residencies and public authorities' premises, call for efficient eGov frameworks that will facilitate the transactions between people and the public administration. This issue becomes even more challenging in the context of the transactions between Small and Medium Enterprises (SMEs) and public authorities.

Rural Inclusion, a major European Project, supported by the Information and Communication Technologies Policy Support Programme of the European Commission, aims at adopting a state-of-art infrastructure that will facilitate the offering of innovative services by public administration in rural areas. To achieve this, Rural Inclusion adopts, adapts, and deploys a Web infrastructure combining semantic services with a collaborative training and networking approach, in rural settings. It focuses on selected case studies of eGov services that regional public authorities already offer, supports them by a rigorous and reusable service process analysis and modelling, and then deploys a semantic service that facilitates the disambiguation of the small businesses needs and requirements when trying to use the particular services. At the same time, the semantic service is complemented by a number of other Web-based services that support the creation of communities of learning and practice in rural settings, thus facilitating the communication between the rural businesses with the regional public authorities.

A major aspect of Rural Inclusion paradigm is the incorporation of a systematic, long term training approach, in regard to the assistance towards interested stakeholders (SME's public authorities, citizens) for the uptake of the introduced innovative services, so that the proposed e-government applications can be effectively introduced in rural settings. This training approach will be comprehensive to integrate actions benefiting both Public Authorities staff and rural SMEs personnel, and will integrate the proposed eGov solution in a wider vision: to provide people in rural areas with ICT-enabled tools so that they adopt and become able to adapt the proposed change, inventing

their own solutions for their specific circumstances, in a continuous sustainable route towards capacity building in the rural community through a lifelong learning culture

The Rural Inclusion platform, through the RuralObservatory2.0 component, offers an innovative and viable solution in terms of rural SME's familiarization with the usage of eGov services: it is an innovative sophisticated Web-based environment, through which rural SMEs are able to find information both on eGov services offered in their region, as well as to have access to e-learning content on how they can use such services.

The success and uptake of such initiatives, is highly dependent on aspects such as user friendliness and interoperability, since these two requirements are critical regarding the uptake of these services by both the citizens (including SMEs) and the administrative authorities. Both these aspects are in their turn highly dependent on the concept of metadata and how this is incorporated in the overall design and deployment phases of the platform. In this paper, we focus on the technical aspects of such a sustainable training tool, going through details related to the metadata standard incorporated, as also to the relevant modifications and extensions made so that the application is specifically tailored to the needs of its users.

Background

Electronic government (eGov) is one of the novel and most appealing applications of Information and Communication Technologies (ICTs). The concept has become widely popular through both Europe and the rest of the world during in the recent years, and there have been numerous initiatives related to the description and categorization of various eGov resources (e.g. documents, legislation, Web pages, descriptions of public authorities or agencies) in digital collections. Such initiatives entail a wide range of applications, ranging from general governmental portals that offer access to national eGov resources (e.g. UK's national governmental portal), to digital collections of specific categories of public documents (e.g. the collection of the European Union law portal).

One of the aspects that have contributed to the uptake of eGov services has been the recent progress regarding metadata standardization. The usage of commonly accepted eGov metadata schemas aims to make it easier to integrate data from different sources, allowing for creation of value added services for the respective sector. Metadata can facilitate the discovery of eGov resources, by identifying resources, bringing similar resources together, distinguishing similar resources, and giving location information. In addition, it can be useful for developing Internet-based services that include some digital collection of e-government resources, such as governmental portals that catalogue descriptions of resources as metadata in their databases. Describing an eGov resource with metadata allows it to be understood by both humans and machines in ways that promote interoperability. This task benefits from using well-accepted metadata schemas, so that resources can be searched more seamlessly online.

Currently, there is a number of national and international initiatives and projects aiming to propose metadata schemas that may be used in eGov applications. Several of them are based on Dublin Core (DC), a cross-domain schema for the description of information resource description schema, which is also an ISO standard [1]. The development of the DC has been a consensus-driven process that involves a cross-disciplinary and international group of stakeholders from many diverse information profession communities such as library community, the education sector, museums, and information and computer science [2]. DC is a proven metadata standard which is easy to use and globally recognized. Its flexibility makes deployment a valid option to improve resources discovery and resource management across a wide range of resources [3]. DC is one of the most widely applied standards, and therefore existing online systems (such as search engines) can already read metadata encoded according to it.

All of the above approaches acknowledge how important it is to adopt a widely-accepted metadata standards, but also outline the need for including appropriate metadata elements (i.e. through application profiles) for each particular context [4]. EGov application profiles allow for the specialization of existing metadata schemas in order to cover the implementation needs of a digital collection that aims at a particular sector, domain or user community. However, as already stated, there is no simple and comprehensive process of creating an application profile.

The need for metadata standard customization through the incorporation of the appropriate application profiles is equally important when it comes to the design and development of a digital repository, such as the Rural Inclusion's RuralObservatory2.0, to be populated with content that aims to facilitate the uptake of eGov services by both specific target user groups (SMEs, public authorities) and the general audience.

When developing a repository such as RuralObservatory2.0 for the uptake of eGov services, an important aspect is to take into consideration the fact that resources for such learners have to reflect and match a variety of special requirements (e.g. linguistic preferences, regional geographical coverage, particularity of covered topics, and educational level of addressed audience). This calls for the development of standard-based, but also context-specialized metadata. In this paper we discuss our experience from developing such a metadata schema specifically tailored for a portal related to eGov services that aims to address the lifelong learning needs of several stakeholders, such as rural SMEs, public authorities and citizens in general.

Rural Inclusion Application Profile

In the context of the Rural Inclusion ICT PSP research programme a repository with resources on eGov is being deployed. The Rural Inclusion Observatory 2.0 portal aims to list the digital training content that will be developed to support the vocational training curriculum on how to prepare rural SMEs to use and exploit eGov services. In the context of the portal, the training content will be deployed in the form of Digital Training Objects (DTOs). The next section provides a concise overview of the application profile (AP) designed in order to describe such objects.

Rural Inclusion Digital Training Objects (DTOs)

Through the use of the Rural Inclusion AP, the project aims to facilitate access, usage and exploitation of digital educational content related to eGov services. It will deploy a multilingual online learning repository, populated with quality training content from various content producers. In addition, it will deploy a multilingual online environment (the Rural Inclusion Web portal) that will facilitate end-users' search, retrieval, access and use of the content in the repository. The project will study educational scenarios that introduce the use of the Rural Inclusion portal and content to support teaching of topics related to eGov in specific target groups such as SMEs and public authorities' personnel. Furthermore, it will evaluate project results in the context of pilot demonstrators to be deployed within participating bodies (e.g. CHIOS chamber of commerce), as well as through open validation events where external interested stakeholders will be invited.

In what is related to its training / educational aspect within Rural Inclusion, the Observatory 2.0 portal will undertake the role of a Digital Learning Repository (DLR), which consist an area of particular interest for metadata development. In such tools, digital learning resources are systematically organized, classified and published. Many institutions are currently engaged in developing DLRs that can be searchable and accessible from a wide audience [5]. Metadata play an important role in DLRs, since they help searching, finding and organizing learning resources. Towards this direction, standardization efforts around the world such as the IEEE Learning Technology Standards Committee and ISO's sub-committee on "Information Technology for Learning, Education and Training (ITLET)" have focused on the implementation of the IEEE Learning Object Metadata (LOM) standard [6],[7] . Using such a recognized metadata standard is important for a variety of reasons: metadata descriptions (records) of learning resources may be exchanged among different DLRs; search queries may be propagated among different (and interconnected) DLRs; and generally the integration of data from different sources is facilitated. This is the reason behind the extensive implementation and study of numerous application profiles of the LOM standard in DLRs around the world [1].

For the description and classification of the DTOs an application profile of the IEEE LOM standard was developed. More specifically, the Rural Inclusion Application Profile for the DTOs consists of the following elements.

Elements

As explained earlier, the IEEE LOM standard has been chosen as the basis for the metadata application profile to be used in Rural Inclusion's AP. The schema is therefore termed as Rural Inclusion application profile. It adopts many of the elements of LOM, specializing several of them in order to best match the needs of the particular

DTOs. In the next paragraph, we will go through the categories of elements of LOM, referring to the elements used, and presenting the performed specializations.

The first category of LOM elements is the category General. It includes elements that describe a learning object (in our case, a DTO), and store general information about it. In Rural Inclusion AP, the following elements have been selected for use as recommended by LOM: Identifier, Title, Language, Description, Keyword, Structure and Aggregation Level. In addition, the element Coverage has been specialized in the way presented in Table 1.

Table 1 Elements of the General category that have been further specialized in Rural Inclusion AP

Element	Sub-element	Description	Use in Rural Inclusion	Value space
General	Coverage	Geography or region to which this DTO applies.	Include 3-layer coverage of specific European regions	http://ec.europa.eu/eurostat/ramon/nuts/codelist_en.cfm?list=nuts

The next category **Life Cycle** describes the history and current state of a DTO, as well as the entities that have affected the DTO during its evolution. In Rural Inclusion AP, the following elements have been selected and used as recommended by IEEE LOM: *Version, Status, and Contribute*.

The **Meta-Metadata** category contains information about the metadata record that describes the DTO. It identifies the metadata record in a classification system (i.e. the repository's database with the metadata descriptions). It contains information about who provided the DTO description and when, which metadata schema was followed to produce the metadata description, and in which language the metadata are in (which can be different than the language of the learning object itself). In Rural Inclusion AP it is used as recommended by LOM, and includes the elements: *Identifier, Metadata Schema, Language, Contribute* and their designated sub-elements.

In a similar manner, a set of selected items from the **Technical** category are used to describe the technical requirements and characteristics of a DTO. The elements selected for Rural Inclusion AP are: *Format, Size, Location, Platform Requirements, and Duration.*

The **Educational** category describes the key educational or pedagogic characteristics of a DTO. In Rural Inclusion AP, the following elements have been selected for use with the vocabulary values. In addition, elements have been specialized as presented in Table 2.

Table 2 Elements of the General category that have been further specialized in Rural Inclusion AP

Element	Sub-element	Description	Use in Rural Inclusion	Vocabulary
Educational	Interactivity Type	Predominant mode of learning supported by the learning object	Vocabulary containing the values than LOM recommends	LOM recommendation vocabulary
	Learning Resource Type	Specific kind of learning object. The most dominant kind shall be first.	Vocabulary containing the values than LOM recommends	LOM recommendation vocabulary
	Intended End User Role	Principal user(s) for which this LO was designed, most dominant first.	Vocabulary containing the values than LOM recommends	LOM recommendation vocabulary
	Context	The principal environment within which the LO and use of this LO is intended to take place.	Vocabulary containing the values than LOM recommends	LOM recommendation vocabulary

Example of use

In Table 3, we provide an example description of a DTO regarding how to manage a farm with IT. Due to space restrictions, not all elements are used. Instead of that, we are restricted only to a combination between the mandatory and the most commonly recommended elements of the AP.

Table 3 Example of a Rural Inclusion DTO

Element		Sub-element
1. General		
1.2 Title		Managing Farms with IT
1.3 Language		en
1.4 Description		A good summary of how you can use IT, the Web and eGovernment services to help manage your farm.
1.5 Keyword		Agriculture, Animal production, Aquatic sciences and fisheries
1.6 Coverage		EAST WALES, WEST WALES AND THE VALLEYS
1.7 Structure		atomic
2. Life Cycle		
2.3 Contribute	2.3.1 Role	publisher
	2.3.2 Entity	Ceri Evans, UK (15-03-2010)
	2.3.3 Date	2000
4. Technical		
4.1 Format		ppt
4.2 Size		40001 bytes
4.3 Location		http://rural-inclusion.vm.grnet.gr:8080/observatory/viewDTO.do?dto_id=51
5. Educational		
5.2 Learning Resource Type		slide
5.5 Intended End User Role		learner
5.6 Context		higher education, professional development
5.7 Typical Age Range		18-U
6. Rights		
6.1 Cost		No
6.2 Copyright and Other Restrictions		No
9.Classification		
9.2 Taxon Path	9.2.1 Source	NACE codes of economic activity
9.2.2 Taxon	9.2.2.1 Id	A
	9.2.2.2 Entry	AGRICULTURE, HUNTING AND FORESTRY

Conclusions

The development of an appropriate metadata schema can greatly facilitate the search and retrieval tasks of the users that are accessing an online digital repository. In addition, the adoption of a well-accepted metadata standard (such as IEEE LOM and e-GMS), can promote interoperability between the Rural Inclusion repository (i.e. RuralObservatory2.0) and others, as well as reusability of the metadata records. On the other hand, in repositories for eGov services, the adopted metadata schema has to be appropriately contextualized in order to better meet user needs and requirements. In this paper we present such specializations which consist of application profile for the Rural Inclusion project. Using the IEEE LOM and e-GMS standards is in line with the majority of other efforts deploying similar repositories of learning and eGov resources content objects

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RURAL INCLUSION: DESIGNING A TRAINING SESSION FOR PUBLIC AUTHORITIES

Nikolaos Marianos, Alexios Dimitropoulos, Katerina Papakonstantinou, Sofia Mavrogianni,
Greek Research & Technology Network, Greece

Introduction

Promoting the adoption and innovative use of ICTs by SMEs has been a primary challenge for policymakers over the last years. Furthermore, EU outlines the importance of ICT in making public services better, more cost effective, and more accessible. E-Government is rapidly becoming one of governments' critical means for the provision of seamless services for governmental agencies, businesses and citizens. Even though more and more people are benefiting from such services, over the half of the EU population either does not reap such benefits in full or is totally cut off from them. This problem is more intense for citizens and businesses in rural areas. Focusing on rural SMEs, since they are a major part its economy, EU reinforces social, economic, and territorial cohesion by making ICT products and services more accessible for regions that are lagging behind (EC, 2005). It is widely acknowledged that Small and Medium Enterprises (SMEs) constitute a critical aspect of the overall production process in liberal economies (UNCTAD, 2005; Maroudas et al, 2011). Hence, it becomes evident that the optimization of their productive processes and the minimization of their operating costs are in the interest of the greater business ecosystem (Karamolegkos et al, 2010).

Experience from training SMEs in rural areas (through initiatives such as the 'Go-Online Training Support' in Greece and the 'Opportunity Wales' in UK) has demonstrated that ICT training activities have to develop (i) a specially designed training curriculum that can convince SMEs about the benefits they will reap from introducing ICT in their business, (ii) innovative training models that can combine traditional forms of learning with e-learning forms (such as blended learning models), and (iii) an online point of reference which SMEs can continuously access for information and content. These three aspects are all important when aiming at training rural SMEs on the use of e-government.

Rural Inclusion, an ICT PSP Programme of the European Commission, aims at adopting a state-of-art infrastructure that will facilitate the offering of innovative services by public administration in rural areas. To achieve this, Rural Inclusion adopts, adapts, and deploys a Web infrastructure combining semantic services with a collaborative training and networking approach, in rural settings. It focuses on selected case studies of eGov services that regional public authorities already offer, supports them by a rigorous and reusable service process analysis and modeling, and then deploys a semantic service that facilitates the disambiguation of the small businesses needs and requirements when trying to use the particular services. At the same time, the semantic service is complemented by a number of other Web-based services that support the creation of communities of learning and practice in rural settings, thus facilitating the communication between the rural businesses with the regional public authorities.

A major aspect of Rural Inclusion will be the incorporation of a systematic, long term training approach, in regard to the assistance towards interested stakeholders (SME's public authorities, citizens) for the uptake of the introduced innovative services, so that the proposed e-government applications can be effectively introduced in rural settings. This training approach will be comprehensive to integrate actions benefiting both Public Authorities staff and rural SMEs personnel, and will integrate the proposed eGov solution in a wider vision: to provide people in rural areas with ICT-enabled tools so that they adopt and become able to adapt the proposed change, inventing their own solutions for their specific circumstances, in a continuous sustainable route towards capacity building in the rural community through a lifelong learning culture.

Background

Electronic government (eGov)

Electronic government (eGov) is generally aiming at the rationalization / optimization and the active transformation of the functions and activities of state and public administration by employing Information and Communication Technologies (ICTs). According to the definition of the European Union, 'Electronic Government (e-government) is the use of Information & Communication Technologies (ICT) in public administration, combined with organizational change and new skills, in order to improve public services and democratic processes and strengthen support to public policies' (EC, 2003a). Broadly, eGov can be described as the continuous optimisation of service delivery, constituency participation and governance by transforming internal and external relationships through technology, the Internet and new media (Manouselis et al, 2009). It aims to improve the development and implementation of public policies and to help the public sector offer more cost-effective services, with fewer resources and lower budget (EC, 2003a). eGov promotes principles such as transparency, accountability, combating corruption and streamlining, upgrading the functions of government, while operating level transactions are faster and more efficient and improve quality of service (Fountain, 2001; Wimmer, 2002; OECD, 2005).

Today, Public Authorities (PAs) aim to provide services to support ICT in an integrated, holistic way. A public body may cooperate with other public and private bodies, interconnects and cooperates with them, sharing information, based on collective knowledge, thus aiming to provide better and comprehensive services to the general public or to specific organizations, with an easy, seamless, flexible and adaptable manner that promotes innovative and collaborative practices (Ke and Wei, 2004).

Small and Medium Enterprises (SMEs) in rural areas

Micro, small and medium-sized enterprises (SMEs) have been defined as enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro, and/ or an annual balance sheet total not exceeding 43 million euros (EC, 2003b). SMEs play a central role in the European economy. They are a major source of entrepreneurial skills, innovation and employment. However, their restricted resources may also reduce their access to new technologies or innovation. Therefore, support for SMEs is one of the EC's priorities for economic growth, job creation and economic and social cohesion (EC, 2003b). EGov can play an important role here by offering a single point of access to administrative information and requirements. Considerable advances have been achieved in the rollout of ICT based public services in many EU regions, and successes are already been registered: for example, online tax returns save millions of hours each year. The difficulties of SMEs are more obvious when considering eGov services for SMEs in rural areas (Deakins, 2007).

SMEs in rural areas are away from the decision-making centres and public authorities, and they do not have physical access to the required public services for doing business with government or public agencies. Furthermore, due to lack of transportation, time and money or even because of bad weather, they are not possible to contact public authorities by visiting local service points. The most effective way to overcome such obstacles is to develop and deliver high quality e-government services. These services should meet the needs of SMEs and enable their daily transactions with public administration (Carmichael and Johnston, 2004). In many occasions regional or central authorities develop and offer eGov services, but very often professionals and citizens are not aware of them and do not know how to use them so that they receive benefits in their everyday business activities. Thus, much remains to be done in order to demonstrate impact and social acceptance in areas that are lagging behind in the development and/ or adoption of such services. For this reason, a survey that will also assess the relevance of existing eGov services to the SMEs and especially in rural areas has been judged as important (Manouselis et al, 2009).

Rural Inclusion Training Methodology

Impact on the Rural Inclusion Training Activities

The training of P.A. employees plays an important role in the framework of the Rural Inclusion project as it should allow training recipients to better understand what the actual needs of SMEs are while they deal with (complex) public services, regardless the latter are delivered offline or online, while training change agents is of paramount importance to the development of business for the project since they will act as promoters of Rural Inclusion

services to their communities. Training will take place in the Living Labs for P.A. employees on the subjects of familiarization and use of the Rural Inclusion services and applications and how to reduce administrative burden through these applications; while on the more focused subject of modelling services using the service modelling methodology, training workshops to the P.A. employees will take place in appropriate places within the respective Public Authorities facilities.

In order to respect the user-centred approach followed by the project (in accordance with the Living Lab methodology) and to foster an actual collaboration between the public services providers and the final end users of such services, the involvement of the SMEs representatives and of local entrepreneurs in workshops addressing Public Authorities employees has been foreseen too (Luccini et al, 2010).

Participants

The list of participants to the Public Authority training sessions includes (Luccini et al, 2010):

- Representatives of RI project partners, as facilitators / observers,
- Tutors who will conduct the training, who might come from the organizations forming the R.I. consortium and external experts,
- Representatives of the hosting Local Authorities (L.A.), not only as facilitators / observers but also as recipients of training,
- Representative of local Public Authorities (PA), typically the Public Services Providers, who are the main target participants.
- Selected SMEs representatives, as well as representatives of Associations of SMEs and of start-up companies.

The RI Formal Training Framework

Actual methodology implementation foresees a blended learning programme which is delivered through the combined use of in-presence meetings, role playing through real case scenarios and of tools such as eGovTube, an online collaborative platform following the most valuable trends of Web 2.0 technology and Rural Observatory 2.0, an information tool. According to the Training Methodology, formal training of the Public Authority employees will be carried out through a mix of formal and informal training in order to benefit from both their strong point. Formal training will take place in training sessions/workshops with tutor support while training content will be delivered in the following formats (Luccini et al, 2010):

- As role playing scenarios following a methodology and format developed specifically for the training of Change Agents and other rural actors aiming to develop their regions with the use of ICT
- As video content posted into the eGovTube Channels and / or in the most appropriate format to be attached or linked to (introductory) videos
- As documents, presentations, exercises, on line courses, synchronous virtual classroom lectures and web site links posted in Rural Observatory and eGovTube channels

At the same time most of the informal training will be supported by the collaborative dynamics generated by the use of the eGovTube collaborative platform which fosters the generation of value to the user in terms of connection value, actionable learning value, as well as entertainment and instant gratification value (Angehrn et al. 2009). However, it has to be noticed that the methodology is flexible enough to allow the use of other specific tools provided by external sources (e.g. off-the-shelf wikis, social bookmarking, LMS / LCMS / KMS platforms). If needed, Rural Observatory 2.0 can directly tap from any kind of Information System provided that some few adjustments are performed. Also, the official Wiki page of Rural Inclusion was created to host valuable tutorials for PAs and SMEs.

Rural Inclusion Training Sessions for PAs

In the context of Rural Inclusion project, a set of local and national training events will be organized by the consortium in order to train the personnel of Public Authorities (P.A.) to: a) become professional in using the services of the Rural Inclusion project; b) to model Public Authorities services according to the Rural Inclusion service modelling methodology and c) assist their community in taking up the services provided by Rural Inclusion, thus reducing the administrative burden from the transactions with the Public Authorities. During the

trainings, the consortium will train the P.A. employees in modeling the Public Administration services using the Public Service Modeling methodology and the on-boarding learning program that provides process and structures, BPMN symbols explanation, examples of services and other useful information. By using new technologies, the consortium sees higher levels of engagement and interest for new employees from Public Authorities who understand the benefits of R.I. In order to achieve maximum impact from our initial interaction and consultations with the P.A. employees, we propose a two-step process comprising of Small Scale Local events and Large Scale National Training events (Manouselis et al, 2011).

Small Scale Local Events

In the Small Scale local events the participants, at least 3-5 P.A. employees and representatives of national Public Authorities, are given an introduction to public services and the Rural Inclusion Methodology for reducing administrative burdens. A series of examples are presented and the R.I. platform and services are demonstrated. Then the participants engage in a discussion on how the can model their public services based on the R.I. paradigm. The aim is to build a community of interested P.A. employees and representatives who can be involved in the following Large Scale Training Sessions and actively engage in the project, by modelling their services and offering them through the R.I. platform. The Small Scale events are multipurpose events, focusing on both training and dissemination. In these events we should encourage and support the development of links, experience exchanges and first discussions on possible collaborations. The participants should be asked to participate to the Large Scale National events and provide contacts that would be interested to join them. The participants will also evaluate the R.I. platform providing feedback on user satisfaction, allowing us to improve it.

Large Scale National Events

In the Large Scale national events the participants, at least 10-15 P.A. employees and representatives of national Public Authorities, are engaged into a much more challenging procedure. These events are also multipurpose, having a strong affiliation and networking side, but are also the main training events promised by RI. The participants are given an introduction to public services and the Rural Inclusion Methodology for reducing administrative burdens. A series of examples are presented and the R.I. platform and services are demonstrated. The participants engage in hands-on session, familiarizing with the RI platform and tools and modelling their public services using the R.I. methodology. The aim is to build a community of interested P.A. employees and representatives who actively engage in the project, by modelling their services and offering them through the R.I. platform. This community is the RI targeted market and in these events, we should encourage and support the development of links and first discussions on possible collaborations. The P.A. they are originating from are the ones we are trying to approach and “sell” the RI results. The participants will also evaluate the training session and the R.I. platform, allowing us to improve them. The proposed agenda for the Large Scale Events for PAs is the following:

1. Welcome speech and introduction: local partners welcome speech and introduction. Brief presentation of the R.I. project and the national R.I. platform implementation.
2. Pre Training Session Evaluation: The participants have to evaluate their current experience and understanding regarding ICT and eGovernment.
3. Setting up Rural LL in RI: Presentation of the Living Labs methodology and how we are setting up Rural Living Labs in RI.
4. Introduction to eGovernment: Introduction to eGovernment and eGovernment Services. Presentation of the differences between traditional government and eGovernment and explanation of what it means in tangible terms for the rural SME?
5. Introduction to Public Services: Explaining the notion of a public service and its complexity.
6. The role of Rural Inclusion: Description of the approach that R.I. follows in order to alleviate the burdens imposed to rural SMEs by public administration as regards to the public service provision process. Presentation of the advantages and disadvantages of using R.I. approach for offering public services compared to the current situation.
7. Public services for Rural Businesses: Presentation of the implemented R.I. services. Step by step live demonstration of 2-3 local/national R.I. services.

8. Hands-on Session – Using the R.I. Services: The P.A. employees are given the opportunity to use the presented R.I. services.
9. Measuring Administrative Burdens: Presentation of the R.I. methodology and questionnaires for measuring administrative burdens.
10. GEA PS Description Template: Presentation of the GEA Public Service Description Template and an example of completing the PS Template for a real local or national Public Service.
11. Poor versus complete service descriptions: Presentation of service description examples, underlining the importance of identifying every "service case" that is included in the public service in focus.
12. GEA PS Description Example: Presenting an example of completing the PS Template for a real local or national Public Service.
13. Diagrams for modeling public services: Familiarizing PA employees with UML Activity Diagrams to model RI public services.
14. Presentation of a real example of a modeled public service: Familiarizing PA employees with RI public service modeling methodology and dialogue creation between PAs and rural businesses through the example of a selected local or national public service.
15. Hands-on Session – Modeling of real public services: Hands on activity allowing PA employees to familiarize with the RI public service modeling methodology and dialogue creation, by modeling a selected local or national public service.
16. Presentation of the eGovTube: An introduction, showcasing the main functionalities of the specific tool.
17. Hands-on Session – eGovTube: The participants should register to eGovTube and practice using its functionalities.
18. Using and exploiting the opportunities of RuralObservatory 2.0: Training PAs on exploiting the opportunities of RuralObservatory 2.0. Brief showcasing of the main functionalities of the specific tool.
19. Hands-on Session – RuralObservatory 2.0: The participants should register to RuralObservatory 2.0 and practice using its functionalities.
20. Q&A session: The P.A. employees are given the opportunity to ask any questions they might have and to share their view and past experience on the subject.
21. Post Training Session Evaluation: The P.A. employees participating to the Large Scale events have to evaluate the R.I. Services – Platform and the Training Session. The trainers of the Large Scale events also have to evaluate the Training Session from their perspective.
22. Closing: In the Closing section the Rural Inclusion Affiliation Program shall be presented to the target groups in order to make partnership options and benefits visible. The facilitator shall also give an overview of the actual European and national partner network.

Conclusions

This paper presented the methodology of the Training Sessions for Public Authorities employees, as designed by Rural Inclusion experts. The Training Sessions aim to train the personnel of Public Authorities (P.A.) to become professional in using the services of the Rural Inclusion project, model Public Authorities services according to the Rural Inclusion service modelling methodology and assist their community in taking up the services provided by Rural Inclusion. To achieve maximum impact from the initial interaction and consultations with the P.A. employees, a two-step process comprising of Small Scale Local events and Large Scale National Training events is proposed.

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EDUCATION FOR SUSTAINABILITY AND ACTIVE CITIZENSHIP IN THE EFL CLASSROOM

Hara Giouroglou, Eastern Macedonia-Thrace Regional Directory for Primary and Secondary Education, Greece

Abstract

Environmental changes and crisis in many aspects of human activity in modern times impose the need for societal change, which is primarily cultivated during formal education. Sustainability Education (SE) is believed to develop skills, knowledge and values for a sustainable environment and it is achieved by active citizenship initiatives in formal and non-formal education. SE is an integrated learning approach that builds subject-independent competences and can be taught across the curriculum. We believe that the EFL lesson in Greek primary and secondary state schools can be reinforced by SE real-life, co-operative activities that derive from contextualised, experiential and Project-based learning methodologies. The ICTs can boost active citizenship via information exchange, communication and collaboration. To this end, we propose a 5 Level of Action EFL curriculum framework for Primary and Secondary education students, which can give incentives for transversal competences development in authentic language learning environments with the aid of ICTs. Critical reflection at the end of a project is crucial in order for learners to consciously develop active citizenship skills and attitudes for a sustainable future.

Keywords: sustainability, education, active citizenship, EFL

Education for Sustainability, Active Citizenship and Key Competences

Environmental changes and crisis in many aspects of human activity in modern times impose the need for societal change, which is primarily cultivated during formal education. As theorists claim, in order to recover or lessen the consequences of humanity's past and current errors, we need "an extra-ordinary degree of international effort" [1]. Sustainability Education (SE) is based on flourishing environment, vibrant community and equitable economy [2]. It is a systemic and holistic approach, broader than Environmental Education [3], which incorporates the synchronization and co-operation of a number of variables that exist inside and outside the school environment. It is, therefore, suggested that SE is concerned with all factors of micro- and macro-environment: political, economic, social, technological, environmental, legal, cultural and aesthetic. All in all, SE can build "a world where people understand and take responsibility for the impact they have on the quality of life of other people, locally and globally [4].

A precondition for a sustainable future is the development of active democratic citizenship [5]. Sociologically, the school forms future generation citizens, aspiring to equip them with competences, knowledge, ethics and sense of justice, aiming at a well-organised and flourishing future society. To achieve this, the four aforementioned variables need to be embedded in the curriculum and practiced at a stable dynamic equilibrium in order to inspire whole person development and active citizenship. The curriculum needs to promote actions and projects that urge pupils work cooperatively and critically in order to analyse current trends and events, solve emerging world problems and make wise decisions over matters that concern people and governments locally as well as worldwide.

Being a member of the EU, Greece should promote the development of active European citizenship. The European Commission (EC) focuses on three main goals for education in the Member States: the development of the individual, the development of society and the development of the economy [6]. Likewise, the EC invests on cultural, social and human capital [7]. In practice, in order to face future personal, vocational and environmental challenges, students need to be equipped with "key competences" [8] that have substituted the former EC term "basic skills". The term "competence" includes a wide range of skills, knowledge and attitudes that promote active citizenship, social equity, lifelong learning, personal development and self-actualization. The three broad categories of key competences include: use of tools (technology, language) for effective interaction with the environment, ability to interact in heterogeneous groups and ability to act autonomously [9]. Moreover, the school

needs to promote democratic values and democratic participation of students [10], via simulations, decision-making or problem-solving projects and visits to public administration offices. These generic or transversal competences are characterized "subject-independent" and refer to cross-curricular objectives, which include self-assessment, learning management, learner-centeredness, interpersonal and intrapersonal communication [7]. Last but not least, the development of key competences is linked to social inclusion, societal cohesion and economic need, with reference to the disadvantaged groups [11].

It is, therefore, suggested that education decision-makers should reconstruct traditional curricula in terms of the abovementioned findings and principles. Teaching and learning methods should also integrate cooperative techniques and active participation of the teaching and learning community. Last but not least, education stakeholders and local communities need to be actively involved in daily school practice.

Contextualized Teaching and Learning and the role of ICTs

Theorists advocate that "skills, values and understandings are best taught and assessed within meaningful, connected contexts" [12]. Contextualized Teaching and Learning (CTL) is characterized as a "conception of teaching and learning that helps teachers relate subject matter content to real world situations" [13] and, more specifically, to learners' needs and interests. Exploitation of learners' "natural aptitude" and "personal passion" helps them unravel their potentials and "connect with something fundamental to their sense of identity, purpose and well-being" [14].

Contextualized learning facilitates the creation of meaning through experience and, thus, is linked with John Dewey's theory of experiential and social learning. On the whole, CTL is viewed as a systemic learning approach and as a "holistic system" [15]. Contextualized learning is a constructive and socio-cultural process that helps students build on prior knowledge and create meaning through experience and interaction with the environment. Modern learning and teaching methods comply with CTL as they are based on student-centered, cognitive, explorative and collaborative learning. Such theories are: Constructivism (Piaget, Papert, Gagne), Sociocultural Theories (Bruner, Vygotsky), Experiential hands-on education (Dewey) and Integrated – multidisciplinary learning theories. Learning in authentic cultural or multicultural contexts is highly experiential in nature aiding societal integration, as it builds cross-culturalism and forms nationally and globally conscientious citizens.

CTL needs the aid of ICTs to boost information exchange, isolation withdrawal, communication and collaboration. Embedding ICTs in national and local curricula seems necessary, as it provides schools with the medium and the platform for cultural or cross-cultural communication and helps students build real-life skills dealing with real-world problems in authentic environments. WebQuests, which are online inquiry-oriented lesson formats, stem from socio-constructivist views of knowledge [16] and are used effectively by teachers worldwide. All in all, educational software based on constructivism, digital media and the WWW – especially the Web 2.0 – gives students the opportunity to explore and construct knowledge and meta-knowledge via interaction with the real world, collaboration in authentic environments and problem solving.

Such initiatives should be reinforced by an integrated curriculum with local implementation that promotes adaptability, interactivity and innovation through knowledge transfer across curriculum areas. Likewise, in-service teacher-training needs to be systematic, incorporate academic findings and be constantly updated.

Sustainability Education Perspectives in State Schools: The Greek Case

Greek primary and secondary education offers students the opportunity to participate in environmental and active citizenship projects and programmes. The Youth Parliament of Greece – a joint action by the Hellenic Parliament and the Ministry of Education in cooperation with the European Union Youth Parliaments Network – addresses to secondary education students. Pupils across Greece meet annually in the Hellenic Parliament to discuss public affairs, developing responsible citizen's conscience by active political thinking, decision-making and rhetoric skills. Additionally, Environmental Education Centers (KPE) offer primary and secondary education teachers and pupils the opportunity to visit areas of environmental interest and work on various local as well as global environmental issues. Likewise, cross-curricularity is promoted by in-school environmental/cultural/health education projects, planned by state-schools teachers in co-operation with pupils, and approved by the local directorates of education. Yet, these projects are discretionary and do not constitute part of the daily curriculum, in order for

pupils to develop sound environmental conscience and active citizenship, which are preconditions for a sustainable future. This implies that SE should become part of a flexible, interdisciplinary curriculum with local implementation.

Certain reformations by the Ministry of Education that are put into practice during the 2010-2011 school year could bring SE closer to pupils. New curricula based on up-to-date academic findings are going to be pilot tested in 180 Greek schools. Additionally, the Ministry of Education introduces the 3 hour/week new subject "Project" in upper high-schools, which aims at research and interdiscilpinarity via group work/assessment.

Enabling Sustainability Education in the EFL Classroom

The EFL classroom in Greek state schools could be an ideal place for SE. English is taught in all Primary and Secondary school Grades, as, since 2010, English has been experimentally taught in grades 1 & 2 in 800 all-day primary schools. The EFL curriculum published by the Pedagogical Institute is interdisciplinary and promotes literacy, cross-culturalism and plurilingualism, via the use of student-centered teaching methods. EFL coursebooks that are used by teachers in state schools do include some material relative to sustainability, which, in combination with modern teaching methods and supplementary material, can boost the desired learning outcomes.

The language teacher can be trained on educational designing skills [17] in order to fully exploit web resources and construct lesson plans that are up-to-date and authentic, focusing on hot issues that concern people worldwide and turning pupils into active world citizens that partake in critical analysis and decision-making process rather than working on language drills. Similarly, the teacher can tailor the lesson to his/her pupils' age, learning styles, inclination and preferences, inspiring motivation and active student participation in a pluralist knowledge society [18]. Meanwhile, the modern state school teacher needs to be informed of all high-priority issues concerning the local and global community in order to act as a role-model for students. The teacher's knowledge, sense of justice, open-mindedness and sense of responsibility for the future generation can urge students explore their inclinations and build up competences that will make them autonomous, self-conscious individuals who can peacefully cooperate with their community in order not to compete, but to sustainably co-produce.

According to their age, pupils should be taught argumentation and reasoning – "the process by which we draw a conclusion or reach a decision on the strength of reasons" [19] – in order to make logical suppositions and reach solid conclusions. Moreover, pupils should learn how to cooperate and work in groups, explore group dynamics, play different roles and cultivate team spirit. Students will gradually practice all language skills simply by working on an in-class task or project collaboratively – in mixed-ability groups – or autonomously.

The task-based approach to language learning [20] helps students practice language functions while part-taking in active, collaborative and holistic projects. Project-based learning helps pupils critically respond to complex real-life issues via group work. Pupils' cognitive, thinking and language skills work simultaneously and cooperatively, via a hands-on endeavour to work on a topic of personal and common interest. Thus, the EFL lesson can turn into a meaningful experience that strengthens students' motivation, collaboration skills and sense of responsibility. The words "act", "reason", "collaborate" and "create/innovate" replace the words "listen, look, write" and "read" giving students the starring role to the lesson and enabling them to freely exploit their intelligence, imagination and inclinations. The final product of their work will help students acknowledge the superiority of collective work against solitary labour. As a result, the role of the language teacher enlarges, as he/she helps pupils appreciate the role of the community and contact the major issues of human concern, achieving the quintessence of his/her profession which is to socialize, cultivate, moralize and educate the young.

Education for Sustainability: 5 Levels of Action in the EFL Classroom

SE is a broad area that needs to be separated into smaller chunks in order to be intelligibly and efficiently taught in primary and secondary education, considering pupils' cognitive state at certain age. For this reason, we propose an inter-disciplinary curriculum with five Levels of Action (LoA) that can help pupils grasp the meaning of SE even from the first grade of primary school, through student-centered approaches in the EFL classroom (Table 1). As theorists claim, young children understand what directly relates to their experience and their "world" which

is still narrow [21].Therefore, we should choose topics that link to their everyday experience. Progressively, we can gradually broaden our area of interest. Thus, according to pupils' age and classroom dynamics, we can build skills and competences through curricula that focus on personal, local, national, European and global sustainability issues (Figures 1 & 2):

- LoA1 – Personal Sustainability: It is suitable for primary and secondary education students and is related to the self and the individual's micro-environment which includes: family, home, friends, relatives and neighbourhood.
- LoA2 – Local Sustainability (primary & secondary education): It can be taught from the 3rd grade of primary school. It refers to sustainability and citizenship issues that relate to students' local area: district, town, province and region.
- LoA3 – National Sustainability (primary & secondary education): It can be introduced at the final grades of primary school and it deals with the development of active citizenship for sustainability at a national level.
- LoA4 – European Sustainability: It is appropriate to be introduced in secondary education, as it refers to students' macro-environment and presupposes the development of cognitive and socio-cognitive skills.
- LoA5 – Global Sustainability: It is preferably applicable in secondary education due to the fact that advanced competences for systemic analysis of world issues are needed.

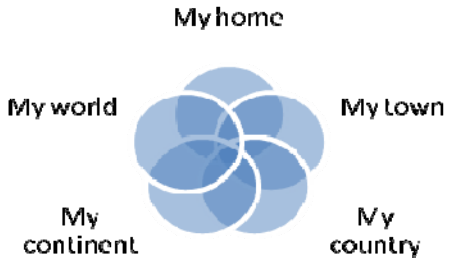

Figure 1: Human-Environment Interaction

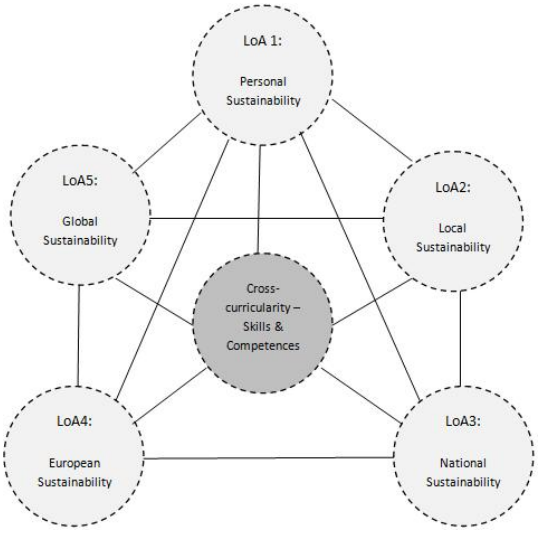

Figure 2: The 5 Levels of Action

Below we present a curriculum framework for SE in the EFL classroom. We define each Level of Action with reference to the education sector it can be applied to. Furthermore, we describe "what" should be taught at each LoA, i.e. what areas of interest each LoA covers. Finally, we provide ideas for classroom implementation in the target language (TL) for every LoA separately and collectively.

LoA1: Personal Sustainability

1. Target group:
   - Primary and Secondary Education
2. Areas of interest
   - Realization of the fact that whatever we do affects not only us but also everybody/ everything around us.
   - Sustainable lifestyle (materially, physically & spiritually ie. sustainable use of resources & waste, nutrition, health, family, relationships, ethical consumerism & attitudes)
   - Green home/school
   - Money management
   - Animal treatment
   - Nature respect
3. Ideas for classroom implementation:
   - Build co-operation and team spirit
   - Exploit little pupils' imagination by encouraging them create their fantasy world and share it with the rest of the class-discuss
   - Unravel pupils' creativity - Engage pupils in creative real-life tasks (create a puppet/ wreath etc, cook, make up a song).
   - Make use of learning by acting and doing e.g. in order to develop healthy nutrition and body hygiene habits.
   - Use the Experiential learning method for recycling home/school garbage.
   - Boost learning through role-play scenarios and field trips
   - Use the ICTs, Web 2.0 tools (e.g. Teacher YouTube, WebQuests) to discuss, compare and contrast different types of environment etc.
   - Assign pupils the decoration of their class/school and appoint student groups that will be responsible for sustainable class / school management. Let them think of ideas to embellish the school.

LoA2: Local Sustainability

1. Target group
   - Primary and Secondary Education
2. Areas of interest:
   - Active involvement in local issues and cultivation of the sense of personal responsibility and action
   - Issues of environmental/ cultural/public interest in the local community
   - Knowledge of the competitive advantage that your local area has (resources, agriculture, stockbreeding, businesses, industries etc.)
   - Family, neighbourhood and/or municipality implication in local interest events/problems
   - Enhancement of citizen participation in local decision-making
   - Local tradition, music, literature, art exploration – comparison to another locality
3. Ideas for classroom implementation:
   - Let students participate in local councils, and present results in the TL
   - Simulate local councils, stake-holders and decentralised public administration in the classroom using the TL
   - Interview the local community/neighbourhood/family and present outcomes in the TL
   - Visit local areas of environmental/cultural interest: report outcomes in the TL
   - Study and critical assessment of the local press – use mediation to explain the situation in the TL
   - Pay a visit to the local museum(s) and work in groups on specific topics
   - Explore and disseminate local goods, practices, tradition, art: Create blogs or posters in the TL
   - Visit local businesses, farms etc. - understand the opportunities and threats they face – provide solutions

- "Adopt a park"

LoA3: National Sustainability

1. Target group
   - Primary and Secondary Education
2. Areas of interest
   - National institutions and policies
   - Strengths and weaknesses of our country in terms of resources, geopolitics etc.
   - National polices on environmental/cultural/ social issues
   - National ecosystems and their hazards
   - National lifestyles that affect the environment
   - National traditions, their symbolism and their contribution to people's wellbeing
   - National initiatives in Renewable Energy Sources
   - Attitudes toward the responsibility of welfare provision
   - National citizenship
3. Ideas for classroom implementation:
   - Study the national news in the TL (read the press in the TL)
   - Select articles, reports etc. from the national press. Discuss and critically assess them.
   - Participate in national initiatives /visits and disseminate the outcomes in the TL via a blog.
   - Compare and contrast the news between national and world media. Is the same news altered? Is there bias? > Link to KPg Mediation
   - Promote critical analysis and problem-solving regarding current national issues
   - Undertake a project on natural habitats

LoA4: European Sustainability

1. Target group
   - Secondary Education
2. Areas of interest
   - Development of a sense of European identity via active involvement in the process of European integration.
   - Understanding key concepts: multiculturalism, cross-cultural dialogue/multilingualism, European values, European institutions, European history and culture, employment, integration, mobility and social cohesion
   - European treaties and policies on environmental issues/human rights
   - European citizenship – rights and responsibilities
3. Ideas for classroom implementation:
   - Prepare lesson plans that make use of the ICTs in order for pupils to explore official EU and member-states websites, documents, youth forums etc.
   - Participate in European programs, e.g. e-twinning that promote intercultural dialogue and project work
   - Debate using forensics about European policies
   - Visit European Commission websites, forums, projects and measures taken regarding the environment and sustainability
   - Case-studies can be used in-class to trigger discussion on EU policies. (e.g. the story of an immigrant family)
   - Development of skills and competences for European mobility (Fill-in application forms in the TL; write CVs and resumes)

LoA5: Global Sustainability

1. Target group
   - Secondary Education
2. Areas of interest
   - Knowledge and engagement with current world events and problems regarding all aspects of social interest (political, scientific, cultural, environmental)
   - Human Rights – the First/ Second/Third/Fourth World – Immigration
   - World tribes, cultures, languages
   - Preservation of world's bio-diversity
   - Cultural diversity
   - Social inclusion
   - Global citizenship
3. Ideas for classroom implementation:
   - Access websites of worldwide interest e.g. CERN, UNESCO, National Geographic, scan for specific information, do a research project
   - Participate in the Model United Nations (MUN) simulation
   - Create a map with UNESCO's preserved sights
   - Surf the Web for Academic institutions and discuss their scientific research
   - Search the Web for world environmental/ cultural organizations – justify their existence.

Ideas for Classroom Implementation that can Apply to All LoA, in Isolation or in Combination

- Familiarize with terms in the TL
- Use the ICTs and the interactive board and provide pupils with authentic, up to date material, as an incentive for discussion or group/project work
- Exploit Web 2.0 tools (wikis, blogs, social media) in order to promote knowledge dissemination and communication.
- Use mediation to transfer messages from mother tongue to the TL (adjusted to any proficiency level)
- Develop healthy relationships based on communication, cooperation and group work
- Provide incentives for creativity and innovation
- Give priority to meaning
- Compare and contrast local communities developing cross-cultural understanding; organize Town-Twinning
- Analyze national practices – Synthesize practices between nations
- Compare and contrast Greek national policies with other European/world nations
- Compare/contrast and classify in quality scales museums, institutes etc. worldwide
- Create concept-maps and flow-charts to schematize a document or solve a problem
- Use student-centered and collaborative learning methodologies such as Project/ Problem/ Challenge-based-learning
- Collaborate with your colleagues who also teach your classes and prepare interdisciplinary lessons
- Organize field trips that provide opportunities for learning by doing on site – preparatory work should be done in order for students to actively participate
- Issue a school newspaper / newsletter in the TL that deals with sustainability issues of local/national/global interest.
- According to pupils' age, organize a Pupils Conference/Forum, where students can present/discuss their projects (pupils can prepare ppt. presentations and deck the school with posters)
- Critically assess the media with the aid of ICTs

Critical Reflection

At the end of the lesson or project, learners should critically assess their work and its impact to themselves, the society and/or the environment. Critical reflection and self-reflection on research assumptions are crucial to transformative learning [22] that can change learners' habits, viewpoints and mindset. Pupils can consciously explain how their project/findings affect their lifestyle, change their perceptions and influence their micro- and macro-environment. They can also provide feedback regarding their methodology and suggest ideas for better performance in the future.

Conclusion

Sustainable development and social cohesion depend critically on citizens' knowledge, skills, attitudes and values [23]. These are subject-independent competences that can be developed cross-curricularly in core education. Similarly, the choice of methodology, tasks and topics in EFL should promote the development of the key competences, enhancing the goals of the EC, which are considered vital for citizens' personal, professional and societal development. The foreign language state teacher can work selectively with the coursebook, exploit the ICTs in order to create up-to-date, motivating and multiple-skill-enhancing lesson plans, and get involved in interdisciplinary short-term or long-term projects that can bring students closer to the local community, Europe and the world [6]. SE via student-centered teaching methods can turn Greek schools into educational organizations capable of boosting active citizenship and producing human and knowledge capital that can gradually influence the micro and macro environment, aiming at a sustainable future.

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NETWORKED LAPTOPS IN HUNGARIAN CLASSROOMS – PRELIMINARY RESULTS OF A RESEARCH INITIATIVE

Pál Molnár, Eötvös Loránd University, Edit Tóth, University of Szeged, Krisztina Tóth, German Institute of International Educational Research, Germany, Andrea Kárpáti, Eötvös Loránd University, Hungary

Introduction

Learning is changing and thanks to the wirelessly networked laptops, knowledge can be made available anytime, anywhere (*Lei* & *Zhao*, 2008). The using of networked and internet enabled laptops for learning in classroom instruction in the world shows a growing tendency (*Penuel*, 2006). One of the main goals of this type of initiative is to diffuse technology based instruction amongst teachers in order to integrate technology into their classroom and change their teaching practice (*Roschelle* & *Pea*, 2002).

Teachers' use of laptops in the classroom

From previous research it is known that teachers often use the laptops for word processing, creation of spreadsheets and presentations and internet browsing in normal classroom activities as well as project work. (*Hill* & *Reeves*, 2004; *Lowther*, *Ross*, & *Morrison*, 2003; *Rockman*, 1997; *Rockman, Chessler,* & *Walker*, 1998; *Russell*, *Bebell*, & *Higgins*, 2004; *Russell*, *O'Brien*, *Bebell*, & *O'Dwyer*, 2003). As an added service, teachers could access the updated learning and teaching resources more effectively (Zucker & McGhee, 2005). Using networked laptops, teachers change their way of thinking about teaching, they use more student-centered (Mouza, 2008), constructivist instruction design (*Altalib*, 2002; *Lowther et al*., 2003), that based on more facilitation and leadership (*Hill* & *Reeves*, 2004; *Russell* et al., 2004).

Research objectives

The Classmate PC (CMPC) is the only laptop included in the Hungarian school supply list selected for purchase through grant applications with an inbuilt pedagogical model. Collaborative learning and network-based knowledge building, the two leading paradigms of ICT-supported education, are the paradigms best supported by laptops. Therefore, with their installation, schools acquire a catalyst for pedagogical modernisation, an agent of change.

The objective of this research is to reveal and evaluate phases in the life of laptops in Hungarian schools, to highlight the patterns of its current and future uses. Based on survey and field observation data, we also want to describe the requirements needed for minimum and optimum utilisation of its potentials.

Our assessment effort focuses on teachers but also involves a variety of other stakeholders, systems operators. Their attitudes towards laptop culture are crucial for the success of the pedagogical innovation effort that makes the introduction of these machines more than another infrastructure improvement effort.

This paper reports findings about some of our main research questions: (1) How often used the laptops by the teachers in the classroom? (2) What resources are used by teachers to prepare their laptop based teaching? (3) For what purposes are networked laptops used? (4) What types of software and hardware development do teachers consider important for more frequent use?

Research methods

The objective of the research group of ELTE University, UNESCO Chair for ICT in Education and the University of Szeged, Institute of Education is *to reveal and evaluate phases in the life of CMPCs in Hungarian schools, to highlight the patterns of its current and future uses*. Based on survey and field observation data, we also want to describe the requirements needed for minimum and optimum utilisation of its potentials.

Our assessment effort focuses on *teachers* but also involves *a variety of other stakeholders,* including school leaders, systems operators and parents. Their attitudes towards laptop using culture are crucial for the success of the pedagogical innovation effort that makes the introduction of these machines more than another infrastructure improvement effort. Instruments employed:

1. **Online survey** of a representative sample of CMPC users at primary and secondary schools.
2. **On-site observations followed by discussions** of lessons using CMPCs in 10 schools representing different geographical locations and social environments in Hungary.
3. **Comparative review of literature on assessment of results educational innovation** (revolutionary or unique hardware as well as software products) to see if patterns of dissemination of innovation is similar with those of the CMPC observed in Hungary.

Sample

In April – May 2011, we introduced an online survey of a representative sample of Classmate PC networked laptop users in primary and secondary schools. We targeted minimum three teachers, one school leader and the system administrator. We intended to observe the use of laptops as innovative teaching tools and also as catalysts of the modernisation of educational methods used in primary and secondary schools, in synergy with other ICT applications.

We approached schools that received CMPC sets in 2008 (in all, more than 69 institutions) through online questionnaires. Our response rate was favourable as 71% (49 institutions) replied. We did case studies in 14 schools to get a better understanding of the use of the machines. (These schools reacted positively to our invitation to fill out questionnaires and in our correspondence, indicated a willingness to share problems as well as results of laptop use in greater detail.) The sample is representative for laptop users (the ratio of primary and secondary grammar and vocational schools equals the national average) but we have more male than female teachers among respondents that in the staff of schools in Hungary. Also, from among teacher groups who use laptops, the men were more willing to share their experiences as they felt more confident about new technology in general.

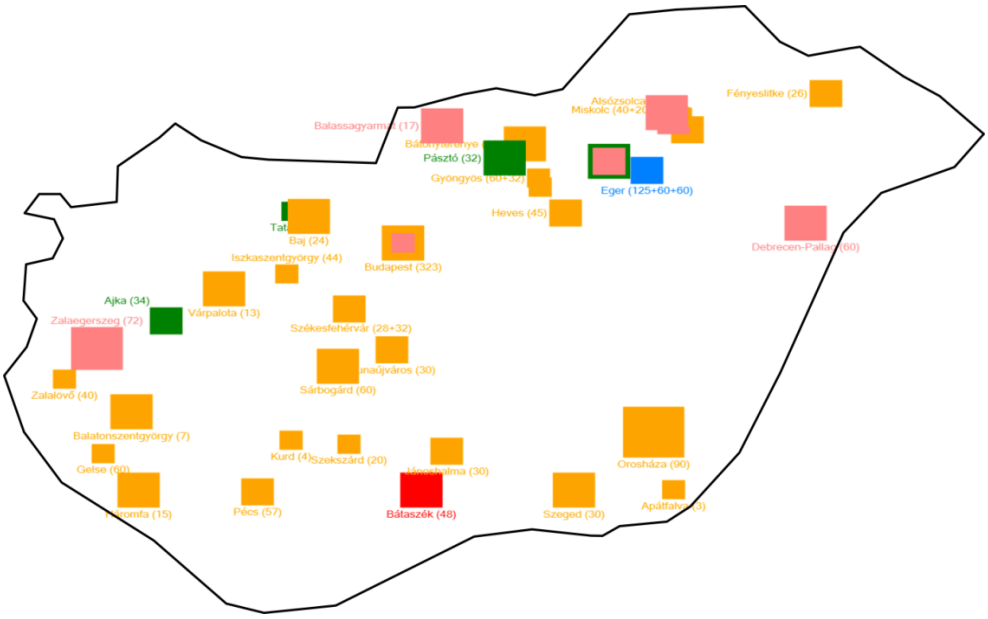

Figure 1 Geographical distribution of the laptop user school sample in Hungary

Figure 1 shows the geographical distribution of the sample and also shows the number of laptops available at each location surveyed. The figure reflects the typical Hungarian situation: ICT based innovations are mostly found in cities (especially in county seats). However, stakeholders in villages and small towns, with an interest in mobile computing, could successfully apply for a set of student laptops.

Survey instruments

Online survey of a representative sample of laptop users in primary and secondary schools: minimum three teachers, one school leader and the system administrator;

Questionnaires for systems administrator (laptop maintenance personnel)

These IT teachers are in charge of the placement, terms of use and maintenance of the laptops. Their survey questions focused on their work to enhance the quality of the user experience and ensure the successful utilisation of laptops in everyday teaching and learning. We also asked them about the ICT infrastructure and general digital competence level of teachers in their institutions. The survey consisted of 19 closed (multiple choice) and 3 open ended questions.

Questionnaires for teachers

This survey instrument focused on the human infrastructure of laptop use: frequency of its educational application, usage types in teaching, learning and communication, educational strategies associated with laptop use and difficulties encountered in each activity. We also collected background information that helps explain user behaviour (socio-demographic data, ICT competence and personal use, peer support, in-service training and mentoring). The survey instrument consisted of 9 sub-sections and included 96 items. We invited respondents to identify useless questions and propose issues not targeted.

Results

Do teachers employ their laptop sets regularly?

The answer is a qualified yes. In one third of the schools, laptops are used at least once a week by all teachers who have learnt how to use them. In the remaining two-third of the institutions surveyed, use is less frequent and only 20 % of teachers trained in laptop use are still involved in teaching with them. Apparently, initial training without further mentoring is not enough for sustained engagement.

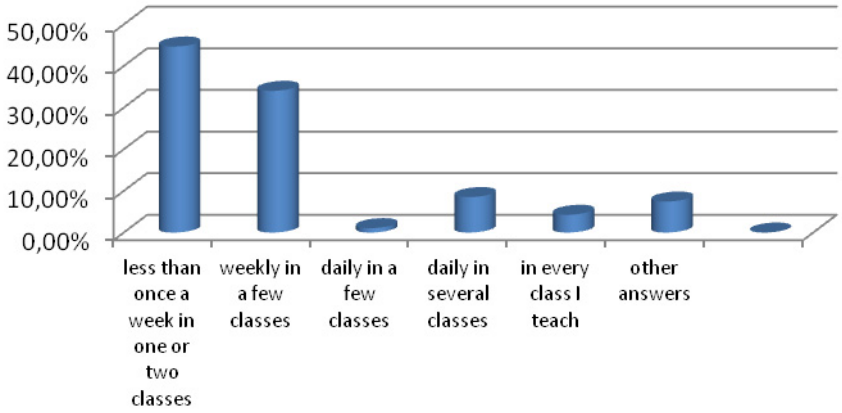

Figure 2 Frequency of laptop use in the classroom

The survey on the types of use shows encouraging results. Most teachers employ computers regularly to provide supplementary educational content. ***In 67 % of the schools, laptops are not only used in the classroom, but also during extracurricular activities*** that range from remedial education through supporting the work of arts and science interest groups to talent development. In schools where laptops are not assigned to one space exclusively, teachers fully utilise the flexibility of laptops and are delighted to have a PC set that may leave the walls of the lab or classroom.

When deciding over use or non-use, the most important factor is the availability of learning content. Pioneer teachers – top level laptop users – are able and willing to develop new content, but the majority is discouraged by the lack of curriculum-related teaching resources. If they become available, however, use is soon

on the rise. The school disciplines that have the most digital teaching aids specially developed for laptops are Mathematics, Hungarian Language and Literature and History. There are many teaching aids for Foreign Languages and IT as well. These disciplines are the same as those best supplied with digital teaching aids in general, according to a national survey in 2009.

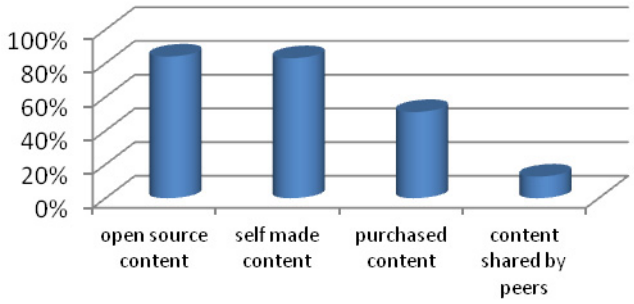

Figure 3 Types of resources used for teaching with the laptops

Teachers not only use open source content, but are able and willing to engage in the production of new teaching aids. Purchasing content acquires third place – an excellent result, as it shows, that ***laptop use is not fully dependent on changes in school financing.*** The computers are likely to function (as long as the hardware lasts) also if the *ICT Head Quote* is decreased or eliminated altogether. This national support system is based on the number of students per school and allocates funds that may only be used for IT-related purchases and is used for the acquisition of learning content mostly.

Most popular uses of laptops

Most teachers use laptops for ***presenting new content, practicing and review / correction*** (See Figure 4). The way the second type of use, almost as intensive as the first, is realised, seems to be a real breakthrough in school ICT culture, as it means individual development and instant feedback from the teacher and peers. It is of utmost importance, that the teacher may observe any student in the process of solving a task and may thus offer corrections of not only the finished task but also the phases leading to an improper solution.

Many teachers employ other digital tools to supplement the effects of laptops: 89,4% uses a projector and 83% an interactive white board to share student work or demonstrate new learning content. In two or three years, the laptop has smoothly integrated with other, already well-established teaching aids and is now one of the popular components of the digital pedagogy applications in the schools that were provided with these laptops in 2008-2009. It is important to note that the laptop is the most flexible from this array of innovative applications, as it equally supports frontal education (the most characteristic arrangement of the Hungarian educational culture) and individual or pair and group work. This flexibility may support the potentials for modernisation of teaching strategies of educators that stable PC labs have failed to catalyse.

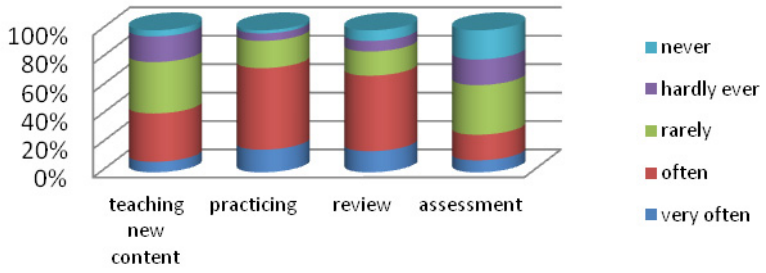

Figure 4 Frequency of using laptops in the classroom in different phases of the learning and teaching process

An unexpected but very promising result: laptops are successfully used with students with special needs, suffering from mental or physical handicaps. More learning content should be developed for these user groups as the individual practice mode with teacher guidance is essential in their remedial education. Students with behaviour problems as well as those with learning difficulties are motivated by the individualised learning environment the

laptops may provide. This area is still unexplored and needs further research about necessary supporting tools, teaching content as well as pilots using existing content in special needs environments.

Further development of laptop technology – requirements by teachers

Networked computers will be distributed in large quantities in Hungary as well as many European countries. This is a great potential for a new device to exercise a real educational impact, but it may only be effective if the ideas of teachers are recognised. Most teachers want ready-made learning content that is easily adaptable to the needs of the Hungarian National Core Curriculum and Guidelines. This requires a much more intensive content development and at the same time, the organisation of sharing and evaluating teacher-made digital content. A repository with an intelligent agent to support easy search and retrieval, with a feedback function and the possibility to upload content would soon increase laptop use considerably. Such a repository, of course, needs an editorial board with subject specialists as editors and reviewers to ensure high quality.

Teachers often encounter problems with the handling and maintenance of the laptops as well as the upgrade of the server software. Schools have very limited resources to employ an ICT specialist and have no immediate support available to help teachers who encounter an unexpected technical problem during a lesson. Most teachers claim the lack of technical support as the most important handicap that prevents them from initial steps with laptop use. Those who manage to overcome this first introductory phase without a lesson "ruined" by a non-functioning application will soon realise the immense learning potentials of the laptop and will overcome difficulties later because of increased motivation for use.

During classroom observations, teachers demonstrated their "survival strategies" against technical flaws: they developed parallel methodology for their lessons and were able to provide an alternative tool if their laptops became dysfunctional. Some of them managed to solve minor problems during class and went on with their lessons as planned, but the majority needed non-digital alternatives to keep momentum and discipline among students. This shows that training should not only focus on best practice and definitely not be provided in well-functioning training sites only. School-based, online mentoring helps teachers be prepared for accidents and overcome them in a variety of ways. Also, a mentor may discuss problems immediately after they occur and provide solutions that may prevent them from reoccurring. Short, initial training courses or manuals are unable to fulfil this function.

The use of laptops often require more time than possible during 45-minute classroom periods. Teachers often employ them during project weeks or study circle activities after classes and require support for developing such extracurricular activities. Teachers want their preparation time for digital lessons recognised – with extra working hours allocated to laptop users for continued training and adapting / authoring learning content. They are keen on getting to know new developments and experiment with new hardware – therefore, regular remedial laptop user courses or school based demonstrations should be organised.

Teachers of liberal arts rarely employ laptops for assessment; however they are ideally capable of providing the infrastructure for individualised feedback on open ended tasks. In general, assessment methods for laptops have to be developed further. Test sheets, task descriptions complete with assessment methods and sample assessment types were much in demand among our respondent.

Another missing content area is aesthetic education, including the discipline called The Moving Image and Media. Pilot experiments seem to be necessary to explore the use of laptops for creativity development, for learning about visual communication and design or music composition.

Teachers do not prefer written descriptions of lessons, (the type of learning content they usually get when enrolled in in-service training courses) they prefer video film documentation or presentations complete with well-designed illustrations. Many educators (both discipline teachers and systems managers) emphasize the need for the establishment of a Laptop User Forum for sharing best practice examples as well as problems and solutions of both technical and pedagogical nature.

The essence of laptop use is collective knowledge building. Therefore, it is evident that the most effective instrument in spreading laptop culture is the establishment of different user groups that also act as peer support mechanisms. Collaboration among teachers of the same discipline has proved useful with the introduction of a

large scale development, the European Learning Content Repository. (About its conception, piloting and assessment see www.calibrate.eun.org) co-ordinated by the European Schoolnet, EUN, www.eun.org). An in-service training method that has successfully been used to introduce innovations is the Mentored Innovation Model that requires the realisation of problems that an innovation may solve by teacher training, pilot projects that use skills and knowledge acquired during training and finally, online mentoring to consolidate new teaching practices. These steps ensure continued use, the growth of the core user community and peer support between experienced users and novices.

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KNOWLEDGE AND EDUCATION IN MODELS OF DEVELOPMENT

Tibor Kis, Maria Cileg, Otilija Sedlak, Novi Sad University, Serbia

Introduction

Regulations in the field of development are spread to all fields of society and economy. In the economy of a country they are especially important in industry and agriculture, while in most cases industry is the most relevant general inducing power of development. In the contemporary world while formulating economic policy the majority of highly developed countries apply minimalistic principle meaning direct interventions only take place when there are certain either internal or external factors causing improper resource allocation leading to negative indices of development. In some other highly developed countries and in transitional countries as well structural theory prevails, supposing not satisfactory flexibility and efficiency of the market; a continuous active role of the state is required here for establishment of adequate business and production environment, for the formation of proper industrial structure and acceptable resource allocation. Business environment as mentioned means a set of legal, economical, social, institutional or political conditions under which organizations operate, separable to internal and external factors, internal including the 5 M's: man, material, money, machinery and management. Level of education and knowledge are directly interconnected with the first two terms but also the constellation and state of other factors are dependent on them. External environmental factors (i.e. government and legal factors, geo-physical factors, political factors, socio-cultural factors, demographical factors etc.) are observed to be out of one's organization control, nevertheless by appropriate knowledge of the management they should be used in the optimal manner. In transitional economies one of the basic problems is inefficient functioning of the market mechanisms, underdeveloped market structure and influence of non economic factors. Not satisfactory construction of the economic system, financial market and money market demand such specific politics in transitional economies that will produce open market environment leading to faster development and strengthening of competitive positions. Either directly or indirectly dealing with resource allocation, the engagement and development of the working force is directly or indirectly connected to economic and societal development. In the next parts of this paper the role of knowledge, learning and education will be analyzed from the standpoint of classical and contemporary models of development.

Economic development and development models

Generally taking, economic development of a country or a region contributes to wellbeing of its inhabitants. Economic development is a term long since used in economic literature, and especially stressed from the period of transiting from feudalistic to the capitalistic system. Often terms like modernization and industrialization are used as synonyms. In scope of the economic policy economic development is connected to set of measures carried out as to achieve goals of establishing welfare and quality of life of population realized through forming conditions for full employment and increase of income. Economic growth imply increment of a quantitative indicator of some results of economic activity like GDP, which reflects the value of aggregate added value, national income total or per capita. On the other side, when talking about general development, a much wider set of indicators comprising not only quantitative characteristics but changes in qualitative values of a society is thought about. Socioeconomic development is not just increment of GDP but improvements in environmental quality issues, freedom, social justice, equal rights and chances for education, free time use etc. [more e.g. in R. Conteras, 2011].

Economic and social growth and development are modelled in different ways in practice, with various methods, nevertheless the basic building elements of models are similar, these are the production function, savings function and labour supply function. The main goal of particular theories and models in this scope is to explain and/or to forecast modes of functioning and developing of economies and societies – or not developing in a satisfactory manner or pace – finding out and opportunities of overcoming of constraints to development, and obtaining support to economic policy about how to initiate, maintain or intensify development. Eastern European countries started with intensive industrialization leading to formulation of the so called "development economics", which was later further elaborated and implemented Asia, Africa and Latin America, while taking into account not only

general growth but structural changes as well, arguing they represent immanent part of any economy [P. Rosenstein-Rodan, 1943, K. M. Mandelbaum, 1955, R. Nurkse, 1953, W.A. Lewis, 1954]. In their paper Knowledge based economic development [Stucki, Andrews, 2011] authors state that 'As the world continues its profound transition from an industrial economy to an "Information-Age Economy," knowledge-based economic development (KBED), the creation of a knowledge infrastructure based on active linkages among academia, industry and economic development organizations, is emerging as a promising tool for communities seeking to attain "world-class" status.'

There is not only one single generally accepted model of development, but every of them give insight into a number of chosen dimensions of such complex phenomenon as development is. Different theories of development are mainly generalized and their application to a particular country or economy means taking into account its specificities that arise from unique historical, societal, cultural and economic circumstances characteristic for that very unit.

Models of development are usually classified in different ways. Contemporary studies observe development from different standpoints mainly starting from economic-industrial modernization, organizational changes of companies, social transformation, market development, cultural differences etc. All these issues lead to analysis of differences in resource allocation efficacy between countries or regions. In the next parts of the paper several various concepts and models of developments will be presented, formulated in different phases of development of economic thought, with special attention to the quality of the labour resource comprising among other indicators level of educational as well.

On the basis of specialization a country obtains, the comparative advantages growth model is formulated [Ricardo, 1817]. International trade is in the first plan of this model. Possession of resources leads to specialization, that enables more exports so expansion in output is needed, and by economies of scales unity costs are reduced, competition asks for to innovations and technological prosperity. For developing countries there are prospects to gain comparative advantage by investments in infrastructure, research & development and, what is of special importance, in general education of its inhabitants. However, developing countries usually do not have enough resources for investment in material or nonmaterial capital, so they mostly specialize in primary sector followed by intensive land and labour use, and because of trade barriers and high transportation costs these incentives rarely lead to declining of differences between developed and developing countries.

The Harrod-Domar model was formulated as a synthesis of investigations of economic cycles lead during the 1930-ies by Sir R. F. Harrod and E. Domar. In this model economic development depends on level and rate of savings as source of investments, while there is a constant rate of return, i.e. marginal product of the capital equals to average product. This model was widely applied in the period after the WW II, where on the basis of the desired growth rate and given capital coefficient the needed savings rate was derived. Economic growth depends on labour and capital, but in developing countries there is surplus of labour and lack of capital that limits development. Main shortages of this model that it does not count with difficulties of increasing savings when the economy is underdeveloped, and it does not take into account other important development factors like structural changes and human resources with its qualifications.

The exogenous growth model is formulated in the scope of the neoclassical economy [Solow 1956, 1957; Swan, 1956]. Here labour, capital and technological progress are separately observed. In this model new capital has higher productivity thanks to technological progress, labour is important source of development, there are diminishing rates of return of capital and labour, two resources has constant rates to scale, but the ratios capital to output and capital to labour are changing. Short range implications derived from this model mean that measures of the economic policy (taxes and subsidies) only affect short range equilibrium but not long range growth rate. Long range growth is determined exogenously, out of the model, while economy is tending towards new equilibrium depending on technological progress and labour force development. Recent investigations of development of different economies show that long range development is more dependent on technological progress than rate of savings. What is of special interest is the fact that this model supposed convergence between nations in long range, but this was not realized in average, except for regions within national economies. New modifications of the exogenous growth model are about conditional convergence where institutional conditions, market characteristics and education policy are main factors. One of the prepositions in this model is interconnection of high technology with high productivity rate but it seems not to be achieved on the World level: modern information technology has not created the expected growth. This problems is sometimes referred to as

the Solow paradox: "You can see the computer age everywhere but in the productivity statistics." [Solow, 1987; Brynjolfsson, 1993]. There are several reasons for this: delay in effecting, computers execute typical jobs but faster, traditional measures of productivity deal primarily with quantitative but not qualitative data, computers are mainly applied in services sector where there productivity is hard to measure and often computer costs are greater than output rise. Besides that, generally in the World information technology bringing appropriate knowledge with itself only represent 2% of the fixed capital in any country.

Mathematically the exogenous model can be expressed as a set of five simultaneous equations: the macro production function, output equation, savings function, capital growth and labour growth function. In the Cobb-Douglas type macro production function

$$Y = A \cdot K^{\alpha} \cdot L^{\beta} \qquad (1)$$

Y is output, K is capital and L is labour, A is the total factor productivity and α and β represent parameters of a system, or elasticity. Constant rates to scale and autonomous technical progress γ introduced, with serial number of observation t and stochastic element u, the appropriate econometrical form of the production function becomes:

$$Y_t = B \cdot K_t^{\alpha} \cdot L_t^{1-\alpha} \cdot e^{\gamma \cdot t} \cdot u_t \qquad (2)$$

Labour growth function is given simply by:

$$L_{t+1} = L_t \cdot (1 + r_L) \qquad (3)$$

where r represents rate of growth.

One of the important issues this model introduces is the technological progress. Technology is defined in different ways. e.g. „the practical application of knowledge especially in a particular area“ and „a capability given by the practical application of knowledge“ [Merriam-Webster, 2011]. If so, technological development is reciprocally connected to labour, or better say human resources: advanced knowledge produces new technology and the application of new technologies needs enhanced work force. So, the technological progress and labour growth are not separated but interdependent, labour growth should comprise changes in quality of work force, not only quantitative figures.

Some disadvantages of the exogenous theory like neglecting of entrepreneurship and institutional conditions produced critics and lead to formulation of endogenous theory of growth [Romer, 1986, 1990; Aghion & Hewitt, 1997, Castro, 1998]. This, the so called “new theory of growth” was derived during the 1980s, which introduced formulation of the macroeconomic model on microeconomic basis: households maximize utility with limited income, firms maximize their profit, and special attention is paid to new technologies and human capital. Growth is modelled by production function with constant returns to scale, which can be augmented with quality changes and knowledge spill over effects. Knowledge spill over stimulates technological improvements of others on basis of one’s own innovation and invention activities resulting in collective economic growth. Especially areas with concentration of industry contribute to the efficient growth of knowledge in the new economy [Carlino, 2001]. In this model, economic policy has important impact on long-range development: subsidies to education and research & development by encouraging innovations contribute to greater rate of growth. Because of the preposition of constant marginal productivity of capital there is no convergence towards zero on aggregate level; besides that, this model does not offer any solution to the problem of the modern world of divergence between highly developed and developing/underdeveloped countries. On the other hand, openness of national economies produces continual competition that generates innovations, transformations of the society and of the economy obtaining long range growth [Howitt, 2007]. There are attempts to connect endogenous growth theory directly with knowledge [Chen, Kee, 2005]. Here the main engine of economic development is knowledge comprising of two elements: technology and human capital. In their paper Chen and Kee associated growth rate of the human capital to growth rate of productivity and output per worker. Rise in educational ability of the labour force leads to increase in the long-term growth rate of per capita income. Here research and development sector is endogenous, so it captures the accumulation of knowledge through technological progress, which is source of long-term growth.

Fisher and Clark developed the theory of structural change, while there are three stages of development, and countries are supposed to pass through them [Fisher, 1939; Clark, 1940]. The first stage is characteristic for low-income countries where primary production prevails (extraction, agriculture, mining, fishing, and forestry). Middle income countries are dominated by secondary production (manufacturing and construction). The third sector prevails in high income countries reaching maturity; here services are main matter, like education and tourism. Changes in resources or the society and policy decisions may initiate structural change causing obsolescence of knowledge and occupational skills of the work force that lead to structural unemployment. Long-range results in solving problems of structural changes can be only obtained by increasing labour mobility that is manageable by investment into education.

The dual sector model of development [Lewis, 1954] analysed transfer of labour from agriculture to industrial sectors. The technologically more advanced industry offers higher wages to labour force that leads to more savings and accordingly more investment, generating higher growth rates. Main problems of this model is that because of technological progress industry does not need all the surplus labour force from agriculture, but maybe less number but more educated workforce.

W. W. Rostow derived the linear development theory from history of economic growth. Modern developed countries passed through five phases of structural changes in their history: traditional society, preconditions for take-off, take off, drive to maturity and age of high mass consumption [Rostow, 1959, 1969]. In traditional societies intensive agriculture is the main activity and capital use and development are minimal. In the phase of take-off or transition economic processes are what drive the society while the roles of capital mobilization and education are especially emphasised and infrastructure, entrepreneurship and manufacturing emerge. During the stage of drive to maturity economic growth is supported by technological innovations that spread through diversified activities. Despite the assumption of this model of linear and similar development in all countries, the reality showed much more diversity especially in terms of moving forward and back in some countries because of different political, social and organizational reasons while comparative advantages are incorrectly identified. Especially smaller countries cannot become competitive by this model of linear growth.

The dependency theory explains using economic and political factors how underdeveloped countries or developing countries depend on more economically developed countries, because of interconnections between development and international trade. This theory was initiated by R. Prebish's works about structuralism during the 1950s [Prebish 1950, 1959] and elaborated by the United Nations Economic Commission for Latin America and the Caribbean during the 1960s. Main postulates here are that poorer countries purchase new or used goods from more developed which gain more profit, and for the purpose of maintaining their own position, more developed prevents less developed from growth through economic measures, public media control, political forcing and banking system and even by control of finance, culture and education.

Theory of balanced growth [Nurkse, 1963], as a generalization of Say's law (demand of one sector is forced by production of other sectors), the theory of big push [Rosenstein-Rodan, 1970] connected to it, assumes simultaneous expansion in almost all activities and regions of an economy, forming reciprocated market prospective. Entrepreneurs should invest into new resources and especially to education of the new work force, but as critics formulated by representatives of the free market theory entrepreneurs are not willing to take risks of own resources by anticipating positive externalities that would generate investments with other firms. Governments should take actions of coordinating and planning simultaneous investments, obtaining financial means, investing in infrastructure, protecting new industries and intervening in prequalification of the work force by organizing and financing the school system and offer appropriate educational programs. Unfortunately underdeveloped countries rarely have the opportunity follow balanced growth: governmental interventions often lead to unproductive resource allocation and non-utilization of comparative advantages. The theory of unbalanced growth [Hirshman, 1958] accepts the idea of generating growth under free market conditions, but assumes planning and governmental interventions are not needed in all economic activities but only in strategic sectors and their development will encourage growth of other firms giving them needed inputs and consuming their output.

Model of sustainable development argues to use resources so that human needs are met but environment protected so it can last to indefinite future. Sustainable development connects natural capacities with human needs, stressing three component parts: environmental sustainability, economic sustainability and socio-political sustainability, in addition to this in documents of UN and EU the fourth pillar is mentioned: the cultural system sustainability [WCED, 1997; UNESCO, 2001]. In Agenda 21 of the United Nations [UN, 1992] information,

integration and participation are identified as elements that support countries to achieve sustainable development with unity of the environment, socio-political and economic system, as shown in figure 1.

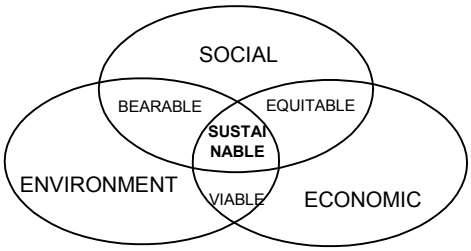

Figure 1 Scheme of sustainable development [UCN, 2006]

Sustainable development can be observed from the standpoint of three types of capital: economic, social and natural, which are not always mutually substitutes and whose consumption is usually irreversible. Degradation of natural and social capital has negative consequences, because benefits are private but costs are externalized to the whole society, information are asymmetric and firms cannot optimize their resource allocation.

Conclusion remarks

The world continues its transition from industrial economy towards information economy. Communities seeking to become most developed should apply the concept of "Knowledge based economic development" [Stucki, Andrews, 2011]. It can be stated that "Economic growth...can only come from a very sharp and continuing increase in the productivity of the one resource in which the developed countries still have an edge: the productivity of knowledge work and of knowledge workers." [Drucker, 1998]. In the contemporary world linkages between business, government and academic research can produce technological innovations obtaining long-range economic growth.

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E-LEARNING PLATFORM FOR GREEK SIGN LANGUAGE TRAINERS

Dimitris Kiriakos, IEK Ag. Dimitriou, Dimitrios Loukatos, EPAL Haidariou, Stavroula Misthou, Greece

Abstract

This work explores the design, implementation and evaluation of an electronic platform for distance learning for teachers of Greek Sign Language (GSL) in special education schools. The online distance learning electronic platform for teachers provides lifelong education and was created as part of an annual teaching program of GSL on behalf of Polychoros Kivwtos, a teaching centre of GSL. This paper is based upon the principles of adult learning and the potential usage of the Internet in distance education. A study and comparison of the e-learning platforms led to an implementation of a synchronous and an asynchronous platform for distance learning. The current research is based on both qualitative assessment of the educational needs of trainees as well as on quantitative study of a web-based questionnaire. According to the results, the training on GSL is a valuable vocational asset that can help trainees to find work. Furthermore, the use of new technologies can help a lot in GSL learning, especially when the face to face teaching is combined with an e-learning platform (hybrid model). Finally, the asynchronous platform in GSL adult distance learning outweighs the synchronous version (teleconference) and is considered to be efficient, flexible and easy to use.

Keywords*:* ICT, e-learning, distance learning, GSL, adult education, lifelong education.

Introduction

Sign language is the only form of language that allows deaf people to communicate easily, in an interactive and effective way. With the help of Sign Language the everyday communication is achieved while the old traditions can be transferred to the younger people. The deaf community is treated as a linguistic minority and not as a group of people who share the same disability [1]. Sign languages play an important role in the linguistic mosaic of Europe. These languages are based on coded gestures rather than on sounds and are also as rich as the spoken languages in terms of grammatical structures, syntax and vocabulary. Generally, each spoken language has its sign language equivalent.

In 1997 the European Union recognized the sign languages of the Member States as official languages of deaf communities in the Union. Sign languages are natural languages that are constantly evolving. Although sign languages seem to have a common visual and kinetic structure, are not mutually comprehensive. Each country has its own sign language, spoken by the members of the Deaf community of the country.

This work explores the design, implementation and evaluation of an electronic platform for distance learning for teachers of Greek Sign Language (GSL). The online distance learning electronic platform for teachers was created as part of an annual teaching program of GSL on behalf of Polychoros Kivwtos, a teaching center of GSL. Another reason for getting involved in this work was that the area of research of GSL in the context of adult education and distance education was almost unexplored. Furthermore, a thorough literature review indicated that better employment opportunities exist for people who know the GSL. The theoretical framework of this work is based upon the principles of adult learning and the potential usage of the Internet in distance education.

According to Rogers [2], the adult trainee is learning occasionally with a non continuous manner. Maslow hierarchical model indicates that the needs of an adult create motives which lead to learning. The trainer in such a course acts as a coach who encourages and coordinates the team. An e-learning system assists in eliminating the fear of exposure which is a common obstacle to learning for adults. All theoretical approaches to adult education agree on the importance of adult involvement in all stages of the learning process.

A study and comparison of the e-learning platforms led to an implementation of a synchronous and an asynchronous platform for distance learning. For the purposes of the current research, this work is based both on qualitative research of the educational needs of trainees as well as on quantitative study of a web-based questionnaire. The questions answered by the research, concern how the students evaluate the educational

environment and the distance learning implementation, the online learning environment, the learning level of the GSL after the completion of the distance education course and whether the distance training is suitable for GSL learning.

Methodology and techniques

The initial goal of the work been presented was to develop / install and evaluate a supplementary tool for training 80 people to become trainers in GSL. In order the chose the best method both synchronous and asynchronous e-learning platform environments were studied and tested.

The DimDim platform was chosen as a good representative of synchronous e-learning method. Initially the trial version was tested with 10 on line users. Due to the poor quality of the trial version and because of serious network instabilities (mainly poor bandwidth) the synchronous e-learning platform failed to meet the acceptance requirements.

In case of asynchronous e-learning platform, two well-known LMS (Learning Management Systems) were candidate. The first one was the eFront platform from Epignosis ltd [3] and the second one was the Moodle platform [4]. Both systems were installed and were proven to meet the necessary requirements. Finally, after considerable tests, the Moodle platform was chosen as people were more familiar with.

The Moodle LMS system was enriched with texts, links and videos suitable for GSL learning. Exercises are also provided either as multiple choice forms or as videos to be created. The access to the system is possible via the URL: http://www.sireneinformatics.com/elearning. Figure 1 shows a screenshot of Moodle platform customized for GSL learning.

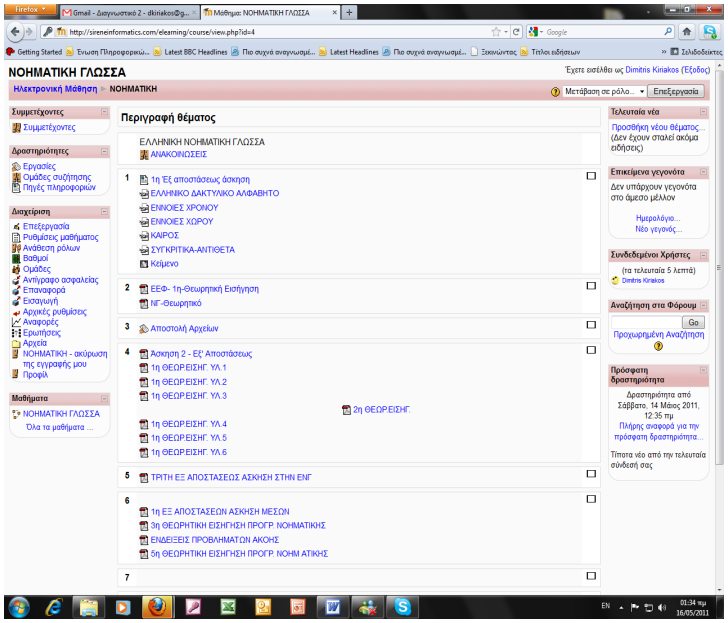

Figure 1 The Moodle platform customized for GSL learning

The approach being followed was based on both qualitative research of the educational needs of trainees and on quantitative study of a web-based questionnaire. The current survey used a sample of 80 people, all of them trainees of the GSL courses.

The most important issues the survey should provide answers for were:

- How the students evaluate the educational environment and the distance learning implementation, the online learning environment?
- Is the learning level of the GSL after the completion of the distance education course satisfactory?
- Is the distance training technique suitable for GSL learning?

For better accuracy, the trainees were asked to fill a pre-questionnaire form (24 such forms were completed and collected the traditional way). At next stage, a detailed set of questions was formed and became available to the trainees using the Internet.

More specifically, in order to collect reliable data in an efficient manner from the trainees, the Google Docs [5] platform has been used. With Google Docs, documents, spreadsheets, and presentations can be created in a variety of formats, or imported through the web interface, or sent via email. Documents are automatically saved to Google's servers to prevent data loss and can be tagged and archived for organizational purposes. The trainee fills the questionnaire and data are exported into a spreadsheet for further processing and/or graphical representation. This data collection method is 24 hours available from anywhere and at almost zero cost. Furthermore, this method provides remarkably objective data as the trainees participating to the survey remain anonymous and fill the questionnaires at the absence of the researcher. Apparently, the researcher had to spend some time to explain how the web-based questionnaire works.

Further processing of the data being collected has been performed via the SPSS [6] method. The SPSS is a computer program used for survey authoring and deployment, data mining, text analytics, statistical analysis, and collaboration & deployment. The most important statistical results provided via the SPSS are discussed into the next section.

Results

A peer SPSS analysis of the questionnaires highlighted interesting results on trainees' profile and on their opinion for the overall program.

More specifically, the profile of people involved in this program was as follows:

- Most of the trainees were women (91.25 %) and between 25 and 35 years old.
- 77.5 % of the participants obtained University degree.
- 55 % of trainees had a previous experience on a special education program but most of them had no experience on distance learning education.
- Almost 100 % of the participants were able to use a foreign language.
- All of them were familiar with the use of Internet technologies.
- 38.7 % of the sample was unemployed and 28.7 % were teachers.

The people's opinion for this program can be summarized as follows:

- 48.75 % of the sample thought that the major difficulty in this program is that it requires a lot of studying and practice with GSL.
- The vast majority of the trainees found that the dim dim platform was unffective and difficult to use.
- The vast majority of the trainees found that the moodle platform was effective and easy to use.
- Almost half of the sample has found the distance education flexible.
- Finally, half of the sample considered that the electronic platform is a sufficient tool for qualification process in GSL.
- 48.75 % of trainees said that the studying of the GSL would assist in finding a job.

Figure 2 indicates the trainees' opinion about the GSL learning level after the completion of the distance education course.

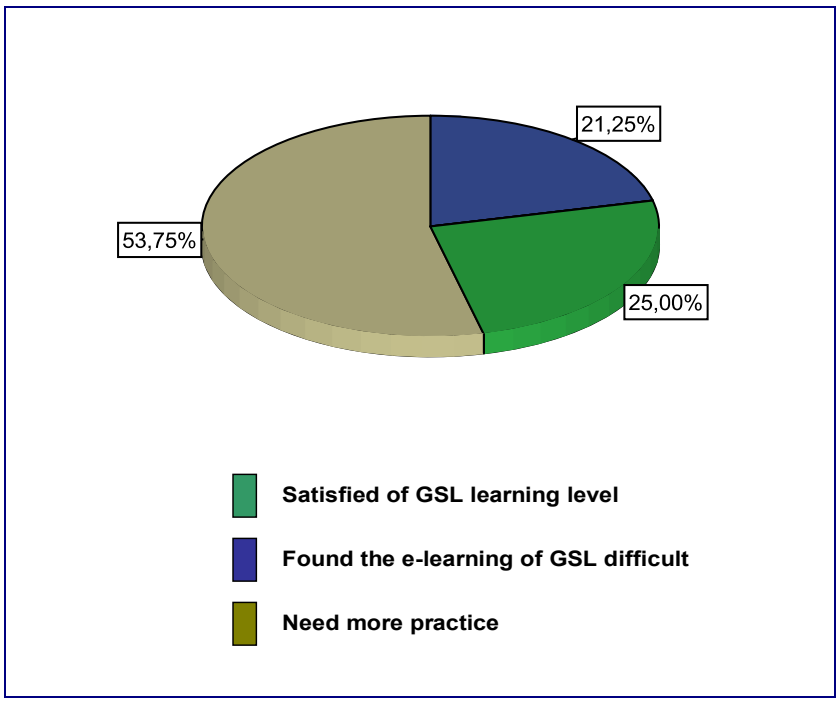

Figure 2 Evaluation of the GSL learning level after the completion of the distance education course

Conclusion and future work

The work been presented explores the design, implementation and evaluation of an electronic platform for distance learning for teachers of Greek Sign Language (GSL). A study and comparison of the e-learning platforms led to an implementation of a synchronous and an asynchronous platform for distance learning. Through literature review a study of the Greek Sign Language focused on the general principles of the GSL Curriculum Studies in Greece and employment opportunities for those people who know the GSL. For the purposes of the current research, this work is based both on qualitative research of the educational needs of trainees as well as on quantitative study of a web-based questionnaire. The questions answered by the research, concern how the students evaluate the educational environment and the distance learning implementation, the online learning environment, the learning level of the GSL after the completion of the distance education course and whether the distance training is suitable for GSL learning.

According to the research results based on this work, it is obvious that the training on GSL is a valuable vocational asset that can help trainees to find work. An analysis of the current research shows that the use of new technologies can help a lot in GSL learning, especially when combined face to face teaching with the use of an e-learning platform. Overall, it appears that the asynchronous platform of adult distance learning outweighs the synchronous version (teleconference). Finally, the asynchronous learning platform in GSL is considered to be efficient, flexible and easy to use. Simultaneously, such a platform removes spatial and temporal constraints, reduces the cost of the education process and is suitable for lifelong adult distance learning.

The results indicate that the electronic platform has gained the confidence of the trainees and thus, could be used as a sufficient tool for qualification process in GSL as well. Another remarkable result is that the volume of video content being necessary to support the e-learning platform was quite oversized for Moodle's current implementation and for his reason the trainees uploaded their videos using the youtube platform. So, a next step would be the introduction of “social video” based upon Web 2.0 tools. This would lead to a turn from e-learning to c-learning environment [7].

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GOOGLE SKETCHUP AS AN INQUIRY-BASED TOOL IN MATH LESSONS

Nataliya Toncheva, Shumen University "Bishop Konstantin Preslavski", Bulgaria

The need of specific tools to implement Inquiry-based approach

The possibilities of Inquiry-based learning (IBL) are being explored for a number of educational areas and with students of different ages, interests and level of competencies. Projects such as PATHWAY- SIS-CT-2010-266624 (Pathway, 2010) and 510276-LLP-1-2010-1-GR-COMENIUS-CMP-LD-skills (LD-Skills, 2010) intended to assist the implementation of constructivist approaches and in particular inquiry-based approaches in teaching mathematics and science at school. For this purpose, pending are trainings of in-service and pre-service teachers in the effective implementation of the IBL approaches. In *(Colburn, 2000)* is mentioned that there is a confusion about the meaning of inquiry and teachers who feel inadequately prepared for inquiry-based instructions. To overcome these problems there are useful projects, as mentioned above, which are an important place where best practices for implementing inquiry-based methods in science and math training are developed. For subjects such as mathematics, one option is to use a software through which students are engaged in activities inherent in the practice by measuring the lengths of the objects, calculating the materials needed for construction, etc.

One convenient feature is to use design software like Google SketchUp which allows modelling real objects. The given approach is relatively new. A survey among teachers *(Toncheva, 2011)* shows that there is a need of in-service and pre-service teachers trainings in its implementation. In this paper is presented the good practice – Google SketchUp as an inquiry-based tool in math lessons, in which pre-service math and ICT teachers are trained in Shumen University but it is suitable for in-servise trainings, too. The examples offered to pre-service teachers are appropriate for training of students from different grades and ages. Pre-service teachers have the opportunity to apply this knowledge and competencies in the real training during their practice that takes place in the school and pre-service teachers have the opportunity to teach within one month in several classes in a school chosen by his/her methodical supervisor.

Training of pre-service teachers passes the following steps:

1. Understanding the main features of the product:
    a. Class work – appearance of desktop, basic tools and actions with them. Materials for self-study, available on the product's site.
    b. Self-study time – an exercise of the basic tools of a product, introduction to some specific tools and actions with them. Work with materials, available on the product's site.
2. Methodological features of the product:
    a. Class work – opportunities to be used in training. Examples of good practices. Examples of unjustified use of this tool in the training.
    b. Self-study time – development of teaching materials using Google SketchUp. Description of didactic material characteristics of each of them (where applicable; supplementary materials accompanying the product; methodological instructions)

Inquiry-based learning as a constructivist-oriented approach

According to *(Borisov, et al, 2011)* Inquiry can be defined as the intentional process of diagnosing problems, critiquing experiments, and distinguishing alternatives, planning investigations, researching conjectures, searching for information, constructing models, debating with peers, and forming coherent arguments. Inquiry learning has been previously classified as learning science as inquiry and by inquiry. Learning science as inquiry includes learning about the way in which the scientific endeavour progresses, and analyzing the inquiry process performed by others, sometimes using historical perspectives. Learning by inquiry, or learning "the abilities necessary to do scientific inquiry" involves the learner in raising research questions, generating a hypothesis, designing experiments to verify them, constructing and analyzing evidence-based arguments, recognizing alternative

explanations, and communicating scientific arguments. Teaching science by inquiry requires imparting not only scientific information but also the abilities to do inquiry and, more deeply, an understanding of what scientific inquiry is about.

Teaching mathematic by IBL is a part of the whole process of inquiry based approach in education. Students have to be closer to problems from real life and to solve them not only with the help of algorithms.

The approach IBL is based on three main axes, as it is mentioned in *(Borisov, et al, 2011)*. They could be shown by Figure 2.

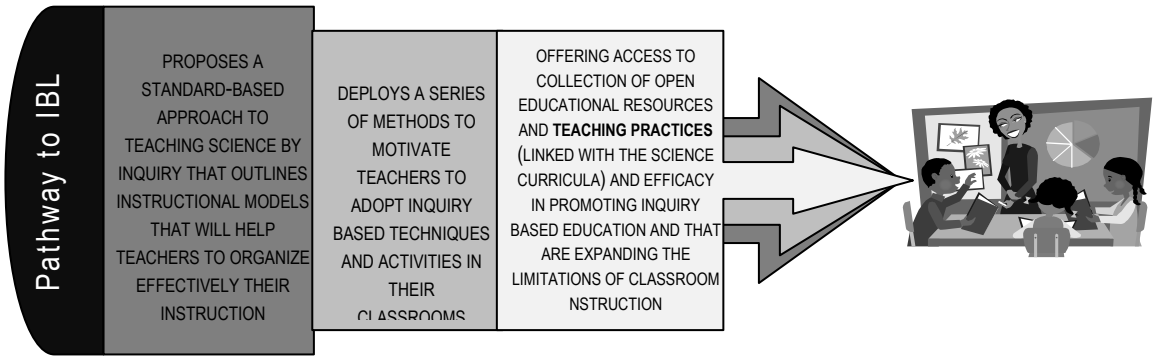

Figure 2

Such an approach enabling all stakeholders (teachers, teachers' trainers, curriculum developers, policy-makers) to examine their own practices in the light of the best performing approaches that set the standards on what can be achieved and provides them with a unique tool to bring about improvements in their everyday practice.

The essential features of inquiry are: Learner engages in scientifically oriented questions; Learner gives priority to evidence in responding to questions; Learner formulates explanations from evidence; Learner connects explanations to scientific knowledge; Learner communicates and justifies explanations.

According to *(Colburn, 2000)* approaches to Inquiry-Based Instruction are:

- Structured Inquiry
- Guided Inquiry
- Open Inquiry
- Learning Cycle

Why to use Google SketchUp

This product was created primarily to design objects, interiors and buildings. Exactly these features often awaken in students a greater interest than the purely educational software designed specifically for training. Pupils are highly motivated and can easily handle with the study of the product by themselves. They can use a set of video lessons, designed for customers from very beginners to professionals in the official cite http://sketchup.google.com. An additional motivation is the ability to create models of buildings for Google Earth. This task can provoke additional interest in pupils and bring them the satisfaction of showing the results of their work in Internet.

Organisation of the product is turned to simplify its using by customers with different needs. It must be emphasized intuitive proposed instruments. Their appearance literally dictates the user what tool to use and how to use it.

Especially important is the fact that there is a free version available for everyone - Google SketchUp. For today Google SketchUp Pro is available at € 360. In the paid version there are many benefits associated with production of documentation related with three-dimensional models, the possibility of high-quality showing in a two-dimensional form, the possibility of convenient presentation many established models, etc. This considerably optimizes work of professional designers, but for training purposes the free version is completely enough.

Realistic models and the opportunity to see them from all sides, to feel in a certain subject, to measure the required components, puts students in situations close to real ones. This is an easy and cheap decision to use inquiry-based approach in mathematical education.

Geometry and especially stereometry gives favourable conditions for demonstrating applicability of school mathematics in everyday life. Some teachers spent time out to show the familiar examples, using measurements of objects held in the classroom. This approach is successful, but requires time and often leads to an excess of emotions for pupils and to deterioration of discipline.

As it is mentioned in *(Toncheva, 2011)* using Google SketchUp as a tool of computer assisted learning or as an addition to the classical form of training, the teacher can easily create or use ready models on the basis of which it is possible to compile and solve problems that are closely associated with human life and conditions of life. This approach can be well used in teaching planimetry, placing students in a familiar situation, finding the necessary plans and solving the problem only in 2-dimentional tasks (example on Figure 3)

Implementation of Google SketchUp in mathematics may follow different patterns. Here are the main options:

1. The description of the problem, along with the ready file is given to students. In the file or in the text of the problem needed dimensions of an object are shown:
    a. Then is it possible to have a full description of a model, but possibly not to mention facts as the correctness of shapes, the fact that a point is the midpoint of a segment, etc. These facts can be clarified during a conversation with pupils and further agree that shall not mention them if they are obvious (as a model - standard household items and all are familiar with them)
    b. Subjects are presented realistically, but if necessary, transparency is given so the students can see them inside.
2. It is given only a model without dimensions and questions about the problem, but the student is required to use the features of SketchUp to measure the specified parameters.
3. Pupils are required to create their own model and to perform calculations.

In this regard, there are different requirements to the equipment of the class and the level of pupils' skills to work with the product. It is possible to work in a room with a computer and multimedia projector, interactive board or classroom equipped with a computer for each student. It is possible students to have only basic skills to rotate, view and measure the object, but depending of chosen approach it may require more in-depth knowledge of the product. According to *(Toncheva, 2011)* there are some basic possibilities:

1. Computer, controlled by a teacher and a projector. Pupils work with their textbooks and on a computer if they are summoned by a teacher.
2. Interactive Board.
3. All students have access to the computer and work independently, follow instructions and actions as in both previous options.
4. The training is conducted at home on a personal computer, in advance of proposed instructions and assignments. This option can be used as an addition to the above.
    a. Independently, if there are problems with the material equipment in the school. In this case, checking and discussion with the class might be spent on the Internet, but for this approach, the teacher must separate their own time and to motivate students to participate in this lesson.
    b. Using the project-based approach. In this case students work individually or in groups to perform assigned by the teacher tasks, and then present before the class their results.

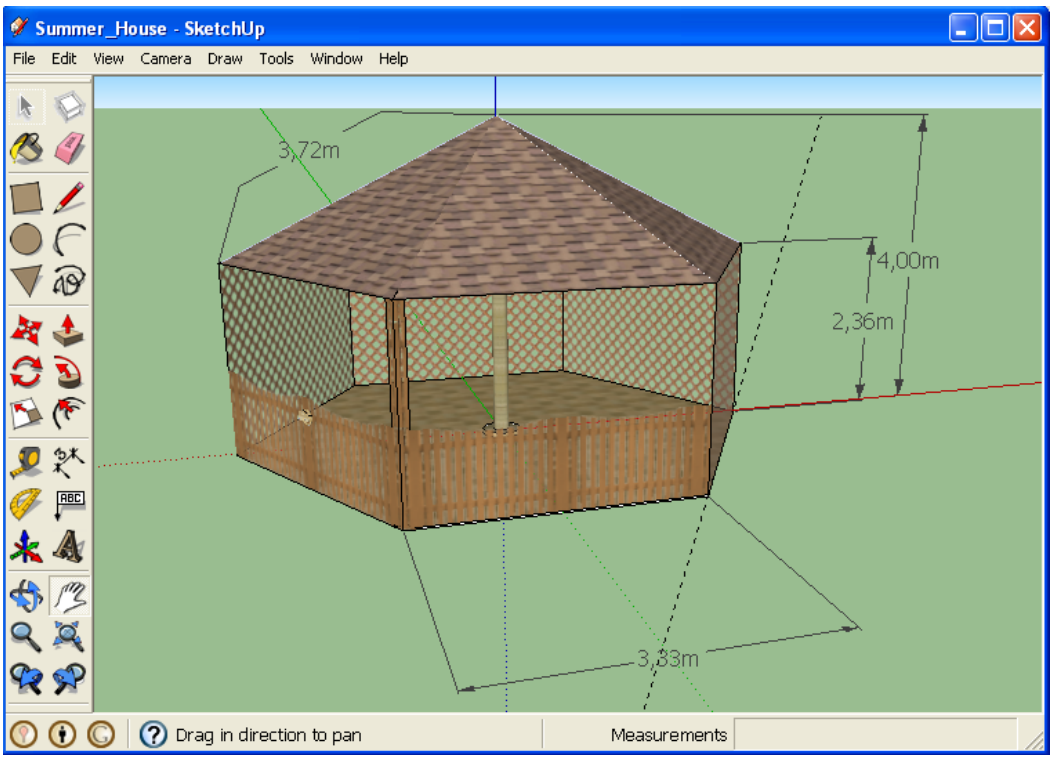

Figure 3

In Figure 3 is given a screenshot of SketchUp 8 with one example - a model of summer-house with some measurements. The teacher can ask a variety of tasks, using this model.

With this example, we can solve a lot of different problems from different grades. For example it is possible to construct didactic material consist of:

- File created with Google SketchUp with this model.
- Text of the problem – how many square feet of lattice planes will need to make this arbour or approximately how many tiles of size 20 cm×20 cm it will take to the floor covering, etc.
- Methodological instructions – to improve inquiry teacher has to choose to hide all measurements and to ask students to find only those which are needed for this problem or to show more measurements that are needed and to ask students to choose only those which are needed. For classes where it is impossible all students to have computers it is possible to use the second approach with multimedia projector or interactive board.

This example shows how different type of inquiry can be applied.

- Structured Inquiry – if the example is given after the theoretical part of the lesson.
- Guided Inquiry – the problem is given for homework before acquiring knowledge of skills to solve such problems.
- Open Inquiry – students are asked to find all needed materials (tiles, shingles, mesh panels, etc) and to find the approximate price by using pricelist which students can find in the Internet.

For more senior students by using the same file, teacher can create problems for calculating the volume of summer-house, only the volume of its roof, finding angles, etc.

Another example is shown on Figure 4. This example can be used as shown previously. In math lessons in design-oriented schools it can be used a similar model of a table or other stuff, which will be manufactured by students later in industrial art classes.

To these tasks can be also added some questions to the calculation of percents, such as: How many cubic meters of wood are needed to manufacture the subject, if you know that the material loss in the construction process will be about 30%?

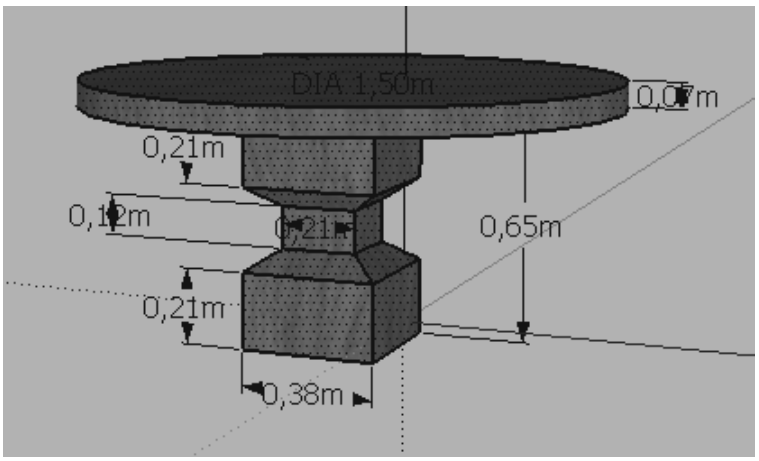

Figure 4

Of course, besides the advantages this approach has its drawbacks. Possible drawbacks may be considered:

- Distraction of attention from problem to the model.
- For learning math – to measure the desired length, or automatically find the desired area in cases where this is the ultimate goal of the problem. This "deficiency" can easily be turned into an advantage by asking students to check their work themselves. The teacher must demand from students to write the complete solution in their notebooks. If the teacher manages the model, he just should not perform these measurements while students have not achieved the result for themselves. This tool is useful for inquiry-based approach when students have to use it like realistic tool to measure objects.
- The need for additional self study by a teacher who takes his personal time and resources.

Conclusion

Presented in *(Toncheva, 2011)* research and practice with university students showed an interest for both pre-service and in-service teachers to use Google SketchUp as an inquiry-based tool in math lessons. The ability to apply inquiry-based approach in mathematics helps to bring the abstract mathematical knowledge closer to the practice and promotes the ability of students to cope with real life problems.

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THE MULTIMEDIA OPEN LEARNING ENVIRONMENT (MOLE)

Nikos Pappas, Polyxeni Arapi, Nektarios Moumoutzis, Manolis Mylonakis, Stavros Christodoulakis,
Technical University of Crete, Greece

Introduction

The MOLE (Multimedia Open Learning Environment – http://www.moleportal.eu/) is a multilingual multimedia management system for managing courses and supporting learning processes and learning communities through the Web. It was developed by the Laboratory of Distributed Multimedia Information Systems and Applications (TUC/MUSIC) of the Technical University of Crete. The MOLE fosters distance learning by enabling communication between tutors/trainers and students, cooperation among students and access to coursework information and learning resources. In doing this, the MOLE platform also supports the combination of traditional classroom-based lessons and practical sessions, with self-study and eLearning. This, so called, "hybrid" or "blended" approach provides a significant learning opportunity as it combines the immediacy of communication among the instructor and the learners and the irreplaceable practical training in laboratories and the convenience, flexibility and self-regulation of education without the time and space constraints. This hybrid organization aims to exploit the strengths of both approaches (traditional and tele-education).

In this paper we present the services offered by MOLE and how they can be exploited to establish and continuously support Communities of Practice (CoP). According to Wikipedia, a CoP is *"a group of people who share an interest, a craft, and/or a profession. The group can evolve naturally because of the members' common interest in a particular domain or area, or it can be created specifically with the goal of gaining knowledge related to their field. It is through the process of sharing information and experiences with the group that the members learn from each other, and have an opportunity to develop themselves personally and professionally (Lave & Wenger 1991). CoPs can exist online, such as within discussion boards and newsgroups, or in real life, such as in a lunch room at work, in a field setting, on a factory floor, or elsewhere in the environment."*

CoP benefit both individual practitioners and organisations by enabling them to manage change, offering access new knowledge, foster trust and a sense of common purpose and add value to their professional lives. As a mechanism for knowledge creation and sharing and capability building, CoP can significantly contribute to Vocational Education and Training by establishing effective training frameworks offering initial training to newcomers and continuous support to community members in exchanging experiences and best practices.

We present the establishment of two such training frameworks for establishing and supporting distributed communities of practice across European countries: The first one consists of computer science teachers in secondary education from European countries. The aim is to exploit modern Educational Programming Languages to make computer science courses in secondary education more attractive and creative in a learner-centred pedagogical setting. The second one consists of agricultural professionals from European countries. The aim is to transfer innovative training practices and eLearning content in Organic Agriculture in the case of vocational education of (young and unemployed) agricultural professionals in new EU members.

The MOLE multi-tenant architecture and services

An important characteristic of MOLE is its multi-tenant architecture that can support multiple instances of it using the same core to serve the needs of different projects or communities (Figure 1). The MOLE platform offers a complete set of services that reflect eLearning common practices supporting:

- the organization and management of digital educational content (e.g. lectures, notes, exercises, technical lab material, literature, FAQs etc.)
- course attendance (e.g. announcements, email messages, course calendar, personal rating, automatic track of exercises and deadlines, content update messages, course syllabus etc)

- learning communities (e.g. mailing lists, live chat rooms, forums, personal messaging, instant messaging, annotation tools, video conferencing and collaboration etc.)
- educational activities (e.g. courses registration, lab teams formation, exercise uploads and deadline management, assessment tests, resource scheduling and reservations, multimedia presentations etc.)
- course monitoring (course usage statistics, class performance indicators)

Each course allows can activate only a subset of course services depending on the course requirements.

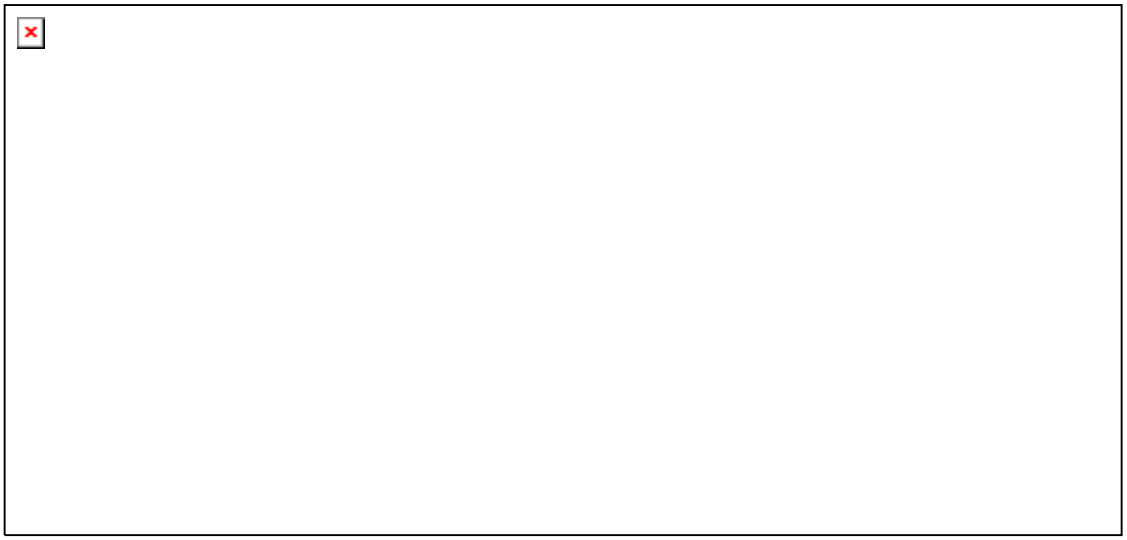

Figure 5 The MOLE multi-tenant architecture able to support different communities and projects

The MOLE platform offers instructors tools for easy content creation and web publishing. They have the ability to use common office applications for document creation. These documents are being processed by MOLE for indexing purposes and are published to MOLE in the desirable web based presentation format.

The platform provides also a framework for dynamic statistics graphical presentations such as real-time user action statistics, learning services usage, course traffic, and learner's performance statistics.

Finally, the MOLE platform maintains a Learning Resources Repository for the storage of the learning resources (locally or by reference) and their metadata. In order to support effective learning resource management and sharing, a framework and an architecture has been developed in MOLE, aiming at facilitating the implementation of such functionality on top of existing Learning Management Systems (Mylonakis et al., 2011). This generic component, illustrated in the right part of Figure 1, is the Metadata Management and Sharing System and is described later in this paper. MOLE also offers a service for exporting a course and its resources to SCORM format, supporting this way interoperability with other SCORM compliant eLearning systems.

An advantage of MOLE in comparison with other eLearning systems (e.g. Moodle, Sakai etc.) is the emphasis that is given in the use of multimedia as a powerful learning means. Learning activities using multiple media can be more effective than doing it through a single medium (such as text), but what is important is combining media effectively; Effective multimedia for learning requires carefully combining media in well reasoned ways that take advantage of each medium's unique characteristics. The most effective multimedia provides learning experiences that mirror real-world experiences and let learners apply the content in various contexts.

In the following sections some of the more interesting services of MOLE are presented: the multimedia support and the corresponding services (e.g. multimedia presentations, virtual conference and collaboration, multimedia annotations), the Metadata Management and Sharing System and the intuitive multilingual interfaces support.

Multimedia support

Special emphasis in MOLE system is given in the use of multimedia as a powerful learning means. In order to support learning applications, the platform was developed to meet the following technological requirements:

- Effective management of multimedia and video/audio data streams. Mechanisms for synchronizing multiple media in presentations
- Support of synchronous and asynchronous learning activities
- Support of live synchronized multimedia transmission through the system, and access to recorded multimedia content
- Screencasts for demonstrations and presentations of software with concurrent recording of the speaker and presentation of slides
- Educational multimedia content creation and editing in dual mode: a) via a web based interface without the need for specialized software installations, and b) via an autonomous desktop application (MOLE Studio) for the creation of high quality video presentations for offline multimedia content creation and publishing
- Communication tools to support eLearning communities (Live chat with video and audio and text in real time, Video Conferencing Services with dynamic loading of shared presentations, Asynchronous multimedia communication messages)
- Advanced multimedia collaborative annotation tools on educational material using multimedia

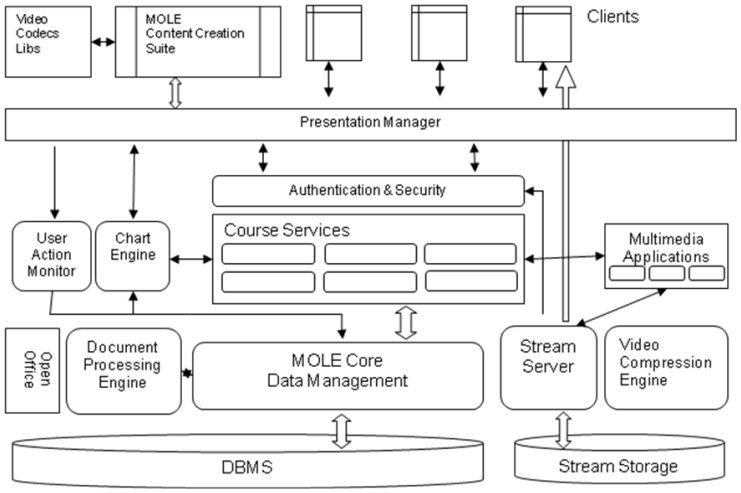

Figure 6 The MOLE internal components

As it is shown in Figure 2, the MOLE platform comprises core components that include the Document Processing Engine, the Data Manager, the Stream Server and the Video Engine. The stream server takes over the stream management and the delay sensitive data delivery to platform users. The Video Engine provides a rich set of codecs and video editing functionality and supports the content editing tools and platform's stream transcoding needs for supporting heterogeneous stream clients.

The multimedia presentation service

The platform supports live broadcasting of a presentation given by an instructor using video and audio synchronized with presentation slides (Figure 3a). It is also possible to record the presentation and store it on the platform to be accessed by the learners at different times. The learner is able to navigate to the different parts of the presentation by selecting the preferred section from the list, while the slides and the video/audio of the presentation are synchronized accordingly.

The video conferencing and collaboration service

This service makes possible for groups of learners to meet in virtual space and to communicate with video, audio and text (Figure 3b). It also provides the opportunity for dynamic processing and uploading of presentation slides, where presentation is synchronized among the members of the conference call. Any registered member in the course can create a video conference room to start collaborating with other users on a specific topic.

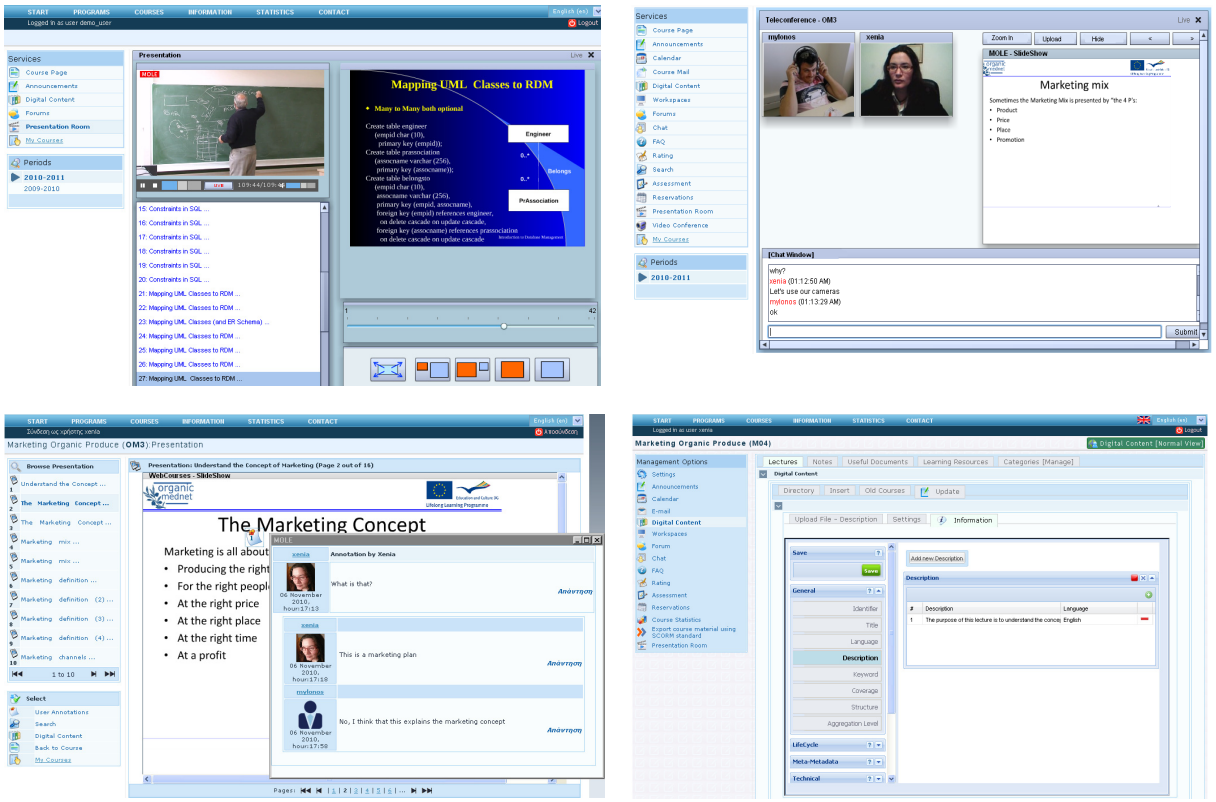

Figure 3 a) multimedia presentations (top left), b) video conference and collaboration service (top right), c) multimedia annotations (bottom left), d) LOM editor (bottom right)

The multimedia annotation service

The multimedia annotations feature (Figure 3c) allows users to navigate in the course lectures or notes, which have been previously processed and presented on the system and leave comments, notes or upload/record audio/video data at several points on the presentation. These comments can be seen by other users and the instructor. It is also possible to create a comment or note in response to a previous comment of a user. This way the educational process is enhanced, since the opportunity of asynchronous communication between learners and instructor via comments or questions on specific points of the presentation of lectures or notes is provided.

The Metadata Management and Sharing System (MMSS)

Educational resource sharing is emerging as a viable means to improve the quality of and access to education (Elearnspace, 2003). The use of learning metadata standards for the description of learning resources, as well as the implementation of harvesting protocols that will make them available to large repositories/federations are technical issues that should be addressed in eLearning infrastructures. The approach followed in MOLE (Mylonakis et al., 2011) addresses the requirements set by the eLearning community and reflected in the work in progress from the LODE group of the IMS Global Consortium – http://www.imsglobal.org/lode.html. This approach is generic and enables an LMS to share and exchange learning content with other systems leveraging the advances in related standards and ensuring the widest possible exploitation of learning content and related investment made by learning organizations today.

The MMSS (Figure 1) allows for the creation of LOM metadata descriptions based on different Application Profiles (AP), supporting the needs of different communities in different educational contexts. The technical experts can take advantage of the system, in order to develop an appropriate AP by using the AP Builder that the users can later use in order to create the corresponding LOM metadata descriptions through the LOM editor (Figure 3d). The LOM XML documents that are produced can be searched and edited through appropriate user interfaces. Moreover, the OAI-PMH Interface implementing the OAI-PMH protocol on top of the LOM Metadata Repository allows for the exposure of the metadata to Learning Resources Federations/Consumers.

Multilingual interfaces support

In order to be able for various communities residing in different geographical places to use MOLE, the platform supports multilinguality in a generic and effective manner. An intuitive form based interface was developed in order to be able to provide translations for each MOLE element from a selected language (reference language) to another (translation language). If asked to, the system is able to suggest a translation for the target sentence. When the translation to a specific language is completed, MOLE interfaces in any MOLE instance can be switched to the user preferred language.

Currently, ten languages are supported (Greek, English, German, Italian, Spanish, Estonian, Turkish, Czech, Bulgarian, Romanian), while French translation is in progress.

Using MOLE in pSkills to build a CoP of secondary education computer science teachers

The pSkills project (http://pskills.ced.tuc.gr) provides the foundation for a future integration of the national educational systems from the perspective of Information Technology (IT) Fluency (Committee on Information Technology Literacy, National Research Council, 1999). IT Fluency is considered an important aspect towards the development of an inclusive and competitive Information Society. This trend is illustrated by current technological advancements, such as the provision of a graphical programming interface based on MIT's OpenBlocks technology (Open Blocks, 2011) and the Android operating system of mobile devices from Google (App Inventor for Android, 2011) that extends the Web 2.0 philosophy in the domain of software development. Such interfaces that exploit the experience derived from using modern Educational Programming Languages (EPLs) are expected to be functional in other domains and provide the possibility of easily creating applications that can be shared with other people thereby promoting a new digital culture that transcends the model of passive consumers of software products. Modern society perceives that the mastery of computer programming (Eric Allen et al., 2008) is a key competence, as well as delivering a number of critiques (The Economist, 2010) on the current focus on the so called computer literacy without addressing concepts and core skills (Kellner, 2000; Tapscott, 2009) that are technology independent and do not change in time.

The pSkills project addresses the needs of computer science teachers to master advanced technological studies, modern EPLs and employ novel pedagogical approaches designed to make programming courses in schools more effective and motivating. It offers suggestions for exploiting the flexibility of computer science courses in European countries to put in place appropriate elements of a suggested Common European Curriculum. The European Curriculum is complemented with learning scenarios that teachers can adapt to their specific needs as well as training material to implement those scenarios.

To ensure appropriate support for teachers, the project establishes a CoP based on a training network infrastructure (the pSkills Affiliate Network) managed by a dedicated Training Support Group that builds and maintains a repository of tools and training material and provides in-service training services through face-to-face workshops, a dedicated Summer School, and services offered by MOLE.

Using MOLE in Organic.Mednet to build a CoP of agricultural professionals

Organic Agriculture (OA) is an increasingly important part of the food and agriculture industries in the traditional member states. Public awareness on environmental issues, as well as food safety and quality, have brought forward OA as an agricultural approach that can not only produce safer products but is environmentally sound too. Due to the particularities of the agricultural sector, it is difficult to promote the new culture of sustainable

agricultural production to its stakeholders. In countries such as Turkey and Spain the uptake of OA practices and techniques is still developing. Among others, the reasons for these countries lagging behind can be found in the slow introduction of OA topics as a priority of academic and vocational educational systems of all levels that contribute to the education of agricultural professionals. On the other hand, large international organizations (Food and Agriculture Organization of the United Nations, International Federation of Organic Agriculture Movements), as well as non-profit associations such as the Soil Association in UK, drive their own awareness and education initiatives for the promotion of OA in countries around the world. In addition, there have been during the past few years, several pilot actions/projects that have increased the production of eLearning content on OA theory, methods and practices (e.g. EcoJob-AP, BIOAGRO eContent, Organic.Edunet).

Such initiatives have various goals and are implemented in different socio-cultural and linguistic contexts. In several occasions they have been proven successful, and they could be appropriate candidates for transfer in new contexts and/or new countries. In this direction, the Organic.Mednet project (http://www.organic-mednet.eu) uses existing results as a basis so that it appropriately adapts, transfers and validates them for training new user groups. Specifically, Organic.Mednet facilitates the transfer of innovative training practices and eLearning content to the case of vocational education of young and unemployed agricultural professionals, as well as to agricultural professionals in new EU members, by establishing a CoP, using face-to-face training sessions, as well as services provided by MOLE.

Conclusions

Communities of Practice (CoP) provide a rich conceptual framework for organizing the interactions among people that share a concern or a passion for something they do and learn how to do it better as they interact regularly. The concept has turned out to provide a useful perspective on knowing and learning. A growing number of people and organizations in various sectors are now focusing on communities of practice as a key to improving their performance.

The approach discussed in this paper addresses the need to establish and maintain CoP among people that may be geographically distributed through the support of a rich set of communication and learning services offered by MOLE, a multimedia learning support platform. MOLE was initially developed to serve the academic CoP (teachers and students) of the department of Electronic & Computer Engineering at the Technical University of Crete. The system has been extended to support multi-lingual communities, rich multimedia communication services and content management to address the knowledge management and learning needs of professional communities. Moreover, MOLE supports two other types of CoP, secondary education teachers and organic farming professionals, established in the context of four EU Projects (pSkills – http://pskills.ced.tuc.gr, Organic.Mednet – http://www.organic-mednet.eu, CerOrganic – http://www.cerorganic.eu, and Organic.Balkanet – http://www.organic-balkanet.eu). Their MOLE instances are available from http://pskills.moleportal.eu/, http://om.moleportal.eu, http://cerorganic.moleportal.eu, and http://ob.moleportal.eu respectively.

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ANALYSIS AND UNDERSTANDING PRACTICES AND USES OF A VLE IN SECONDARY EDUCATION: TOWARD A NEW MODEL OF THE USES

Manuel Schneewele, LISEC – Université Nancy2, Samuel Nowakowski, Universite de Lorraine, Isabelle Houot, Antoine Zapata, LISEC – Université Nancy2, France

Abstract

In France, the Region of Lorraine is currently implementing a Virtual Learning Environment in his secondary school. But the arrival of such tool changes existing practices. So we are led to understand: what drives people to use it or not and how is it used. We make the following hypothesis that using a VLE in the daily practices is linked to a set of variables which are considered as predominant by users. Based on individual perceptions, ergonomic and social considerations, we plan to create our own acceptability model of a VLE, to explain and predict its uses in a specific context: the secondary educational community.

Key words: VLE, acceptability, TAM, perception, useful, usability, subjective norms, attitude, secondary school.

Introduction

Information and communication technology (ICT) are more and more present in dally live of developed society. Widely used in work context, manly to improve productivity and communication, it's not a surprise to see them appear in the education system. Looking for innovation and improving quality of their education, schools are trying to integrate modern tools so as software and platform of e-learning. They notably do the postulate that support digital culture can promote students access to employment. However, integrate new technologies into the educational system request to rethink the manner of working notably by teachers. Consequently, many questions in terms of uses and communication processes emerge when a digital device in educational context is implanted (Paquelin, 2009).

Nowadays more and more education communities would adopt a web platform to guide their students. So, many teaching institutions decide to deploy a Virtual Learning Environment (VLE). Previous works of Martins & Kellermann (2004) and Ngai, Poon, & Chan (2007) Van Raaij & Schepers (2008, p. 839) define this tool as "*a web-based communications platform, that allows students, without limitation of time and place, to access different learning tools, such as program information, course content, teacher assistance, discussion boards, document sharing systems, and learning resources*".

VLE: French specificities

In France, we use the term of "*ENT*" for "*Environnement Numérique de Travail"*. But its signification is sensibly different from the English vocabulary. The platform is used both to teach and to administrate. It's a "toolbox" with a wide range of services. French government defines officially an *ENT* as "*a global system providing a unified access point, through the networks, to all the tools, contents and application services related with its activity. It's a unique entry point to access to the information system of school administration or school* "(SDET, 2011). Therefore, in France, ENT is more a digital work environment than a VLE. However, because our study considers an educational context, we will use the term of VLE to designate the ENT.

The VLE deployment in secondary schools has become a priority for the French ministry of education, as shown by the circular of 16 March 2010 (MEN, 2010) and the construction of a master plan for its deployment (SDET, 2011). Many circulars and reports highlight the need to modernize the education system and to develop students' digital competencies to enforce their employability (Attali, 2008).

Context of the study

To support the deployment of this technology, institutions looked for a methodology to observe and to analyse practices in the education community. So, since September 2009, a PhD thesis was co-funded by the Regional Council of Lorraine, Meurthe & Moselle County, Caisse des Dépôts group, two private companies, Itop and Atos Origin.

This work takes into account the progress of VLE deployment and the confrontation between effective uses to expected uses. We aim to propose a model which describes and explain current uses of the computer system. Our hypothesis is as follows: VLE acceptability in the daily practices is linked to a set of variables considered predominant by users. To understand the process of the tool appropriation, our study focuses on ergonomic and social context considerations and more particularly on the individual perceptions.

Our research is based on the Nancy-Metz Academy. According to a timetable over three academic years, they actually deploy a Learning Management System (LMS) in secondary school, first and second level. This system is called PLACE for *Plateforme Lorraine d'Accessibilité et de Communication pour l'Education*. It includes some functionalities distributed in modules such as emails, information board, personal storage space, collaborative tools, School books, a library space, planner, resources reservation module. For the Lorraine Region, it will be a tool to serve the citizen with two objectives: on one hand, facilitate the access to resources and services for every member of the educational school community, on the other hand, improve the access conditions to a digital culture. Since September 2009, the platform has been applied in more than a hundred schools in Lorraine. Ultimately, it will concern more than 300,000 people.

To understand uses of a VLE, we have do primary research about first uses of his school books (Cherqui-Houot, Trestini & Schneewele, 2010) and the social representation of PLACE. But elaborate a model to explain VLE uses in secondary school will be not so easy. Firstly, population is composed by many users' profiles i.e., parents, teachers, students, and administrative staff. Obviously, objectives of each one can be radically different according to their status. Secondly, we must consider that people who work in a school establishment are not only employee; they are mainly civil servants so they benefit a stability of employment. Thirdly, parents come from different socio-professional categories. Consequently there is a large variety of experiences in computer use.

There exist many models describing the cognitive process for new technology acceptance. Many variables can influence the decision to use a technology. So we search to elaborate an appropriate model in accordance to our problem notably the specificity of the educative community. Here, we consider that TAM is a good starting point but it neglects the importance of two factors that we think that they are crucial in a school context: social pressure (Schepers & Wetzel, 2007) and the place occupied by the technology in work habits (Triandis, 1979).

Acceptability: a definition

Acceptability can be defined as a positive or negative feeling which determines the decision to use a technology. We refer on the theoretical framework coming from a well-known model developed by Davis (1989) called the Technology Acceptance Model i.e., TAM. It was based on the theory of reasoned action (TRA) from Fishbein and Ajzen (1975), which considers that beliefs determine attitudes and, consequently, user's behavior. This is related to the following question: is the use of VLE in a school "*consistent with the value, culture, organization in which you want to insert* "(Tricot, Plégat-Soutjis, Camps, Amiel, Lutz & Morcillo, 2003, p391)?

Technology Acceptance Model

What is it?

TAM is a concept belonging to social psychology. It aims to provide the use of a tool probability based on two evaluation criteria: perceptions of usefulness and perception of usability. But for more clarity, in our model we were use the French terminology employed by Tricot (2003): usability and utility. Davis (1989) defines the usefulness as "*the degree to which a person believes that using a particular system would enhance his or her performance at work*" and the ease of use as "*the degree to which a person believes that using a particular system would be free of effort*" (Davis, 1989, P320). The model structure is shown in figure 1.

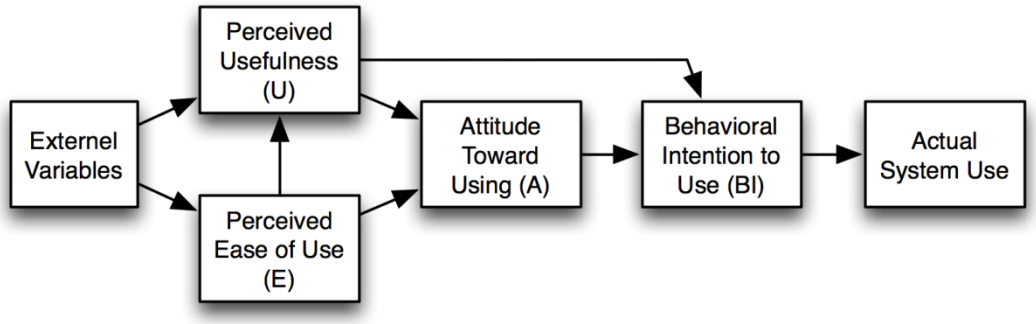

Figure 7 The Technology Acceptance Model (Davis, Ragozzi & Warshaw 1989 p.985)

Why ?

TAM is the appropriate approach to study technology acceptance. Based on an ergonomic approach, it has been used in many real cases (Sun and Zhang, 2006). Used in different cultural environments, especially American and European (Straub, Keil & Brenner, 1997), it has been applied to web portals, eLearning platforms whose characteristics are similar to VLE's ones (Ngai, Poon, & Chan, 2007; Van Raaij & Schepers, 2008; S□nchez & Hueros, 2010). User-friendly, TAM is particularly well suited to our study specially because its robustness and parsimony which have been highlighted in several studies (Subramanian, 1994, Venkatesh & Davis, 2000; Sun & Zhang, 2006). Moreover, TAM can permit to identify changes to make more acceptable and more attractive systems.

Its limitations

Although, TAM can help to predict user's behaviour this model leaves out contextual factor (McFarland & Hamilton, 2006). Therefore, the authors have tried to improve their model by a second version of TAM (Venkatesh, Morris, Davis & Davis, 2003), but the new version has no real success in the literature, mainly because it becomes too complex to apply.

The model

Our model considers, in a first part, like the TAM the influence of usability and usefulness in the decision of using a new technology so as a VLE. But this consideration is not sufficient to explain behaviors. We consider, in a second part, that the uses are directly impacted by two contextual factors that we call: social and instrumental pressure (Figure 2).

Social pressure

Social pressure refers to the person entourage, their social network. People around us have an opinion on using a VLE, then, they are likely to influence our behaviour of use and our acceptance of this tool. This concept is similar to the notion of subjective norm developed by Fishbein and Ajzen (1975, p. 302). A concept that they define as "*the person's perception that most people who are important to him or her think he should or should not perform the behaviour in question* ". The authors highlight the impact of social factors on the behaviour intention. For Jan & Contreras (2011, p.487), it's the perception that individuals in the social system have about the person who is going to adopt a technology. So a norm can be characterized as subjective and contextualized (Zapata, 2009).

A meta-analysis conducts by Schepers & Wetzels (2007) show a significant influence of subjective norm to the behaviour intention to use and therefore actual system uses. Hsu & Lu (2004) studies the use of online games, they find that social influence impact directly on uses. Consequently, in our research we consider that social pressure impact on the VLE uses. On the other hand, based on the studies of Malhotra & Galletta (2002), Jan and Conteras (2011), they observe that this factor can impact significantly on the attitude towards using software. Although all these studies are not conducted of secondary school students, and although a digital native effect can appear (Prensky, 2001), we suppose that we should obtain the same conclusions in our model.

Instrumental pressure

In our study we define instrumental pressure as the incorporation of a tool in educational community daily activities so as to become essential even mandatory. We consider that for the success of their educational activities, users would feel a need, almost irresistible, to use the VLE. Our concept is close to the notion of behavioural habits, as outlined in the model of Triandis (1979), but we add the notion of dependence to the object. In his model habits influence affect towards the tool and therefore the behaviours intentions. So we can consider that instrumental pressure influence the VLE acceptability.

To our knowledge, the concept of instrumental pressure doesn't exist as we understand it in this study according to the TAM his variables. However a lot of researches observe a connection between the pressure of habits, in the sense used by Triandis (1979), and the behaviour intention to use a new technology (Thompson, Higgins & Howel, 1994; Paré & Elam, 1995; Gagnon, 2003). Instrumental pressure is or characterized by the presence of prior experiences, a factor that has been the subject of many studies. For example, Koohang (2004), who study the students' online library uses, found that those with a high level of experience on the Internet uses have a perception of using online library more positive compared to those who have little experience. Similar results were observed by Akremi, Ben Naoui & Gaha (2004) in a population of employees. They highlight a positive impact of informatics skills in their attitude towards the use of an e-online training. Furthermore, Woods, Baker & Hopper (2004), observe that the main factor to explain the uses of a blackboard in faculty is prior experience. Consequently, in our model we admit that instrumental pressure influence directly acceptability and indirectly VLE uses.

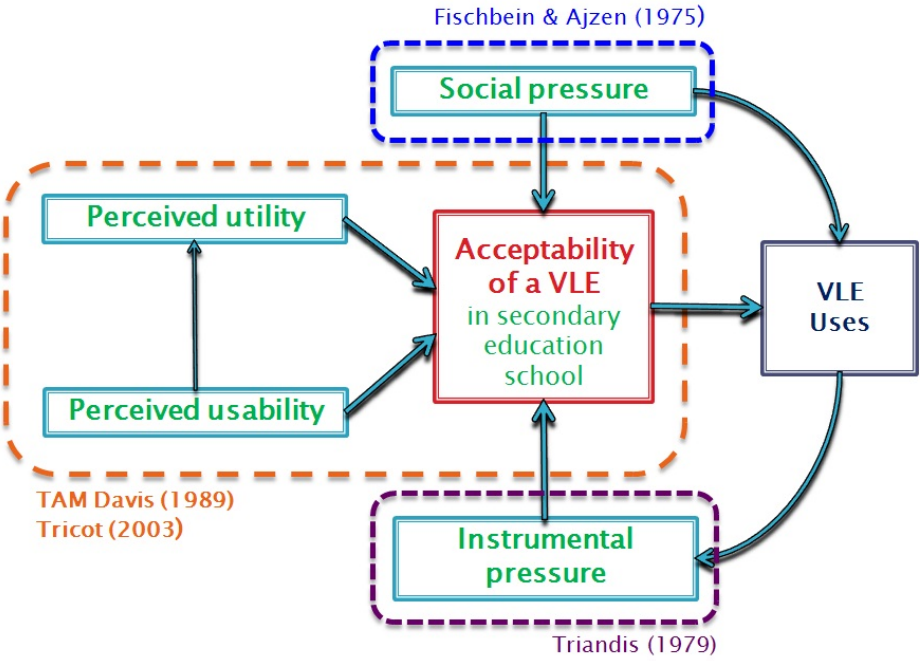

Figure 8 Model developed to observe educational uses of a VLE

Application of the model

After doing specific Likert scales for each dimension, the model was applied by an e-questionnaire specifically adapted for teachers, students, parents and administration staff. During March to April every person who logs on to the platform were asked to participate on the survey. We have obtained 4,635 answers but the results are actually being treated. More detailed results will be described in a forthcoming study.

Conclusion

Integrate LMS at school include to modify daily practices of the educational community. In addition, for most of them, they do not have the habit of using such technologies. This thesis aims to search a methodology able to observe and predict VLE uses. So we create a new model specifically adapted to study educational context. The uses were explained by a decomposition of the technology acceptance process, in reference to the TAM that we

modify and extend to contextual factors. Through the construction of our model, we want to increase our capacity to understand and influence actual VLE uses in the Lorraine academia. At the end of this work, we should help the Region Lorraine to establish managerial guidance to supports more efficiently the implantation of his *ENT* called *PLACE*.

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A SOCIAL PLATFORM FOR COLLABORATIVE DIGITAL STORYTELLING

Madalina Ungur, Agro-Know Technologies, Nikolaos Marianos, Nikos Manouselis, Greek Research & Technology Network, Yannis Psochios, Agro-Know Technologies, Greece

Introduction

In 2001 Ian Hargreaves and Daniel Meadows of the Centre for Journalism Studies at Cardiff University were announcing Digital Storytelling, a new project at the BBC Wales radio station (Meadows and Kidd, 2009). The project was making use of low-cost digital cameras and notebook computers to enable people to tell and publish online their personal stories using multimedia. Complementing the radio show, a series of workshops followed. Ian Hargreaves argued at the time that Digital Storytelling could offer a variety of benefits: access and training for the Welsh people in new media tools, a boost to the Welsh creative economy, and raising community self-esteem by asserting a self-defined identity (Coyer et al., 2007).

Earlier in mid-1990s Daniel Meadows journey through California took him to the Centre for Digital Storytelling (http://www.storycenter.org/) where he discovered a methodology in a research organisation that was aiming to enable adults around the world to craft and record meaningful stories from their lives and share these stories in ways that foster learning, build community, and inspire justice (Meadows, 2003). At the same time in the UK, the Museum of London was launching London's Voices, a programme designed to engage diverse audiences through innovative oral history projects (Thumim, 2009). StoryCorps is another American initiative whose mission was to provide the American people of all backgrounds the opportunity to record, share, and preserve the stories of their lives (http://storycorps.org/). Since 2003, StoryCorps has collected and archived more than 35,000 interviews from more than 70,000 participants. Again in California, the KQED Digital Storytelling Initiative (http://dsi.kqed.org/) is one of the leaders in community that created and distributed digital content. The initiative provides training in story theory and in the use of multimedia and digital technology for teaching, learning, and experiencing. Hoping to enrich the lives of all ethnic groups of all ages, the History Makers (http://www.thehistorymakers.com/) hosts one of the largest collections of video stories of the African American community.

In the past years such initiatives have multiplied showing that the digital storytelling approach to community education and engagement is becoming more popular (Hastings, 2009). Social media tools have also become more popular encouraging users to share more and more openly (Richardson, 2009). This has also implications for digital storytelling as it opens a new field for writing digital stories in a collaborative manner. In the educational sector, digital storytelling gives students the opportunity to integrate technology they are already familiar with transforming them from consumers of media to producers (Hofer & Swan, 2006). Some of the issues that educators might face when trying to integrate storytelling in the classroom are related to their reluctance regarding the use of technology (Cunningham, 2007). Moreover they might encounter problems when educating students on topics such as politics and active citizenship, topics often considered a boring, failing to attract interest (Bhavnani, 1991). POLITICS project (http://www.politics-project.eu) has tried to answer these challenges by bringing collaborative digital storytelling on a transnational European level through a social platform, namely the Learning about Politics (LAP) Platform (http://learningaboutpolitics.eu), built around the concept of storytelling, Web2.0 technologies, digital resources and teacher Tutorials. The project is a European initiative funded by the Lifelong Learning Programme (LLP) of the European Union and conducted by three research organisations, two secondary schools, a higher education institute and a public authority. Addressing a diverse target group comprising of school students of different ages, trainees in Vocational and Educational Training (VET) programs and adult learners, the POLITICS project proposes using collaborative digital storytelling for educating learners on less attractive topics by developing a better understanding of how modern society functions and, at the same time, developing communication, writing and language learning skills. Several transnational story-writing events will be organised to foster collaboration and test the effectiveness of the POLITICS approach.

The scope of this paper is to introduce the Learning about Politics (LAP) Platform (http://learningaboutpolitics.eu) and present how it supports collaborative digital storytelling. The first section provides an overview and the scope of the paper. The second section presents the Learning about Politics (LAP) Platform. The third section offers an

overview of the educational content hosted on the LAP Platform, while the fourth section introduces the Politics Digital Storytelling Tutorial. The last section offers the conclusions of the paper.

The Learning about Politics (LAP) Platform

The Learning about Politics (LAP) Platform (http://learningaboutpolitics.eu/) (Figure 9), built on WordPress and Buddypress is a digital platform that supports learning in different learning contexts. By 'learning context' we define the environment of the learner that can be classified in three categories: a. the learner's external environment (classroom, working space, in-person coaches, etc.), b. the internal environment (previous beliefs, thoughts, hopes, etc.) and c. the digital environment (Downes, 2004). Addressing a diverse target group, the LAP Platform satisfies all three categories being a digital environment that can be used in the classroom, but also supporting self-directed learning by providing access to a set of digital resources and communication channels through its multilingual blogs, forums and groups where users can express and share beliefs.

Figure 9 The main page of the LAP Platform

The LAP Platform is designed as one main European platform and six (6) additional blogs with content and communication tools in six languages: English, Greek, German, Italian, Estonian and Slovenian. The LAP Platform provides access to more than one thousand (1000) digital resources, a collection of Digital Stories and Educational Scenarios and various communication channels. Moreover, a set of Tutorials have been developed to guide users through the use of these methodologies. The following sections focus on describing them in detail.

To support collaborative writing, several communication channels are available on the LAP Platform such as Groups, Forums and Blogs where users can register, create and personalize their profiles and become friends with other members of the community. By creating and joining groups, members can upload files, start a forum discussion within the group and collaboratively edit documents.

Access to the LAP Platform is open to all interested users. In order to become an active user of the LAP Platform and publish stories on its blogs editor rights are necessary. The LAP Platform is intended for educational uses only, so in order to obtain editor rights, interested users are invited to access the Contact page accessible from the main page of the platform, provide their personal details and explain their motivation for joining the platform. Teachers are encouraged to join the Politics Active Citizenship (PAC) Club, an open online space specially designed for educators interested in learning new ways of engaging students in topics such as politics and active

citizenship. By joining the PAC Club, teachers gain several benefits, such as: access to a community of similar educators and learners interested in digital storytelling; the opportunity to use the LAP Platform together with other communities and with their students for their own learning needs; the chance to promote their institution/organization, to participate in the POLITICS project events and receive updates about its activities and to receive support from the POLITICS consortium.

Educational resources to facilitate Collaborative Digital Storytelling

The LAP Platform provides access to three main categories of content: Story Frameworks, Digital Storytelling Tutorials and various educational resources such as articles, videos, pictures, presentations etc. The Story Frameworks provide the story skeleton that learners can built on to write their own story and complete with various resources e.g. videos, pictures accessible on the LAP Platform or elsewhere. The Tutorials guide users throughout the story-writing process focusing on how to complete the task in a collaborative manner.

Digital Story Frameworks

The main purpose of the LAP Platform is to enable the collaborative creation and hosting of digital stories. More than that, in order to enable a group of diverse users to communicate and produce a story together a starting point is necessary. To answer this need the POLITICS project came up with the Story Frameworks. We define a Story Framework as a skeleton of a story in which the reader decides on how to fill in the blanks, to re-shape the story and bring it to life by personalizing it e.g. by becoming the main character of the story. By September 2011 the project offered three (3) Story Frameworks hosted by the Wiki page of the project at http://wiki.agroknow.gr/politics/index.php/Digital_StoryTelling. Users can choose the Story Framework that best suits their learning needs and build on it individually or collaboratively on the LAP Platform.

Figure 10 The Politics in the University Story Framework (en)

For example, the 'Straight into Politics' Story Framework comprising of ten chapters and available in seven languages invites pupils to use their creativity and play a team game in which they plan to make a change in their society by organizing an election campaign. By the end of the story pupils will have learned how to work in teams, how to set common goals, how to be a leader; and they will have gained valuable knowledge about the society around them and the European scene. The story is more suitable for secondary level students. Another Story Framework is 'Stories of Migrants' available in English that focuses on identities, on being part of the society or being an outsider. This story addresses adult learners. The 'Politics in the University' Framework (Figure 10) was written for university students and it is a story of a young man who, by becoming an adult, discovers what politics is and what he can do to make a change. Throughout its eleven chapters the main character together with his university colleagues set up a campaign to design and form their own political party and get involved in the local elections. The framework is available in English and Greek language.

Digital Resources

Since its launch in May 2011 and as of September 2011 the LAP Platform hosts over 1000 unique digital resources available in six languages. This content was either created by teachers and learners from Europe or collected from online repositories. In some cases the resources were initially created in English and then translated to other languages, as in the case of German language, where all the 341 resources were translated from English. By far, most of the resources created by educators and students or simply collected from other repositories and posted here are in English (857). Besides the 341 German resources, the platform hosts 140 resources in Estonian, 40 in Greek, 35 in German and 18 in Italian language.

The categorization of resources by their educational purpose shows that the LAP Platform includes 26 digital stories, 21 educational scenarios, 448 educational activities, 87 articles, 73 lesson plans, and 428 images and videos. Resources such as articles, scenarios and activities can support learners in the research phase of the story-writing process when they need to find reliable information on selected topics (e.g. election campaigns). Other stories available on the LAP Platform can serve as a source of inspiration. Multimedia resources such as images and videos can be used at a later stage of the storytelling process to enrich stories.

The Digital Storytelling Tutorial

Far from imposing a unique approach to learning about politics and active citizenship, the LAP Platform initiative is based on the idea that learners often acquire knowledge outside the formal context and have an important role in their own learning process (Atwell, 2007). In order to guide both independent learners, students and teachers, the LAP Platform offers access to Digital Storytelling Tutorial s, (http://wiki.agroknow.gr/politics/index.php/Digital_StoryTelling) hosted at the Wiki page of the Politics project (http://wiki.agroknow.gr/politics). The Digital Storytelling Tutorials focus on different dimensions such as: providing information about Digital Storytelling, about how to collaboratively write a Digital Story, how to use the LAP Platform and integrate Web2.0 tools to enrich Digital Stories and finally, how to address copyright issues.

Firstly, the Tutorials introduce digital storytelling and the advantages of writing stories in a collaborative manner. The learners are offered eight tips to telling a great story, such as telling a story from a unique point of view, capturing audience attention, using vivid language, choosing appropriate multimedia, keeping the story brief and concise and keeping a good rhythm throughout the story.

An important section of the Tutorials advise the learners on how to conduct a collaborative story-writing event. It encourages them to start by carefully selecting their team and getting to know each other. Storytelling might expand over several weeks, so good organization and planning are important elements to success. The Tutorials propose several steps to ensure smooth collaboration and timely results, such as:

- Selecting an appropriate Story Framework to pursue (e.g. students are encouraged to try the 'Politics in the University' framework, 'Straight into Politics' is more suitable for younger pupils, while 'Stories of Migrants' address adults)
- Brainstorming regularly to encourage spontaneous ideas and creativity
- Collecting, sorting and deciding which ideas to pursue
- Becoming familiar with the LAP Platform
- Selecting and distributing individual tasks among the team members
- Researching the topics of the story
- Building a draft story, revising and polishing it
- Posting the final version of the story on the LAP Platform, asking friends and colleagues to read it and evaluate it for feedback

The next section of the Collaborative Storytelling Tutorial focuses on the use of the LAP Platform. It inform users on how to create accounts for them and their team members and how to personalize their profiles. Users are encouraged to create groups, as ideal online space for communication and collaborative. In groups users can upload files (Documents) and create Docs that can be collaboratively edited within the group. Additionally, groups can host Forums. Moving on the Tutorial explains how to write the story, save it as a draft and finally publish it assigning tags and categories. For further support the LAP Handbook has been prepared with detailed

instructions on the use of the LAP Platform. This can be downloaded from the main page of the Politics Wiki (http://wiki.agroknow.gr/politics).

To complement the Digital Storytelling Tutorial, two more Tutorials have been developed as follows:

- The Web2.0 Tutorial (Figure 11) presents eight Web2.0 tools such as: YouTube for video sharing (http://www.youtube.com/), Wikis (http://www.mediawiki.org), Flickr for imagine sharing (http://www.flickr.com/), Facebook for social networking (https://www.facebook.com/), SlideShare for file sharing (http://www.slideshare.net/), Wordle for word clouds (http://www.wordle.net/), Prezi for interactive presentations (http://prezi.com/) and Smilebox for animated postcards etc. (http://www.smilebox.com/). For each Web2.0 tool, the Tutorial introduces the tool explaining how it works, presents the pros and cons of its educational use and offers detailed Tutorial through its functionalities. The last section offers links to articles and scientific papers on the topic, plus a list of similar Web2.0 tools.

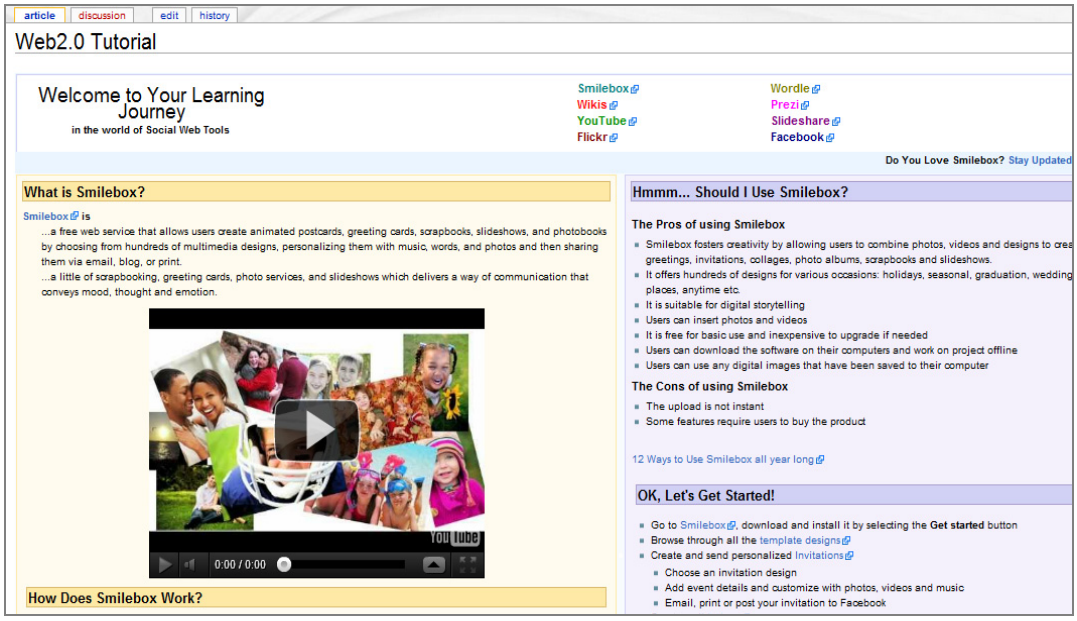

Figure 11 The POLITICS Web2.0 Tutorial

The Copyright Tutorial explains how to make sure that sharing and remixing of digital resources respect copyright laws and suggest using the Creative Commons (CC) licenses (http://creativecommons.org/). The Creative Commons copyright licenses are free and easy-to-use and provide a standardized way to give the public permission to share and use creative work under specific conditions. The Copyright Tutorial explains how users can license their work using CC and presents tools such as Flickr (http://www.flickr.com/), OpenCourseWare (http://ocw.mit.edu/index.htm), Connexions (http://cnx.org/), CK-12 Foundation (http://www.ck12.org/flexbook/), Public Library of Science (http://www.plos.org/) and Wikipedia (http://en.wikipedia.org) that provide openly licensed educational resources.

All the stories written following the POLITICS approach will be published in a special section (Digital Stories) on the LAP Platform (http://learningaboutpolitics.eu/). An example of a story developed using a POLITICS Story Framework (the 'Story of Migrants' Framework) can be view at http://bit.ly/storiesofmigrants. It comprises of several chapters illustrating stories of migrants around Europe, e.g.: the case of Tunisian and Afgan refugees, the story of a Lithuanian in Greece, the situation at the French-Italian borders etc.

Conclusions

The present paper introduces the Learning about Politics (LAP) Platform (http://learningaboutpolitics.eu) and discusses how this supports collaborative digital storytelling. It presents the functionalities of the Platform and offers an overview of the educational content and Tutorials hosted by the LAP Platform together with its complementary Politics Wiki page. The LAP Platform addresses some of the issues identified in the context of teaching politics and active citizenship in and outside the educational setting. Classified as a boring and unattractive topic, teaching politics is often challenging for educators. POLITICS Project proposes using

collaborative digital storytelling, as an approach to engaging students on the topic. Studies have shown that storytelling is becoming popular among students and especially digital storytelling gives them the opportunity to use social tools already familiar to them. To facilitate the organisation of collaborative digital story-writing, the project proposes an educational package consisting of a set of Story Frameworks, the stating point in writing stories and a collection of digital resources to be used for reading and completing stories. To limit the gap between students' and educators' technological skills, the project offers a set of guiding Tutorials, such as the Web2.0 Tutorial, the Copyright Tutorial and the Digital Storytelling Tutorial. In order to test the effectiveness of the POLITICS approach, collaborative storytelling events will be organised across the participating countries of the project, engaging students in transnational collaboration to foster learning on the topics of politics and active citizenship.

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FACTORIES NO MORE: RESTRUCTURING THE LEARNING ENVIRONMENT FOR RADICAL CHANGE

Stephen Harris, Sydney Centre for Innovation in Learning, Australia

Abstract

This paper provides an overview of the work of the Sydney Centre for Innovation in Learning, especially with its focus on creating a radically different learning environment – a world where there is clear cohesion between the physical spaces that students work in, together with the virtual or blended online spaces of the school's operation. SCIL seeks to contribute to the process of educational reform by examining the impact that embedding research and innovation into everyday school practice can have in enabling change in education – through facilitating a dynamic and fundamental shift in educational paradigm and pedagogy. This has been brought about as a result of a process of observing international 'best practice', linked to subsequent intentionality in changing paradigm and pedagogy. The result - a new model for schooling is emerging, potentially suited to scaled implementation.

The vital link in any transformation process is the empowerment of teachers at the classroom level, situated in new spaces, to take best advantage of available technology in order to improve student achievement. With this challenge in mind, Northern Beaches Christian School (NBCS), Sydney, Australia, created a tangible expression of its vision for a dynamic school-based research structure, and established the Sydney Centre for Innovation in Learning (SCIL) in 2005. Since then, SCIL programs have experienced phenomenal growth in scope, providing teachers with opportunities to embrace the challenges inherent with pedagogic shift. SCIL has worked within a paradigm that has allowed any teacher at the school with a desire to innovate and experiment to feel free to do so, in the knowledge that their efforts would not only be supported, but facilitated.

Since 2005, SCIL has been steering the process of accelerated pedagogic change within and beyond the school. A particular focus has been on the role of educational leadership within an institution and how management strategies, structures and frameworks can add focus, speed and clarity to the process of educational change. SCIL has fostered an expanding range of projects – with the most recent, *Spaces to Learn*, emphasising the emerging importance of spatial considerations and furnishing as a catalyst for permanent and significant paradigm change.

From an educational perspective, SCIL has sought to bring pedagogical thinking into the virtual world in very deliberate ways. To facilitate this, SCIL has encouraged teachers who view themselves as 'early adopters' in relation to new technologies, to self nominate into professional development roles providing on-the-shoulder support to other staff keen to develop their ICT skills. SCIL has recognized the imperative to place the strongest classroom practitioners as the pedagogical leaders of new virtual environments and to place continual emphasis on recurrent workplace professional development.

One of the greatest challenges in promoting innovative teaching practice is to create an educational climate that is not only comfortable with change, but actively seeks to experiment with new technologies in order to improve pedagogy – and outcomes. As teachers become excited about the possibilities for new thinking and learning, they invariably become the 'change champions' who will in turn drive innovation. The goal is to support those teachers capable of switching the process from being more about top down 'push', to being more of a workplace 'pull' scenario.

SCIL has focused on creating the infrastructure necessary so that every class has a virtual space (moodle-based portal) that effectively integrates with every real-time class. The practice of teachers has been developed so that they can move learning in and out of these dimensions in any given lesson, at any stage. This requires reliable access to the digital resources, the re-thinking of the use of existing physical learning spaces and consideration of new furnishings to support this shift in pedagogy and practice.

In 2010, a new purpose-built learning environment, the SCIL Building, was opened, followed by a second space, The Zone, in 2011. These spaces have enabled a significant step ahead in encouraging global pedagogical shift

across the school. The SCIL Building and The Zone are multimodal, multimedia-enhanced educational playgrounds – places designed around the interplay of shape, colour, light, sound and unique space.

SCIL: research and innovation – a focus on theory

'Megachange' in education: the challenge of the journey

This paper will provide an overview of the work of the Sydney Centre for Innovation in Learning, especially with its focus on creating a radically different learning environment – a world where there is clear cohesion between the physical spaces that students work in, together with the virtual or blended online spaces of the school's operation. SCIL seeks to contribute to the process of educational reform by examining the impact that embedding research and innovation into everyday school practice can have in enabling change in education – through facilitating a dynamic and fundamental shift in educational paradigm and pedagogy. This has been brought about as a result of a process of observing international 'best practice', linked to subsequent intentionality in changing paradigm and pedagogy. The result - a new model for schooling is emerging, potentially suited to scaled implementation.

Background

In a speech delivered in 2009, Emeritus Professor Hedley Beare identified that:

> *A wave is in the process of overtaking education, and with arresting rapidity. It involves a genuine globalization of schooling and learning, with individual schools and learners acting as though they belong in the world … We now live in a borderless world in which trade, interaction patterns, a huge number of enterprises, and social contacts are being internationalised.*[1]

This 'wave', as Hedley Beare describes it, has followed the 'wave of reforms driven by computerization … [with] the development of technology transforming the way schools and universities present and teach their curricula, the way teachers teach and the way students learn'[2] (Beare, p.15). This challenge – reforming education systems internationally – has been in the spotlight in the last decade, the first of a new millennium. Unsurprisingly, it has given rise to the notion that learning needs to be relevant to the twenty-first century context.

Recent TED talks by Sir Ken Robinson and Charles Leadbeater capture the challenge well. Robinson pinpoints the issue succinctly when he states:

> *The problem is that the current system of education was designed and conceived and structured for a different age. It was conceived in the intellectual culture of the Enlightenment, and in the economic circumstances of the Industrial Revolution.* [3]

Leadbeater adds to this discourse by highlighting the urgency of the challenge as 'our education systems are failing desperately in many ways. They fail to reach the people they most need to serve ... [and] improvement is increasingly difficult to organize.'[4] Leadbeater's comments recognise that the challenge exists at all levels – government, system and institutional. Trilling and Fadel very effectively draw this thinking down to the school level in their work, adding that:

> *Our historic shift to a 21st century Knowledge Age … has forever tilted the balance of what is needed and valued in our work, our learning, and our life. In the 21st century, lifelong learning is here to stay.*[5]

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[1] Beare, H., Six Decades of Continuous School Restructuring, ACEL Monograph Series, Monograph 46: April 2010, Australian Council for Educational Leaders Ltd, p.16
[2] ibid, p.15
[3] Robinson, October 2010, *Changing Education Paradigms*, viewed 3 September, 2011, http://www.ted.com/talks/lang/eng/ken_robinson_changing_education_paradigms.html
[4] Leadbeater, April 2010, *Charles Leadbeater on Innovation* , viewed 3 September, 2011, http://www.ted.com/talks/charles_leadbeater_on_innovation.html
[5] Trilling, B. & Fadel, C., 2009, *21st Century Skills: Learning For Life In Our Times*, Jossey-Bass, San Francisco, p.19

There has been considerable professional dialogue in education since the advent of the internet in 1994 about the need to change, to become relevant to the 'twenty first century'. Trilling & Fadel highlight the impact new technologies will have, stating that 'achieving education's goals in our times is shaped by the increasingly powerful technologies we have for communicating, collaborating and learning'.[6] Yet, for all the talk, the majority of schools globally are still stuck in the industrial mindset and model. Richard Gerver summarises this bluntly when he states:

> *Our current system assumes that all children should be the same, reach the same learning states at the same age, be able to do the same things at the same time in the same way, know the same 'stuff' and share the same interests.*[7]

Arguably, this challenge has global expression as education systems, whether doctrinaire, colonial or industrial, have created a highly teacher-centric default learning experience that continues to dominate the pedagogy of teachers, expectations of students and the mindsets of parents.

SCIL research and innovation – a focus on change

SCIL: starting the shift

The vital link in any transformation process is the empowerment of teachers at the classroom level, situated in new spaces, to take best advantage of available technology in order to improve student achievement. With this challenge in mind, Northern Beaches Christian School (NBCS) created a tangible expression of its vision for a dynamic school-based research structure, and established the Sydney Centre for Innovation in Learning (SCIL) in 2005. Since then, SCIL programs have experienced phenomenal growth in scope, providing teachers with opportunities to embrace the challenges inherent with pedagogic shift. SCIL has worked within a paradigm that has allowed any teacher at the school with a desire to innovate and experiment to feel free to do so, in the knowledge that their efforts would not only be supported, but facilitated.

SCIL has grown guided by the notion that pedagogical change:

- led via school leadership in a vision driven process,
- supported by teachers, kept close to the classroom,
- located in new non-industrial spaces, and
- connected to pervasive and innovative use of ICT,

will have the potential to enable improved individual learning outcomes and provide a catalyst for whole school improvement.

Since 2005, SCIL has been steering the process of accelerated pedagogic change within and beyond the school. A particular focus has been on the role of educational leadership within an institution and how management strategies, structures and frameworks can add focus, speed and clarity to the process of educational change. SCIL has fostered an expanding range of projects – with the most recent, *Spaces to Learn*, emphasising the emerging importance of spatial considerations and furnishing as a catalyst for permanent and significant paradigm change.

From an educational perspective, SCIL has sought to bring pedagogical thinking into the virtual world in very deliberate ways. To facilitate this, SCIL has encouraged teachers who view themselves as 'early adopters' in relation to new technologies, to self nominate into professional development roles providing on-the-shoulder support to other staff keen to develop their ICT skills. SCIL has recognized the imperative to place the strongest classroom practitioners as the pedagogical leaders of new virtual environments and to place continual emphasis on recurrent workplace professional development.

[6] ibid, p.16
[7] Gerver, R., 2010, Creating Tomorrow's Schools Today, Continuum International Publishing Group, p.65

One of the greatest challenges in promoting innovative teaching practice is to create an educational climate that is not only comfortable with change, but actively seeks to experiment with new technologies in order to improve pedagogy – and outcomes. As teachers become excited about the possibilities for new thinking and learning, they invariably become the 'change champions' who will in turn drive innovation. The goal is to support those teachers capable of switching the process from being more about top down 'push', to being more of a workplace 'pull' scenario.

SCIL research and innovation – a focus on practice

Developing learning spaces that support innovation and research

As Brian Caldwell has noted in 'Raising the Stakes' (Caldwell, 2008), student capacity to learn should be the focus of attention:

> *both at the beginning of the planning process and at the point at which the intended learning outcomes are identified and used as the basis for learning and teaching … The student and his/her characteristics are also considered in the context of values, purposes and expectations.*[8]

SCIL has focused on creating the infrastructure necessary so that every class has a virtual space (moodle-based portal) that effectively integrates with every real-time class. The practice of teachers has been developed so that they can move learning in and out of these dimensions in any given lesson, at any stage. This requires reliable access to the digital resources, the re-thinking of the use of existing physical learning spaces and consideration of new furnishings to support this shift in pedagogy and practice.

In spatial terms, a virtual space has been added to conceptual thinking about space within the school (see Fig. 1). The extension of learning into virtual environments has broadened the school's conceptual thinking in relation to educational space. Concepts of virtual space need to be very identifiable for teachers and students alike. SCIL has established a range of formal and informal virtual environments. In the formal sense, every class and course in the school now has its own virtual environment. Different portals have been created to effectively place a virtual school that exists alongside the real school. In the informal sphere, SCIL has developed specific virtual space, such as that available through Second Life, Minecraft and OpenSim. Minecraft is proving to be the most relevant virtual space for students, rapidly overtaking Second Life in its appeal and application to learning. It has created a playground for student-led initiatives.

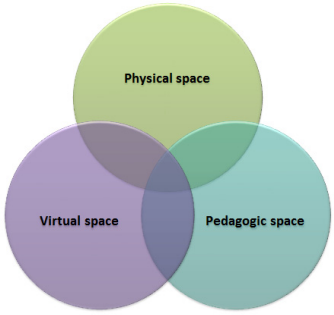

Figure 1: spatial considerations for change

This intersection between physical, virtual and pedagogical space has informed the construction or re-design of classroom space, organisation and dynamics. SCIL recognized that classroom design, choice of furniture and the ease of access to technology within a classroom, can have a highly significant impact on a teacher's ability to successfully integrate ICT into curriculum design and their concepts of classroom space. It is interesting to note that NBCS has clearly entered a second phase of learning space construction or reconstruction, driven by the implications of pervasive mobile technologies. A broad BYOD program (bring your own device) is seeing an acceleration in change in the physical sphere, rapidly freeing up spaces that were otherwise static because of the

[8] Caldwell, B.J. (2008) *Raising the Stakes,* London, Routledge, p.106

nature and implications of fixed computers in traditional models of learning. The original 2005 model adopted by SCIL meant that at the very least, all learning areas had access to a multimedia capability including:

- a large screen with digital projector, surround sound,
- connection to a flat screen monitor visible to the teacher,
- connection to an internet enabled hard drive, accessible from anywhere,
- and all located on an lectern within a room.

This model is now being rapidly superseded by a combination of mobile devices within a wifi environment and more pervasive use of LCD large screens as a mode of large screen delivery. It is supported by a professional shift from teacher-centred paradigms to consistently student-centric curriculum construction. It is also located in spaces far removed from 'factory' modes of learning.

The SCIL Building and the Zone

In 2010, a new purpose-built learning environment, the SCIL Building, was opened and this has enabled a significant step ahead in encouraging global pedagogical shift across the school. The SCIL Building is a multimodal, multimedia-enhanced educational playground – a place designed around the interplay of shape, colour, light, sound and unique space. It has drawn from Thornburg's work in relation to 'primordial learning metaphors' (quoted in Nair et al, 2009, p.128), that includes:

- the campfire (whole group learning space)
- the watering hole (peer supported learning space)
- the cave (independent learning space)

The SCIL building has been designed around the notion that spaces for teaching and learning in the twenty first century need to be inherently different from those of previous decades or centuries. It has been designed to facilitate teams of teachers working together with their students, rather than the more isolated models of earlier paradigms. The different connected spaces of SCIL have been playfully named – *The Parklands*, *The Canyon*, *The Glasshouse* and *Greenhouse*, *The Brainforest*, *Rivendell*, *The Pulp Mill*, *The Sandpit*, *The Loft*, *The Bridge* and *The Deck*. In 2011 SCIL has also overseen the transformation of the old Library space, now re-named 'The Zone', into a conceptually similar space.

Technology & information access in the SCIL Building and the Zone

Learning spaces for the 21st century need to be saturated with technology and information access. The design of the SCIL building and The Zone has been informed by these notions. Technology becomes a tool for learners so that they can access the information needed for problem solving or collaborative projects. At the same time, the SCIL Building and the Zone serve as a professional playground for teachers as they seek to develop their understanding of the pedagogical possibilities of new technologies in a supported environment. And the technologies inherent in the SCIL Building and the Zone go even further. The buildings themselves are a living, breathing example of technologically enhanced sustainability.

SCIL websites

SCIL has oversight of multiple websites. Some of these are linked to the main www.scil.com.au website or the broader school portal, while some remain as independent entities. Different web domains are attached to different projects and stages within the school, creating an immediate access point for the wider community, as well as providing an avenue for showcasing student endeavour or enterprise. Other key websites include:

- www.hsconline.nsw.edu.au
- http://www.realaudienceproject.com

Key SCIL programs

Since 2005 SCIL has developed and implemented a range of key programs. In time, each program becomes an embedded activity of NBCS.

LEARN Portal

NBCS has progressively developed an online school portal as the entry point for a virtual school that mirrors face-to-face classroom activity. That portal commenced as a HTML based system in 2002, but by 2005, led via the developmental work undertaken through SCIL, that first more basic iteration of a school portal was replaced with a Moodle based tailored learning management system – LEARN (http://learn.nbcs.nsw.edu.au). As teachers became more adept at using LEARN to support their pedagogy, a timeframe was established for SCIL to lead a further significant step forward and start transforming LEARN material into a format suited to the delivery of distance online courses. An additional portal was established to deliver a range of courses for the New South Wales (NSW) Higher School Certificate (HSC) in fully online distance delivery mode.

Distance Online Learning

Perhaps the most significant program currently managed through SCIL is the development and delivery of fully online or blended Stage Six courses. In 2006 SCIL was ready to commence offering fully online interactive courses in Year 11 with its own specific new web domain, established using a Moodle environment - www.hsconline.nsw.edu.au. In doing so, through the work of SCIL, NBCS was the first individual school in NSW to offer fully accredited online courses to its own students, as well as a number of external students. Initially 15 students, from 4 schools completed NSW Board of Studies Preliminary HSC courses in either Legal Studies, Software Design and Development or Ancient History. Since then there has been a rapid uptake of online courses and by 2011, over 350 students from more than 40 NSW schools have enrolled in one of 35 courses. The majority of students undertaking online courses live in rural regions of NSW, choosing subjects that would not otherwise be an option at their local school.

The growth in online course delivery has had the positive side benefit of allowing more highly developed blended learning approaches to be offered to all NBCS students. It would also be a recurrent observation, that the process and preparation of online course programming, has had a significant flow on effect in raising the standards and quality of all senior courses, as well as encouraging more obvious innovation and integration of ICT-enabled learning in a wider range of subjects.

Primary education through e-learning (PETE)

One important aspect of SCIL has been its vision to support innovation and the integration of ICT into all areas of NBCS activity. This has been as focused on work in Kindergarten, as it has been on the senior years. The Primary Portal Project – PETE (Primary Education Through E-learning), operating since 2006, explores the use of the school's intranet as applied to all three stages of student learning in the school's Primary section. It has been established using another separate Moodle instance - http://pete.nbcs.nsw.edu.au.

Integrated Curriculum

Teachers have 'long known that asking open-ended questions and posing intriguing problems engage[s] children's imaginations' (Trilling, 2009, p.94). A continuum of teaching programs has been created by SCIL around this notion, so that students experience four years of targeted integrated learning and associated core skills in the middle years. The Primary-focused *Journey* is followed by the Year 7 *Pursuit Matrix* and ultimately, the Year 8 *Quest*.

Real Audience Project: Student Website Publishing

The Real Audience Project (RAP) provides a virtual space for publishing student work online for the world to see. Students can create a class website as part of a group process, using *Wordpress*. RAP is one of the most straightforward projects that many of the school's teachers are taking up. Its success lies in the simplicity of the

process. The impact on student learning comes from their awareness of having a global audience. Some of the RAP projects include:

- Year 5/6 Sci Fi story http://ringoftime.wordpress.com
- Year 9/10 Geography http://australianenvironment.wordpress.com

Tomorrow's School Today (TST)

One key SCIL Project in 2010 and 2011 has been to link space and pedagogy in ways that allow teachers to change their daily teaching methodologies, in order to create a template for transferable implementation. In practical terms, it has seen the remodelling of a teaching space (old library) into an area purpose-created for 180 students at Stage 3 level (10 and 11 year old children). The six teachers have united into one collaborative team and all work is conducted as a cohesive unit. The concurrent programs with an emphasis on literacy, numeracy and thinking skills support skills development in line with the P21 Framework: http://www.p21.org/index.php?option=com_content&task=view&id=254&Itemid=120). The *Tomorrow's School Today* Project is a key project in terms of putting all SCIL emphases into action in a space and context that has been constructed around integrated curriculum. It is within this conceptual framework that the *Tomorrow's School Today Project* found its direction.

Changing the furniture

Another component of current SCIL activity has been to examine the impact that changing the furniture within a classroom space has on the students' perceptions and attitudes toward learning. In consultation with a local furniture manufacturer a range of sofas have been created where the ergonomics 'act like a chair', whilst still looking like a sofa. A number of these sofas and associated furniture items have been installed in a range of more traditional classrooms on site in 2011. Student response has been highly positive. The changed furniture configurations have also enabled teachers to shift pedagogic practice more readily than in the past and mobile devices are easily catered for in these new furniture configurations. Students very clearly equate 'better learning with comfort'.

Conclusion

SCIL emerged from a process that originated with the notion that recurrent educational innovation, especially as linked to the integration of ICT, would in time drive a significant pedagogical shift, leading to improved student learning outcomes. This has proven to be the experience of NBCS. The core intention that SCIL would facilitate increased integration of ICT innovation, so that all students in the school, Kindergarten through to Year 12, would experience ICT-enabled learning in a wide range of subjects, as a fundamental component of their schooling, is being increasingly realised. To achieve this, SCIL has had at its core the notion that collaboration and team approaches are critical to changing teaching paradigms, along with empowering innovative teachers when it comes to implementing creative ideas, aided by support structures and spaces that enable rather than hinder.

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APPLICATION OF CONTENT MANAGEMENT SYSTEMS ON SECONDARY EDUCATION BY MEANS OF THE DRIVER CONSTRUCTIVIST MODEL

Thenia Ermeidou, Spyros Blatsios, Platon Schools, Greece

Abstract

The rapid technological development observed in recent years enforces the need to a) use new methodologies and materials that allow familiarization of students with emerging technological trends and b) to provide a fresh approach to curriculum teaching methods.

The Moodle open source content management system is a contemporary teaching environment where the student is able to have immediate access to learning material via PC. After reviewing the currently available bibliography, it becomes evident that electronic distance learning (EDL) can be directly applied to all scientific fields, while research indicates that EDL promotes cooperative learning and enhances the self-confidence and creativity evident in all children.

This new teaching method was experimentally applied to secondary education students in order to abet the active participation of learners – in contrast to the traditional teacher-centred methodologies – and to incite the emancipation of students from the otherwise omniscient teacher.

Keywords: cooperative learning, creativity, active participation.

Introduction

Conventional education teaching methods are carried out indoors and the teacher performs (more or less effectively depending on his pedagogic skills) the following functions: purpose- and objective-setting and upholding their fulfilment. The teacher furthermore caters for the digest and understanding of taught material, dividing it into appropriate chapters, coordinating the frequency of access to said material, using fitting methods to maximize the effect, namely learning. The teacher also stimulates the active involvement of learners, provides links between acquired knowledge and skills and incorporates them to the taught subject, and finally aids the consolidation of said cognitive objects through revision, rigorous exercises and personal and/or team projects.

In distance learning the abovementioned functions are sought to be fulfilled through the taught material per se. Indeed, appropriately formed material can set objectives, clarify grey areas, provide feedback, trigger further exploration and application and offer data so that learners are constantly interacting with the object under study (Race, 1999 and 2001).

During the pilot trial of this application both teaching methods were used, as the cross-examination of their results, the comparison of mutual and different advantages and disadvantages and the facilitation of the transition of students from conventional to EDL learning were issues deemed imperative.

Greek educational bibliography lacks the multitude of references on the use and results of DL in a non-experimental school environment present in other languages. A recent research conducted on senior primary education students (Anastasiades et al, 2001) indicated positive results concerning the acceptance from children (both male and female), the development of cooperative practices, as well as the development of problem solving cognitive capabilities.

The Moodle platform user interface

Moodle (Modular Object Oriented Developmental Learning Environment) is an Open Content Course Management System, widely used in asynchronous distance learning. Thus far (October 2010) there are 49.952 certified websites and 37.000.000 users using the platform, which is available in more than 75 languages.

Moodle has various characteristics typical of an e-learning platform, in addition to certain revolutionary features (such as the filtering system) and other enhanced features. Furthermore, Moodle is versatile enough to be applied to multiple curriculum subjects, training courses and skills development activities.

Programmers can expand the modular construction of the platform by creating plug-ins for specific new functions. In addition, Moodle infrastructure supports most available plug-ins, such as:

- Activities, Source material
- Questions (multiple choice, true-false, fill the gaps etc)
- Data fields (for Data Bases)
- Graphics
- Passport control (may demand username and password)
- Inscription methods
- Content filter

Various openly available plug-ins, created by other developers, use this infrastructure.

Moodle users can use the built-in PHP editor and contribute new tools for the user community. This unique feature contributed to the rapid development of the user interface and the likewise fast correction of any errors.

Application

Application of Moodle was conducted on the required curriculum of third year junior secondary school students on the subject of Biology and second year senior secondary school students on History, by "PLATON" private schools in Katerini, Greece, throughout the academic year (2009), and was funded through the EU Educonlinux project, Minerva action. The former class consisted of 22 students, the latter of 16. Courses were conducted for 2 hours per week and included one complete subject matter chapter.

The teaching method involved the structuralist educational model introduced by Driver and Oldham (1986), who proposed a five step course procedure:

- Orientation
- Previous knowledge check
- Reformation of false points of view
- Application of student knowledge
- Evaluation of student knowledge

Courses were held at the computer labs of the school and involved two observing teachers, who provided guidance and coordination, namely observing the student progress, interfering when students encountered difficulties to support them with prescriptive suggestions only. All students had satisfactory computers skills, the majority was acquainted with the use of web browsers but none had former Moodle experience.

In the initial part of the procedure a preparatory course was deemed necessary for familiarization purposes, whereby students observed a demonstration of the user interface and tools of the platform.

As far as the Biology courses were concerned, the purpose of the application was to help students acquire fundamental knowledge on Darwinism, while the teacher's primary concern was to remedy the false presumptions present in student viewpoints. Sources included various Wikipedia articles, preliminary checked for inconsistencies, as well as audiovisual documentary material available from BBC.

The History course emphasized on the most important events of the Byzantine empire, enriching the frugal information provided by the school book with additional informative material collected from history encyclopedias, journals, websites and History Channel and BBC documentaries.

Conclusions

Given the difficulty of assimilating the educational material of the application within a limited time frame and the fact that the students were not accustomed to this teaching method, the results were the following:

- Mobilization and active participation of students
- Creation of a cooperative learning framework
- Highlighted the necessary shift of the teacher's role from omniscient to administrator of knowledge
- The majority of students showed understanding of taught material

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SERIOUSLY ABOUT SERIOUS GAMES AND TEACHING PRACTICE IN BULGARIA

Roumiana Peytcheva-Forsyth, Vassya Krumova Delibaltova, Silviya Hristova Yotova,
Sofia University, Bulgaria

Introduction

Both theorists and practitioners agree on the key importance of the quality of higher education teaching practice for pre-service teachers' professional preparation. Quite naturally, all over the world the teaching practice is an integral part of the curriculums of the pedagogical degree courses. The Bulgarian national standards for example prescribe 150 academic hours for teaching practice – observations, analyses, evaluations and teaching of lessons. However, as a result of the increasing number of students and the insufficient funding, numerous administrative, organizational, pedagogical, methodical, social and personal problems have arisen. In such a critical situation any suggestions for alternatives and innovations, including virtual practice based on serious games, should be seriously taken into consideration. Thanks to the realization of the international project **SimAULA- Tomorrow's Teachers Training –** (511472-LLP-1-2010-1-ES-KA3-KA3M) such an option has become possible. Very soon the future teachers will have the opportunity to interact with avatars, develop lesson plans, and teach in the virtual classrooms. In order the expected serious games to be effectively applicable in the actual teaching practice a lot of preliminary studies have been made. This paper will present the Bulgarian outcomes of the first stage of this project.

Aim and methodology of research

The main goal of the study is to evaluate the current state and identify the problems of the teaching practice at Sofia University, as one of the higher education institutions playing leading role in the preparation of teachers, and to find out if serious games can act in favour of supporting teacher preparation. In order to achieve this research aim, the following aspects were researched:

- The aims and objectives of the pedagogical practice;
- The typical teaching strategies and learning activities the practicing students apply in the class room;
- The problems met by of the key actors involved in the practice;
- The problems that could be solved through virtual practice;
- The teaching strategies and learning activities which are the most appropriate to virtualise.

The following **key concepts** have been used:

- **Teaching-learning strategy** (or didactic strategy, pedagogical strategy): an approach to the planning of teaching; an idealized notion about the effective design of the models of teaching depending on the type of the interaction between the teacher and the pupils and between the pupils.
- **Teaching-learning technology**: a scientifically based logical sequence of specific aims, methods, tools, forms, assessment procedures and ways of didactic reduction of learning content, constructed with the purpose of achieving the desired final outcome.
- Teaching-learning method: a valid series of mutual and/or reciprocal acts between the teacher and the pupils.
- **Learning activity**: an interaction between a learner and an environment (optionally involving other learners, practitioners, resources, tools and services) to achieve a planned learning outcome. Under this definition, task, content and context are fundamentally inseparable. (Beetham and Sharpe, 2008).

The **research methods** encompassed:

- Documentation analysis – analysis of the national regulations on future teachers' practice
- Literature review – analysis of the research carried out in the field of teachers preparation and the role of the practice in it at national level during the last ten years
- Semi-structured interviews with the main actors involved in the pedagogical practice: university lecturers, hosting teachers and students.

Data collection and analysis

Literature review on the research in the field of the teaching practice

There are two approaches towards the teaching practice in the Bulgarian pedagogical literature. The first views the teaching practice in the frameworks of the more complex problem of the teacher preparation, training and education, while the second treats it as a separate topic.

The unflagging considerable attention to this problem is due to its social and pedagogical significance as well as to the circumstances that the researchers in the fields of pedagogy and teaching methods are university professors or lectures in the departments for teacher qualification who directly take part in the process of the teacher education and training. The latter explains why most of the publications focus on the content and organisation of the teachers' theoretical preparation, and only a small part of them have the teaching practice (professional-practical preparation) per se as a subject of study.

There is a consensus that the six groups of interrelated problems – administrative, organizational, pedagogical, methodical, social and personal - of the professional pedagogical preparation highlighted at the end of the 80-ies of the 20th century (*М. Андреев*, 1988) still have not found their adequate solutions.

The majority of the pedagogical publications are devoted to the implementation of the state standards for the professional qualification ''teacher", i.e. to the administrative problems of the pedagogical preparation. The act itself of the introduction of the national standards is estimated as a clear success. On the contrary all the articles of the standards defining the curriculum disciplines and the number of hours for their study are seriously criticized. Generally the standards are evaluated as in no way acting in favor of diminishing the discrepancy between the growing social expectations towards the teacher profession and its comparatively low social status, attracting mostly ''mediocre students" to its realization. Having in mind the crisis in the secondary education, the increasing opportunities for higher education abroad and the low academic status of the pedagogical bachelor degree courses, it's not a surprise that those courses are among the least preferred ones. The level of competitiveness between candidates for entering teacher-training programs is very low if it exists at all; therefore, the selection criteria are limited to only a passing grade on the university entrance exam.

In such a social context the recommendations for urgent measures towards an increase of the hours for the basic pedagogical teacher preparation seem as lacking an alternative. It's obvious, that the permanent disagreements about the ratio between the scientific and the pedagogical preparation of the students still are settled "to the detriment of the pedagogical professionalism", "inappropriately and ad hoc". Although the state standards fix the educational minimum, it's evident from the curriculums of the pedagogical degree courses that most often this is also their maximum (*Б. Господинов,* 2009). The latter is possible because there are no professional standards (in the form of knowledge, skills, competencies) for teachers in Bulgaria towards which the students to be assessed at the end of their education, and respectively to be awarded their professional qualification certificates (*Р. Пейчева-Форсайт,* 2009).

So the pedagogues insist for an immediate state intervention and initiation of changes in the state requirements and introduction of more effective systems for internal and external quality control of the process of teacher preparation. They are convinced that the repeatedly alleged flows of the ''old pedagogical preparation' '(*С. Райчева*, 2004) should be overcome by a ''radical structural reform of the teacher preparation in order to save the profession'' (*Я. Рашева- Мерджанова*, 2008).

Meanwhile the specialists in teaching methods don't share the dissatisfaction with the state and university legislation, organization and content of the pedagogical preparation of teachers, so typical for the lectures in pedagogy and didactics. They prefer to focus their studies mainly on the optimization of the elements of the different teaching-learning techniques. Their proposals for positive changes are limited to the inclusion of these innovations in the curriculum programs of the future teachers.

The last decade publications dealing with the teaching practice per se are written by professors in the methods of teaching of the corresponding subjects who are in charge of the organization and conduct of the practices. These are manuals, guides and descriptive articles sharing good or innovative, according to their authors, pedagogical experience. The term research in its strict sense is hardly or not at all applicable to the majority of these works.

For example one of the most frequently used textbooks - ‘’Professional-Practical Preparation of Students - Future Primary Teachers” (G. Boneva, 2004) is not an exception. Both in structure and content the monograph follows the didactic tradition of the 70-ies of the 20the century. The well-known formulations about the essence, basic characteristics, aims, principles and forms of teaching practice are systemized and enriched with later their Bulgarian and Russian revisions. Then the problems of the assessment and control of the teaching practice are described and finally three approbated in the author’s practice evaluation forms are disseminated. Both the theory and the evaluation forms are based only on the traditional German and Russian teaching-learning strategy which is usually associated with its focus on the teaching and the teacher. The key phrases helping the recognition of this strategy are ‘’to passing knowledge’’ or ”knowledge transfer”.

Because both the technology and the terms used for its description are the most popular in the Bulgarian teaching practice, in the pedagogical and methodical preparation of the students, as well as in the teaching practice of the students the same terminology was chosen for the formulation of the interview questions (especially the ones in regard to the aims, assessment and the difficulties of students) of the designed for the purposes of the project interviews.

Documentation analysis focused on the teaching practice organisation, content and structure according to the state and university normative documents in Bulgaria

The education and qualification of teachers has always been declared as a priority in the Bulgarian educational policy. They are seen as key components of the quality of the education in the strategy for the development of the education in Bulgaria (*National Program for the Development of School Education and Preschool Education and Preparation 2006 -2015*) and the government’s *Program for the Development of education, Science and Youth Policies in the Republic of Bulgaria 2009-2013*).

State normative documents

The state normative acts in regard to the teacher preparation are the Law for Public Education and the Council of Ministers Decree N 162 from the 17th of April 1997 for adoption of Ordinance for the uniform state requirements for acquiring professional qualification “’teacher” referred to in this paper briefly standards.

According to the Law every citizen who has teacher qualification can be a teacher and the preparation of teachers is carried out by the system for the higher education.

The most important articles of the ordinance are the ones determining the curriculum subjects for the theoretical and practical preparation, the minimum number of hours for their study and the form of the graduation exam. The uniform educational minimum for the theoretical preparation includes compulsory, optional and facultative disciplines. The compulsory ones are:

> *“1. pedagogy (theory of education and didactics) – 60 hours;*
> *2. psychology (general, developmental and pedagogical) – 45 hours;*
> *3. audio visual and information technologies in education – minimum 15 hours;*
> *4. methods of teaching-learning – 60 hours."*

The practical preparation includes:

> *“1. Observations and analyses of lessons and other forms of teaching-learning under the guidance of the university tutor – 30 hours;*
> *2. Ongoing pedagogical practice – observations of lessons and other forms of teaching-learning with the aim of preparation for the pre-diploma practice – 45 hours;*
> *3. Pre-diploma pedagogical practice is an independent participation in the teaching-learning and educational process under the guidance of a school teacher and a higher school teacher – 75 hours”.*

At the end of the pre-diploma pedagogical practice the state exam is conducted. This exam includes a lesson planned and taught by the student and assessed by a commission whose members are appointed by an order of the Rector of the University. The tutor teacher also obligatory participates in the commission.

It is clear that the Ordinance determines only the forms, though not very successfully in regard to the observations and the ongoing practice, and the number of hours of the teaching practice. The shortcomings of this approach give grounds to the already outlined in the literature review pedagogical criticism.

University normative documents

The principle of the academic autonomy is proclaimed in the *Constitution of the Republic of Bulgaria (article 53, paragraph 4)* but the main act regulating the functioning of the universities is The Higher Education Law. The most closely related to the teaching practice is its Chapter 4. There it is stated that the curriculum plans of the different degree courses are approved by the Academic Councils of the higher schools while the subject programs are adopted by the Faculty Councils. Following this Law each university adopts its own regulations.

The curriculum plans and the teaching practice programs of the bachelor degree pedagogical programs geography and biology and biology and chemistry of The Faculty of Biology, chemistry and informatics and chemistry and physics of The Faculty of Chemistry and Pedagogy of the Faculty of Education of Sofia University have been examined.

Curriculum plans

The total horariums of the core teaching practices approved with the curriculum plans of the examined degree programs not only comply with the state standards for the practical preparation of students but even exceed them. Probably the approximately 13 % relative share of the teaching practice horarium to the whole higher education may be estimated as insufficient, especially in regard to the part-time degree courses and the contemporary challenges to the teacher profession. However, if the curriculum plans are more carefully analyzed it will be clarified that further increase of the teaching practice hours is neither appropriate nor possible. Such an increase will have a negative impact on the theoretical pedagogical and scientific preparation. The semester distribution in the last two years of study even of these practices creates enormous difficulties and has as a consequence an inadequate balance between lectures, seminars and practice. Having also in mind that according to other state and normative regulations the week workload of an assistant professor includes other seminars and that the ratio of an assistant professor to his/her practicing students is 1: 50 it's obvious that there are many obstacles confronting the normal course of students' practice at schools. Thus, the advantages of a virtual classroom as an effective tool for the achievement of teacher preparation aims in any case should not be underestimated or ignored.

Practice subjects programs

All of the analyzed programs meet the didactic criteria and requirements for higher school practice programs. Their aims and objectives are consistent with the previous knowledge and skills of the students and the determined horariums of the subjects. The taxonomic approach is used in their formulation, so it's possible the achievement of the objectives to be registered. The expected results – lesson evaluations, plans, protocols, synopses, scenarios, taught lessons, weekly or monthly schedule of lessons – are also included. The selected teaching-learning and assessment methods, techniques and procedures are also appropriate for the stated aims.

However, the aims themselves are limited to the communication of teachers with pupils and mainly to the teacher professional knowledge, understanding and skills of planning, teaching and assessing of the classroom lesson teaching-learning. All the other forms of pedagogical communication, teaching-learning and education are neglected.

It is evident both from the preferred terminology and the applied lesson evaluation forms that the traditional teaching strategy of knowledge transmission is still dominating the teaching practice of the students. This fact hardly could surprise the Bulgarian pedagogical community. The conservativeness of the teaching practice, the overloaded school subject programs, the restrictions imposed by the equipment of the standard classroom, the lack of learning materials, teacher guides and assessment instruments, the indifference of school authorities to the teaching-learning process in favor of its most often externally tested outcomes - knowledge and understanding are only some of the reasons for the extensive use of this technology. We realize that the use of serious games in teacher training cannot neutralize all the barriers to the application of different teaching strategies and integration of some of their elements with the traditional teaching strategy of knowledge transmission; however, we believe it

may greatly contribute to the achievement of the stated in the practice programs aims as well as to allow inclusion of a wider range of teacher competencies as programs objectives.

Interviews

The three interview schemes that were developed for the different **target groups** considering the characteristics of the respondents are the following:

- **University lectures – assistant professors from Sofia University** – 6 assistant professors in charge of the teaching practices of the students-future teachers from the Faculty of Biology, the Faculty of Chemistry and the Faculty of Pedagogy. All of them are experienced in organizing and training of students future teachers (20, 14, 9, 7, 6, 4 years; Me = 8). They are engaged in the three existing in Bulgaria forms of higher school teaching practices. The academic subjects are: observations in didactics, school pedagogy, methodics in the teaching/learning biology and chemistry, ongoing pedagogical practice, pre diploma pedagogical practice. The total number of their students this year is 285.
- **Master (host) school teachers** – 6 teachers – 2 primary, 3 middle, and 1 high school teacher. The primary ones teach Bulgarian language and literature, mathematics, "native place", English and IT. The secondary school teachers teach ''man and nature" (science in grade -5 and 6) and chemistry and biology (in grade 7 - 12). The host teachers have over 10 years of experience as teacher trainers. 4 of them work at secondary (1-12 grade) schools, 1 in 1-8 grade school and one in vocational (8-12 grade) high school.
- **Practicing students** – 12 students from Sofia University who study pedagogy, biology and geography, biology and chemistry, and chemistry and informatics.

Data analysis

The trends in pre-service teacher training revealed through the interview data analysis are discussed further in this section.

First of all the different role, status and responsibility for the setting of aims, organization and conduct of the teaching practice result in significant differences in the opinions of the assistant professors and the teachers in regard to the barriers for their normal functioning. The assistant professors take into account all factors affecting the students' performances at all their institutional levels – from the national policy and the normative regulations of the teacher preparation and competencies, through the level of inter-institutional relations and curriculums to the level of intra-institutional practice – administrative, organizational, pedagogical, methodical, social and personal. On the other hand, the teachers explain all the shortcomings of the teaching practice just with the personality traits and dispositions of the students. The only exception is one self-reflective statement of a teacher revealing that she is aware of the influence of her own competencies to the student performance. Such differences to a great extend raise questions about their scope and depth of knowledge about the conditions and external requirements for the organization and conduct of the teaching practice. Although the lack of consistency in the opinions of assistant professors and teachers can be regarded as an unfavourable prerequisite for the effectiveness of teaching practice, probably such an assumption goes too far having in mind that all the respondents express agreements on the necessity of establishment of university system for the preparation of master teachers.

Secondly, on the ground of the described heterogeneity of positions in regard to the difficulties in the setting of aims, organization and conduct of the teaching practice, there is the full consensus about the spheres of practice realization that are problematic for the students. The interviewees from the three target groups unanimously identify the students major difficulties as connected with the application of new methods of teaching-learning and the realization of the differentiation and individualization of teaching. Some of the reasons for this unchanging over years trend are seen in the traditional architecture of the classroom that limits the options for an alternative organization of the class work and the application of innovative methods. The incompatibility of the innovative methods with the school approved educational practice is also stated as a possible reason for the preference of the traditional model of teaching through knowledge delivery. Well founded are also the opinions that part of the difficulties are because of the correlated to a certain degree lack of teaching practice incentive schemes and the students' low motivation for work and study. The agreement on the ascertainment that the teaching practice is the most expensive, the most difficult for carrying out, but the least financially supported part of the pedagogical

preparation requires the need of a creative search of opportunities for optimization within the now existing conditions.

Thirdly, the interviewees identify several key areas of the teaching practice that need to be improved in the future:

- optimization of the system of criteria for conducting and evaluation of practice;
- creation of a bank of materials facilitating the preparation of students for their lesson practice;
- development of rules with strictly prescribed rights and responsibilities of the participants in the teaching practice;
- increase of the time for the preparation of students.

Finally, the interviewees' expectations to a virtual practice, based on serious games, are varied within each target group and between the three target groups. They cover the whole possible range: from minimalism – virtual practice can be effective only in the acquisition of a limited number of specific skills, through realism - it can be effective only on certain conditions for the formation of nearly all of the teacher competencies, to maximalism – virtual practice in any case can improve the quality of all aspects of the teacher practice. This variability is so great that any reflections or even comments on them would be rather arbitrary and suspicious. All the respondents admit that they don't have any personal experience with serious games and it's obvious that the design of the research including only their oral description failed to compensate this lack of personal experience. Based on these outcomes it could be suggested that the next stage of the project which plans focus groups with demonstrations and opportunities for serious games playing will help to generate rather more reliable opinions of the participants.

Conclusion

Without doubt, the contemporary concept of the development of teacher education is inextricably linked to the quality improvement of teaching practice. The solution of the teaching practice problem is not an easy task mainly because of its structural and functional complexity. Only the mutual efforts of all specialists to think and act in one and the same direction would lead to a satisfactory result.

The pedagogical aspects of the teaching practice problems have been outlined theoretically and partially confirmed empirically by the research data. These aspects are:

- the insufficient time for the preparation of the students for the practice;
- the students' difficulties in choosing adequate to the specific situation methods;
- the students' lack of skills for individualization and differentiation;
- the students' restrictions by non-existing or outdated learning materials, tools and media

One of the options for overcoming the existing difficulties in the planning, organization and conduct of the teaching practice is the application of the so called ''serious games". Of course in a situation of absence of standards and awareness of the need of rethinking of all the normative documents regarding the teaching practice in Bulgaria such an attempt should be made with taking into consideration all the peculiarities of the national educational policy and the present educational realities.

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THE DEVELOPMENT OF LESSONS, CASE STUDIES, SCENARIOS AND SIMULATIONS IN THE MOODLE VIRTUAL LEARNING ENVIRONMENT FOR SELF DIRECTED LEARNING (SDL)

Michael O'Rourke, Athlone Institute of Technology, Ireland

Introduction

The objective of the project is to research the feasibility of developing lessons, case studies, scenarios and simulations in the Moodle Virtual Learning Environment (VLE).

In the Moodle VLE, there is a lesson facility which is rarely used by educators. A lesson delivers content in an interesting and flexible way. It consists of a number of pages. Each page normally ends with a question and a number of possible answers. Depending on the learner's choice of answer, he/she either progresses to the next page or is taken back to a previous page. This is known as branching. Navigation through the lesson can be straight forward or complex, depending largely on the structure of the material being presented. In branching lessons, programmed learning opportunities can be created in which each correct answer brings up a new piece of information and a new question. The lesson can be graded by the Moodle VLE, which is a great incentive for self directed learning (SDL), as it encourages learners to work through it, thus enhancing their knowledge and understanding of the topic. A lesson can be used to simulate a situation or particular environment. It can also be used to 'package' open educational resources (OER) like video, audio, images and animations in a format that learners can work through in a logical and coherent manner.

This project researches lesson, case study, scenario and simulation development with various course groups and subjects, using the facilities provided in the Moodle VLE. A literature survey is undertaken as part of this research, to determine the state of the art and current practice in lesson, case study, scenario or simulation development in e-learning situations. It also determines the development effort in terms of time and technical knowledge required to produce these learning objects. Learners are surveyed to determine the success or otherwise of this approach to SDL.

Background to the Moodle lesson activity

A lesson is the most complex, and most powerful, type of activity in Moodle. It is a series of web pages that presents information and questions. It can be a combination of instruction and assessment. (Rice, 2008) Primarily, it is a teaching tool, as opposed to an assessment tool. The design of the lesson activity is focused on teaching and learning, rather than pure assessment; the quiz activity in Moodle is especially designed for assessment.

The educational psychologist, Robert Gagne, developed the theory of ideal learning conditions (Gagne, 1965). He discovered that there are nine instructional events that must take place. The first event is called “gaining attention” of the learners. Once their attention is gained, activities should be developed that do the following:

- Inform learners of objectives and create levels of expectation
- Stimulate recall of prior learning that relates to the course objectives
- Present instructional content
- Guide learners by creating categories and sequences
- Encourage performance and practise
- Provide feedback
- Assess performance
- Apply knowledge to a particular job or activity

(Rice & Smith Nash, Lesson solutions, 2010)

These instructional events are very useful when constructing an e-learning course and many of them can be applied within a Moodle lesson.

Lesson examples

Lesson 1: Laptop technology (a linear lesson)

In this lesson, the learner is being guided through a series of open educational resource (OER) video clips on laptop technology. The objective is to present each video clip and ask a question related to its content. This forces the learner to watch the clip, unless he/she is already familiar with its contents. Then the question is answered and if correct, the learner moves on the next clip; otherwise the question must be attempted again. The maximum number of times that all questions may be attempted can be adjusted in the lesson settings. The lesson may be scored and timed; scoring, providing an incentive for the learner to complete the lesson. This type of lesson is an ideal technique for encouraging learners to work through any type of multimedia content (text, images, animations, video, and podcasts) and be rewarded for doing so. It is a tremendous incentive for self directed learning (SDL).

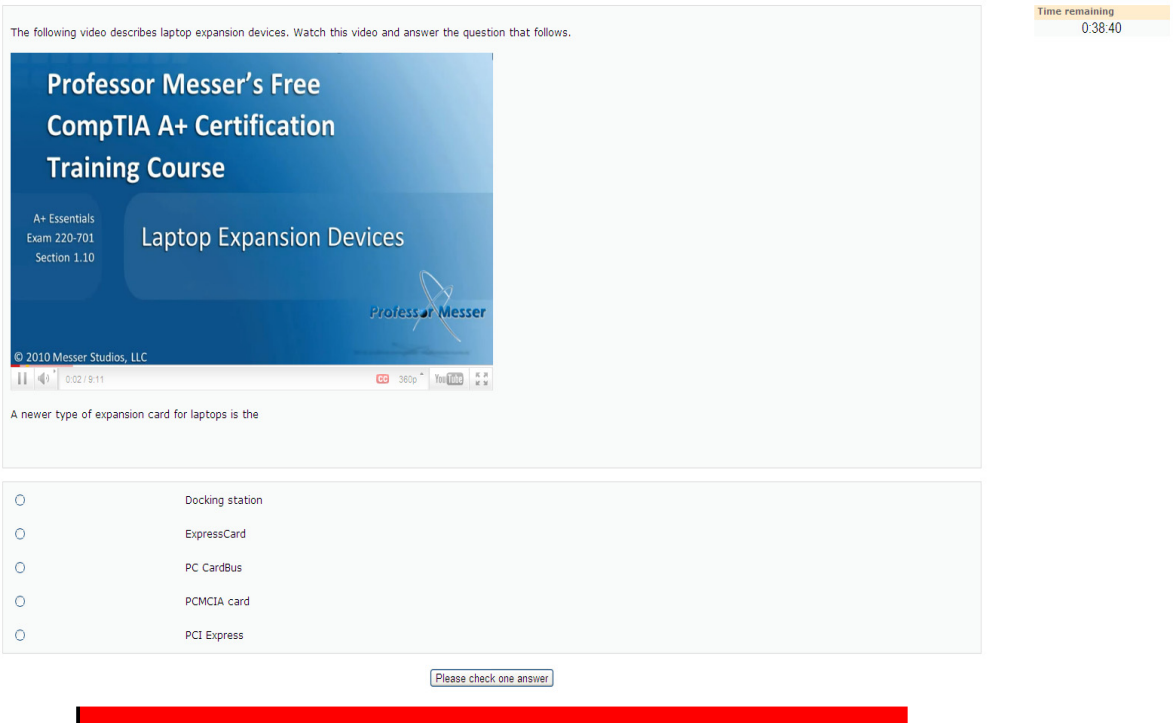

Figure 1

Lesson 2: Troubleshooting scenario for a computer technician (a branching lesson)

In this scenario, the learner assumes the role an ICT technician in an organisation providing technical support to a large number of users. The majority of users are non technical and know nothing about computer systems. The technician receives technical support queries through a ticketing help desk system. On a particular morning, the technician receives a ticket indicating that a particular desktop pc will not switch on and the user cannot proceed with important work for an upcoming deadline. The technician is requested to respond immediately to resolve the issue. Using a flowchart is essential in the planning of the design of this lesson, as the decision branches can be determined in advance of the actual development.

In this scenario, you are an ICT technician in an organisation providing technical support to a large number of users. The majority of users are non technical and know nothing about computer systems. You receive technical support queries through a ticketing help desk system. On a particular morning, you receive a ticket that a particular desktop pc will not switch on and the user cannot proceed with important work for an upcoming deadline. You are requested to respond immediately to resolve the issue.

Continue

Figure 2

Lesson 3: Mountaineering decision making simulation (a branching lesson)

In this simulation, the learner is being asked to simulate going away on a mountaineering trip in the Slovenian Alps. There are many decisions to be made before and during the trip; some of which are not so serious and some that are potentially life threatening. It is up to the learner to decide how to progress through the simulation depending on experience and common sense.

A climbing expedition to Slovenia.

In this scenario, you are heading off to Slovenia for high altitude climbing and hiking in the Julian Alps which contain the highest peaks in the country. Along the way, you have many decisions to make which determine the outcome of your trip. Good luck!

Continue

Figure 3

Learner survey

A survey was undertaken to determine the views of learners who had used the lessons provided as part of their studies over the course of the academic year 2010/2011. Three groups of AIT learners were surveyed electronically using the Zoomerang survey tool.

Conclusions and findings

The following conclusions and findings can be drawn from this project, having worked on it over an academic year:

- The lesson activity in Moodle is an excellent activity for presenting material to learners because they are led through it in a very structured and interactive manner.
- The lesson may be used to 'package' all types of open educational resources (OERs) in all formats including audio, video, animations, text and images.
- Adequate feedback may be provided at all points in the lesson.
- Decision making is easily incorporated using 'jumps' within the lesson.
- Various question types are provided within the lesson including Multiple Choice, True/False, Short Answer, Numerical, Matching and Essay thus giving wide variety in assessment.
- Short lessons of 15 to 30 minutes duration work best in order to keep learners engaged and avoid loss of concentration.
- The planning and development time is considerable for a single lesson, particularly if it involves decision making; a flowchart is recommended for planning a decision making lesson.
- Some prior experience with Moodle is desirable as it takes time to become familiar with the technicalities of the lesson interface.
- The Moodle lesson activity provides a very flexible method of creating SDL resources for teaching and learning.

The benefits for learners are as follows:

- It aids with SDL because it is interactive and the score attained by the learner can be designed by the lecturer, to count towards the final assessment mark.
- Feedback is provided within the lesson, case study, scenario or simulation where appropriate, to give pointers to learners as they progress through it.
- The lesson, case study, scenario or simulation can be taken a number of times for knowledge and understanding reinforcement by the learner.
- The lesson, case study, scenario or simulation can be undertaken off-campus at any time as they are online.

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USING WIKIPEDIA IN A COURSE ASSIGNMENT: IMPLICATIONS FOR WIKIPEDIA LITERACY IN HIGHER AND SECONDARY EDUCATION

Alexios Brailas, Panteion University, Greece

Abstract

The present study investigates the effects of an educational intervention, using Wikipedia as a learning tool, on students' digital literacy and learning. The intervention took the form of a Wikipedia assignment integrated into the syllabus of an undergraduate Sociology course. During their assignment students created, enhanced or fixed Wikipedia's articles in the scope of sociology in the Greek Wikipedia project. The aim of the assignment was the utilization of Wikipedia for teaching fundamental sociological concepts through editing corresponding Wikipedia's entries. For the evaluation of the intervention a focus group was conducted and the research findings regarding the impact of the assignment on students Wikipedia literacy are presented. Important implications for learning process in a wiki space are discussed.

Introduction

Wikipedia constitutes a new paradigm for creation and dissemination of knowledge, a radical new and deep participative and collaborative approach (O'Sullivan, 2009). Articles are co-authored by volunteers in a virtual collaborative working space. The content actually emerges through the interaction of authors and their contributions with each other in a framework of reciprocal determination (Shirky, 2008). Through present educational intervention it becomes obvious that students who have deepened their knowledge of how Wikipedia's articles are created, never again use Wikipedia as they used to do before, but in a new and qualitatively different way. The new example of creation and dissemination of knowledge that Wikipedia manifests requires a new type of literacy. This new digital literacy is absolutely indispensable in order to fully utilize Wikipedia's potential and use it in a safe and reliable way.

Today, Wikipedia constitutes a rather easily available source of information for students in the internet. Wikipedia is on top of nearly every Google search result. Students will read a Wikipedia's article despite their suspiciousness of its reliability, especially when there have been rumours about this very issue. College students use Wikipedia for course-related research in combination with other information resources such as course readings and Google search results (Head & Eisenberg, 2010; Head & Eisenberg, 2009). Wikipedia is a unique and valuable student resource especially for obtaining a basic understanding of a topic and get an idea about its context (Head & Eisenberg, 2009). Many instructors integrate Wikipedia as a learning tool into university courses (Associated Press, 2007). Previous research investigated the role of Wikipedia editing assignments in improving students' research and writing skills (Martineau, 2011; Wannemacher, 2009). The present research investigates the impact of these assignments on students' Wikipedia literacy.

As the present study depicts, students that are fully aware about what Wikipedia is and how its articles are created and evolve over time, use Wikipedia in a very different way, taking into consideration discussion pages, historical records and existing references within articles. Digitally literal students use Wikipedia's articles as starting points for their quest, not as a final resource of knowledge. And if they find any erroneous or suspicious entries they may correct them or discuss them with other community members at the appropriate discussion pages. In any way, they will probably not bother whether Wikipedia is a source of valid information or not. They have realized that Wikipedia's validity is directly related to their ability to use it in the appropriate way, in the same way that adults are not concerned about the "safety" of a knife when using it to cut bread, but are concerned about its hazard when it is used by young children or guys with bad intentions.

Intervention design

The purpose of the intervention was to utilize Wikipedia in the teaching of fundamental sociological concepts by editing corresponding Wikipedia's articles. The intervention took the form of an assignment integrated into the syllabus of an undergraduate Sociology course at Panteion University of Athens, department of Psychology. The initial design of the assignment was based on the experience of previous or concurrent assignments at universities in the USA. Information about these assignments was derived by the English Wikipedia's special page for School and University Projects (Wikipedia, 2011) and from the concurrent *Public Policy Initiative* program in the USA (Wikimedia Foundation, 2010). Information derived from these sources was modified to match the special features of the Greek educational system and the requirements of the particular course and academic context. The guidelines for the assignment were handed to the students during their first course lecture, including the aim and planning of the project, description of the required procedures, directives on the selection and editing of articles, week days and hours of available technical support and method of evaluation and grading. Participation in the assignment was voluntary and twenty students finally took part. In the middle of semester time a learning workshop about Wikipedia took place with the aid of the local Wikipedia community. This particular project is the first systematic intervention of this type in the Greek university. As a result the corresponding page for School and Universities in Greek Wikipedia was created to accommodate the specific and future projects (http://el.wikipedia.org/wiki/Βικιπαίδεια:Πανεπιστημιακά_Εγχειρήματα).

Intervention evaluation

After the end of the semester and the written students' examinations, a focus group took place in order to evaluate the intervention and to investigate the students' opinion regarding Wikipedia and particularly its potential as a learning tool. Focus group is a research methodology developed in 1940 at Columbia University (Bureau of Applied Social Research). Focus groups were widely used later on by commercial and advertising companies during 1960s for the evaluation of products and services. In the last few years focus groups were used again in social sciences because of their specific advantages over other methods and their complementarity to other methodologies (Bloor et al., 2001). This particular focus group took place at Panteion University on July 14, 2011. In the focus group participated three students (aged 19) and the discussion was facilitated by a professional psychologist. The researcher participated as an observer. Before the discussion, the facilitator undertook an intensive training in Wikipedia and the particular assignment. The focus group discussion lasted 45 minutes. Focus group advantage in comparison to personal or group interviews is that participants do not just answer questions but are involved in live discussions, interacting with each other. The small number of participants in the specific group reduced the number of possible opinions that could be expressed. On the other hand members of the group felt more comfortable and secure to express their thoughts and share their experiences. Permission for recording was given by the participants and the discussion was recorded. Focusing questions were used during the process to focus the discussion on the desired field (Wikipedia and Wikipedia in education particularly).

The recording was transcribed by the researcher. The transcribed data were indexed to make them manageable for interpretation (Auerbach & Silverstein, 2003; Gibson & Brown, 2009; Lofland & Lofland, 1995). The indexing process took place in two phases. During the first phase, initial categories were attributed to each corresponding utterance. In the next phase initial categories were merged, separated or rephrased to better fit the raw data. A systematic analysis of the data followed using the formed set of categories. The method of analysis was analytic induction (or analysis of deviant cases), a research methodology of analysing qualitative data developed by Florian Znaniecki (Bloor et al., 2001; Silverman, 1993). According to this method, the researcher defines the phenomenon to be investigated and based upon the raw data derives an initial research hypothesis in an attempt to explain the phenomenon. The initial research hypothesis is then checked against every case that appears in the raw data, using the indexing categories and the context of the discussion. If a case that cannot be explained by the initial hypothesis is discovered, the hypothesis is tuned to cover this deviant case.

Focus group analysis

A prominent indexing category that emerges from the focus group discussion analysis is the *encyclopaedic feature* of Wikipedia. Before the intervention, students thought of Wikipedia as a classical form of an encyclopaedia, though implemented in a networked platform with open and free access to its content. Students thought Wikipedia's articles were authored by certified experts like in traditional encyclopaedias. During the course of the assignment and their active participation in Wikipedia through editing its articles, they realized that Wikipedia is not a traditional encyclopaedia but something new and quite different.

> *"For the same reason my fellow student said, I believe it is absolutely necessary to have relative lessons during gymnasium. Because school children are using computers all the time and they use them as a tool ... I mean I didn't know that everybody can write there, I didn't know it. I believed that Wikipedia is an ENCYCLOPEDIA (emphasized by the participant)." (Focus group participant)*

Focus group participants during their discussion noted they were impressed by the fact that everybody could create or alter Wikipedia's articles. Contribution to knowledge is open to everybody in Wikipedia either for creation, correction or enhancement of its content. However, this open content creation complies with rules and policies. Rules are co-determined by the community of Wikipedia's editors and Wikimedia Foundation in order to serve the purposes of the project. Some of the participating students realized the existence of these rules as soon as their first edits were reversed by the community for violating Wikipedia's policy.

While all participants underlined they were amazed by open to all content creation, nobody referred to the open and free access to Wikipedia's content. The group participants that grew up hand in hand with Wikipedia (aged 10 when Wikipedia started in 2001), take for granted the open content access but not the open content creation. The first is manifested through a Google search returning the corresponding Wikipedia entry. The latter is rather latent and an educational intervention may be required to realize it.

> *"But I have an objection ... whether [Wikipedia] can be used as a reliable source of information or not ... May be for this is because there is the possibility to edit and correct an article. Because you don't know whether something is written by academics or by school students, so accuracy is not guaranteed. On the other hand, if you are interested in something, you can investigate it and correct it." (Focus group participant)*

Information accuracy and reliability of Wikipedia's content was another important point noted by participants during the group discussion. The stereotype among students was that anything to be reliable has to be written by academics or other experts. So students cannot write a reliable article. The idea of an article that is produced collaboratively and its content emerges from a process that is self-organizing and correcting erroneous information (Shirky, 2008) is not yet widely accepted. The very same student that first raised the accuracy issue later proposed Wikipedia to be used as a student's resource. May be due to their assignment, students were in the process of changing their opinion about Wikipedia. Wikipedia is still a vague area for the participants. Initially students thought of Wikipedia as a traditional encyclopaedia, so they were worried about its reliability as soon as they found out it can be written by anyone. The group discussion revealed that students through editing Wikipedia's articles and familiarizing with the wiki process of collaborative creation started changing their point of view about Wikipedia's validity. Wikipedia is not a traditional encyclopaedia but a new participatory paradigm for content creation, requiring a new kind of literacy so as to be used safely and efficiently.

> *"I agree with the previous, all I knew about Wikipedia is that you can find information but I didn't know how it operates and now I finally learned it and this was very interesting. But the most beautiful was this part of freedom, the fact that anybody can write and anybody can correct it. That easy access." (Focus group participant)*

Wikipedia literacy, a special form of digital literacy, is directly connected to Wikipedia's validity. What Wikipedia actually is, how it operates, in which ways Wikipedians (members of the Wikipedia community) interact and how articles' content is created and negotiated is an absolutely required knowledge in order to safely and efficiently

use this knowledge tool. Participants realized it and subsequently proposed similar interventions to be implemented earlier in High School.

> *"And I wonder whether children now at the elementary school ... OK maybe at the elementary school is too early, cannot yet use Wikipedia, but what about gymnasium or High school.. I mean pupils can be impressed by the content and will not be in a process of critical thinking, whether something is accurate or not. They usually take it for granted and this is potentially dangerous, to be misinformed on a subject by Wikipedia." (Focus group participant)*

People not adequately digitally literate about the way Wikipedia operates and how its articles are created may think that it is an encyclopaedia in the traditional way, so its content is guaranteed by a team of experts and qualified editors. So they will take for granted every piece of information contained in it. The danger of misinformation is greater for people without available means to check or question article's validity, such as young children, elderly and not appropriately informed digital immigrants. So participants propose Wikipedia literacy to be included into high school curriculum.

> *"I would prefer [Wikipedia] to be taught at school, for example at the computer class, it would be interesting. [...] Yes, just to be at the university with this knowledge given." (Focus group participant)*

> *"[...] I mean it could be quite interesting for a pupil fed up with traditional approaches like reading books and learning content by heart, to get involved in Wikipedia" (Focus group participant)*

Wikipedia literacy radically alters the way students utilize the specific knowledge project. Wikipedia is not a traditional encyclopaedia and its content is not reliable when it is used as one. On the contrary Wikipedia is an encyclopaedic knowledge project with unforeseen in the past possibilities, available to people with adequate knowledge and skills to benefit from them. Wikipedia literacy transforms articles from final stations to starting points into a knowledge quest.

> *"I like [Wikipedia] to be used both by teachers and students in a more critical way, like starting point of knowledge, not as pure knowledge. Like I said before, I do not take for granted its accuracy; everybody can come in and write. From this point of you, like we said before, it is necessary to have a lesson in high school, maybe in the computer class, where a discussion between teachers and students can take place." (Focus group participant)*

Another crucial point related to using Wikipedia in education, identified by the group participants, is the *technical difficulties* imposed by the mediawiki (open source wiki software) interface. The text processor of the wiki environment uses a special wikimurkup code for formatting text, which is quite inconvenient. This is a known problem to Wikimedia Foundation and during Wikimania conference 2011 the preparation work for a visual editor was presented (Vibber & Kandalgaonkar, 2011). Wikipedia's interface requires some time and training to get used to and training activities and technical support should always be included into assignment planning.

> *"But I have to tell you this ... there is no need to press '=' 2-3 times in order to properly place a section. What is the reason for this? Couldn't it be possible to write down in a simple way? I don't understand the usefulness of all this strange code. Why not to be able to write in a simple way like with Word?" (Focus group participant)*

During the most time of the conversation students pointed out that Wikipedia assignment was a pleasant process. It was an alternative form of assignment, quite interesting to them and learning provoking that offered them the opportunity to understand profoundly how Wikipedia operates and what is all about. The total assignment implementation including instructions, technical support, discussions, workshop and evaluation of the intervention was a quite pleasant and creative learning process.

> *"All this thing with the assignment, I confess I liked it very much. This ongoing interaction, the recurrent meetings to see what we gonna do. All this thing with Wikipedia was nice" (Focus group participant)*
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> *"I think I enjoyed the whole process. I mean it is nice to get on board and talk to yourself and say: I learned this subject and I know it, why not to put it in the corresponding article? Even if you can add only two lines, a simple reference, this can be useful to others. I understand there may be some shortcomings or flaws to Wikipedia, depends on the point of view, but the whole process is really nice." (Focus group participant)*
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> *"Yes it was something nice and we learn new things we didn't know. It was something completely different. I enjoyed having the opportunity to discuss not only about our subject articles but even about Wikipedia in general. […] I think Wikipedia assignment was well organized. And all the people involved were gathering together and discussing. And there were office hours for technical support every week. I didn't know even how to make a user account and I get support even for this and I like it." (Focus group participant)*

Conclusions

Wikipedia literacy is considered a very significant factor by focus group participants. Students enjoyed the assignment and the profound knowledge they acquired about Wikipedia. However, students propose Wikipedia literacy to be adequately cultivated during secondary education, so university students are already equipped with this absolutely necessary knowledge. Editing Wikipedia's articles as a course assignment can be quite a beneficial activity for both improving specific subject learning and Wikipedia literacy. Before the specific intervention students were consumers of Wikipedia's content. During the intervention students became producers of Wikipedia's content, while the way they consume this content radically changed.

The issue of validity of Wikipedia is directly related to Wikipedia literacy. It does not make sense to compare Wikipedia with traditional encyclopaedias in terms of validity. Wikipedia is not written by certified experts but by the participatory effort of thousands of anonymous contributors. Furthermore, Wikipedia is not a traditional sized encyclopaedia. Today, the English version (there are 282 language versions) of Wikipedia is sized, if printed, 1575 volumes, 25 cm tall, 5 cm thick (equivalent to Britannica's size) and containing 3.736.024 articles total (Wikipedia, 2011b). Wikipedia (only the English version) is authored and maintained by total of 15.281.656 unpaid registered users, 1.525 unpaid administrators (elected by the community of users) and many others contributing anonymously (without registering). Britannica, a famous commercial encyclopaedia, is sized 32 volumes and contains over 65.000 articles (Britannica, 2011). Britannica is authored by more than 4000 recognized expert contributors. Comparison of Wikipedia with traditional encyclopaedias is a comparison of two completely different things.

Wikipedia is not a common learning tool. It is not just an innovative knowledge project that can be used in a traditional educational intervention. Contributing to Wikipedia as part of a course assignment has numerous "side effects" not directly related to teaching the intended academic subject. Such a side effect is cultivating Wikipedia literacy, getting to know how to reliably and efficiently use Wikipedia resources. Digitally illiterate students who are desperately seeking information for their assignments or dissertation, in a great hurry, are passively consuming this information. The learning process starts beyond this point, when the Wikipedia literate students use this information in a radically new and critical way, as a starting point for their quest. Contributing to Wikipedia is beneficial for students because they participate in an inherently learning process where the content of the articles is negotiated and emerges through collaboration among Wikipedians in the context of a virtual learning organization. However, knowing the backstage of Wikipedia is absolutely necessary for utilizing the front-stage in an efficient and safe way.

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EDUCATIONAL EVOLUTIONARY TRANSFORMATION: THE EUROPEAN PROJECTS TEAM AT THE REGIONAL DIRECTORATE FOR PRIMARY & SECONDARY EDUCATION IN WESTERN GREECE

Niki Lambropoulos, Anastasia Diamantopoulou, Giorgos Panagiotopoulos, Marie Kotadaki, Charikleia Pitsou, Greek Ministry of Education, Greece

Introduction

Currently, the European projects serve as a medium for educational change and innovation in the Greek schools. Since educational change is a highly complex process, the procedure of involvement in European projects is an example of educational innovation itself, which has been accepted with enthusiasm by a great number of Greek teachers. This is evident in the voluntary way the Greek teachers embraced the European projects which was later supported by the Greek Ministry of Education. The Regional Directorate of Primary and Secondary Education in Western Greece (PDEDE) is an education organization under the umbrella of the Greek Ministry of Education, Life-Long Learning and Religion. The new evolutionary and transformational educational strategy adopted by the PDEDE completed the establishment of a European Projects Team within the Directorate (EU-PDEDE). EU-PDEDE's objectives are to support Lifelong Learning in Primary and Secondary Education and develop new skills and practices meeting real needs of teachers and schools.

Factors for evolutionary transformation in the Greek education

Greek teachers were voluntarily involved in European projects, although there was absolute absence of support on behalf of the government when the projects were first introduced in the Greek schools. However, the high mobility of teachers and students and thus their success led to their institutionalization (Demertzi 2009). The last decade, the Greek teachers have deliberately been prepared towards their participation in projects on a voluntary basis. This is because they have been convinced about the importance and necessity of their underpinned educational principles and the importance attached to both formal and informal learning that occurs in such projects. Such wide European projects acceptance from the Greek teachers gradually led towards change of perceptions within the Greek school (Bagakis 2000, 2003, Demertzi 2001, 2007, Govas & Demertzi 2001).

In regard to the process of introducing change and innovation in the Greek school, the European projects initiative is possibly the only initiative that was launched by the teachers themselves and relied entirely on teachers' voluntary involvement (bottom-up process). In addition, the projects provided an environment open to experimentation (Demertzi 2007) where teachers were willing to take the risk for new and creative solutions and safely introduce alternative ways of learning. Since educational change is directly related to the professional development of teachers, such involvement introduced the concept of cooperation between the Greek teachers. This helped to overcome, to some extent, the introvert character of the Greek school and opened space for discussion on good practices. On the top of this, European projects provided teachers with new methodological approaches in order to familiarize them with new methods and techniques such as teamwork and collaborative learning, the project method and techniques of experiential learning. Finally, the European projects in school education is probably the only example of peer-to-peer learning and training via the presentation and exchange of good practices as well as teachers' voluntary participation in experiential courses and in-service training (Bagakis, Demertzi et al. 2005).

The most important change that affected the Greek education through the European projects is the change of teachers' perspective and attitude about the official learning process and environment (Demertzi, Skia, et al. 2002). The European projects offered innovative experiences and practices outside the textbook and the classroom; moreover, they provided initial evidence of the fact that students learn best by working in teams rather than passively observing on their own. Furthermore, the newly introduced forms of self-evaluation (e.g. discussion, questionnaire, logbook, self-evaluation, presentation of the project, etc.) facilitated and supproted communication frameworks between teachers and learners. According to some authors, participation in the

European projects is still perhaps the only place in the Greek school where redefinition of the role of education takes place (Cros 2002, Demertzi 2009).

Consequently, the European projects provide the framework for piloting innovation (Skia, Bagakis & Demertzi 2001). Findings from a series of related studies reveal interesting information on the management of educational change, such as the difficulty of the teacher to get rid of his/her traditional role or the time a new approach needs to become an action (Bagakis, Demertzi & Stamatis 2007). Therefore, there is a need to support the effort on the process and identify ways of educational change and innovating that do not offer ready solutions but to encourage personal involvement and implementation.

As a result, educational real change comes when the Greek teachers are involved, internally motivated by personal choice and they become active mediators and "the principal architects of change" (MacBeath 2005). It is therefore necessary to establish an environment that provides opportunities in order to engage the teachers in a process of mutual learning and interaction (Hangreaves 1995).Thus, such educational change is directly related to the Greek teachers' professional development starting from the current educational practices (MacBeath 2005), raising issues of teachers' training within such projects, attending seminars or training programs and other forms of in-school training, such as peer support, which is considered to be a highly effective approach to personal development and a dynamic strategy for change and improvement (Fullan 1982, 1993, 2001, MacBeath 2005a).

Innovation for change at the Regional Directorate for Primary & Secondary Education in Western Greece

In this framework, the Regional Directorate of Primary and Secondary Education in Western Greece (PDEDE) is an educational organization under the umbrella of the Greek Ministry of Education, Life-Long Learning and Religion. It is in charge of over 1300 schools of both levels of education -primary and secondary- and a number of more than 10000-12000 appointed teachers of all disciplines. It is one of the largest educational organizations in Greece – responsible for schools and teachers in three Prefectures, Achaia, Etoloakarnania and Ilia. Its task is to co-ordinate, supplement, back up and implement the educational policies of the Ministry, along with supervising the implementation of various education projects, like European projects, in schools. Head of the Directorate since January 2010 is Dr. Giorgos Panagiotopoulos. One of his primary goals for evolutionary transformation rather than mere evolution of existing practices is to reinforce the educational process in schools under his jurisdiction. In this way, transformational strategies can meet a radically altered external educational environment which impacts the future of the students in Western Greece.

History

The Regional Directorates for the Primary and Secondary Education in Greece were actively launched in 2002 (legislation 2986/2002). This new legislation established the Regional Directorate directly under the auspices and control of the Greek Ministry of Education and Life Long Learning. Additionally, there were three departments, the Administrative, the Department of Scientific and Pedagogical Guidance for the Primary Education and the one for the Secondary Education. The responsibilities for the first Administrative Department were modified by a new legislation (3467/2006). In 2008 (339672/D4), there was a clear distinction between the Administrative and Financial Service; PDEDE was directly established as a Directorate (Διεύθυνση) with the 3 main departments and 2 sub-divisions.

Teachers within PDEDE had successfully participated in European projects with 3 preparatory visits, 44 Life Long Learning Programme (LLP) projects, 29 schools engaged in the projects, 8 teachers' training, and also 500 students and 93 teachers visiting other European countries.

Based on the successful results from such participation in European projects, the new evolutionary and transformational educational strategy adopted by the PDEDE targeted at the establishment of a European Projects Team within the Directorate (EU-PDEDE) among other targets. EU-PDEDE mainly aims to coordinate, create and promote European projects under the Lifelong Learning Programme (LLP) in Western Greece as well as disseminate the projects outcomes and best practices in the schools and educators. In this way, EU-PDEDE can monitor, record, control and support the results of already existing European projects as well as provide assistance to schools wishing to participate to new LLP European projects. EU-PDEDE was officially launched on

01/09/2011 targeting at planning and developing: (a) an information hub for the region about the European projects; (b) a link between the European Union, the Greek Ministry of Education and the schools and educators of Western Greece; (c) a Greek teachers' community in order to actively engage them in European projects within Western Greece; (d) more effective dissemination of the European projects results and outcomes in local and regional level and thus extending their impact; (e) multiple educational interventions based on project outcomes and best practices derived from European projects; and (f) effective management and coordination of the European projects based on the educational needs in the region in order to increase the local impact of the previous actions.

EU-PDEDE aims and objectives

EU-PDEDE's aims and objectives are: (a) to support Lifelong Learning in Primary and Secondary Education; (b) to develop new skills, practices and technology applications that meet real needs of teachers and schools; (c) to create innovative methodological approaches through exchange of ideas and proposals based on the diversity of project participants; (d) to expand and implement the best practice among training providers in three counties and those of the European Union; and (e) to direct implementation and dissemination of results of European Projects in PDEDE impacting the daily teaching practices.

Actions for evolutionary transformation in Western Greece

There are three main actions for educational evolutionary transformation in Western Greece: the European Projects Portal, teachers' ongoing onsite and online help and support, and the creation of a Community of Practice. The European Projects Portal targets at providing information about the LLP in several formats based on users' preferences such as abstracts, detailed texts and slides. Such information provision is also supported by onsite EU-PDEDE Team members' visits in official annual gatherings and schools as such. Lastly, the creation of a Community of Practice targets at teachers' support as well interactive exchange of information and development of new ideas for project proposals.

The online and onsite strategy provided the framework for the transformational activities and was based on the following five steps:

1. **Information provision:** The first step was based on mere information provision and one way information communication from the EU-PDEDE to the teachers and schools of the region via an information portal (http://blogs.sch.gr/eu-pdede). Information here is related to both information about the European projects as well as best practices and outcomes directly derived from local projects. Such best practices are designed to offer practical and immediate advice as well as interventions for the everyday educational practice.
2. **EU-PDEDE 'real' and web presence:** The second step targeted at increasing local and national awareness about the team so as to make the information available to a wider audience as well as acquiring feedback based on the two usability evaluations of the portal. Such presence was successful and evident as to the increase of (a) interest in participating in proposal writing, (b) group members in the 3 available web communities on Facebook, Slideshare and the Greek Educational Network, and (c) views on the documents available on Slideshare with the document about the EU-PDEDE creation reaching the hottest topic on Facebook for one hour immediately after uploading it.
3. **EU-PDEDE Communities:** The third step was the interactive engagement of 3 communities' members. The different communities were developed based on Greek teachers' preferences and finding them on their locus rather than creating a new virtual location for them. It also refers to the discovery of crucial core members who will be able to provide support on a more local level. Such engagement was also successful especially on the face-to-face interaction and Facebook.
4. **EU-PDEDE Community Support:** The fourth step targets at the active engagement and collaboration of the EU_PDEDE communities members with minimum intervention from the EU-PDEDE initial team.
5. **Best Practices for Educational Innovation:** The last step targets at the identification of best practices to promote educational innovation in the schools and the teachers within the region. These practices are gathered and disseminated via the web portal to encourage direct implementation in the educational everyday practice serving as a medium for innovation and change in the current educational environment.

With the above three targets – actions to provide information as well as support and the associated evolutionary activities, EU-PDEDE aims at online and onsite convergence of innovative changes via the involvement of the Greek teachers in European projects. Although the EU-PDEDE creation as a team may not be innovative in other European countries, the EU-PDEDE initiative and the ground-breaking frameworks are contextualized and associated with the Greek educational environment and every day practice. As a result, EU-PDEDE conveys evolutionary change and transformation in difficult times for the Greek education and economy.

Conclusions

The newly founded team to support European projects at the Regional Directorate of Primary and Secondary Education in Western Greece, EU-PDEDE, aims at providing help and support to the teachers who would like to get involved in European projects. A second aim is to disseminate and implement best practices deriving from European projects results within the primary and secondary Greek schools. This initiative was anchored in the great importance attached to the evolutionary change and innovation conveyed by the European projects in order to successfully support Lifelong Learning in Primary and Secondary Education. Consequently, EU-PDEDE, by implementing the European projects results and best practices, targets at the reinforcement and development of new skills, best practices and technological applications in the everyday educational practice and thus, meeting the needs of teachers and schools in the area. Moreover, such effort also supports the design and development of innovative methodological approaches through multicultural collaboration and the exchange of ideas, based on the diversity of project participants. Thus, EU-PDEDE facilitates, supports and directs the implementation and dissemination of results of the European Projects in PDEDE impacting the teachers' views, attitudes, perspectives, ideas and everyday educational practices.

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TEACHERS AS GAME DESIGNERS: ENHANCING INNOVATION AND CREATIVITY IN THE CLASSROOM

Mario Barajas Frutos, Frederique Frossard, Anna Trifonova, University of Barcelona – DOE, Spain

Introduction

During the last part of the 20th century and early part of the 21st, creativity has been seen to be increasingly significant in education (Craft, 2008). Indeed, many authors (e.g. Ferrari et al., 2009; Sawyer, 2006) suggest that creativity should be an important educational objective. Nevertheless, creativity still does not seem to play a central role in the curriculum or learning objectives that teachers are asked to follow in every country (Cachia et al., 2009).

Teaching creatively refers to teachers using imaginative approaches to make learning more interesting, exciting and effective (NACCCE, 1999). Game-based Learning (GBL) is a good candidate to fulfil these requirements. Indeed, games provide challenging experiences that promote the intrinsic satisfaction of the learners and offer opportunities for authentic learning (Gee, 2007; Mims, 2003).

In the context of the ProActive[1] European project – Fostering Teachers' Creativity through Game-Based Learning, this paper presents a study in which a GBL design approach is used to promote creative teaching methodologies. ProActive promotes an innovative pedagogical approach where practitioners at various educational levels become game designers and engage in creative teaching practices. Within co-design training workshops, teachers and trainers distributed in 23 pilot sites in four countries (Spain, UK, Italy and Romania) used two game editors for designing their learning games: <e-Adventure>[2], an open source software for creating adaptable 2D point-and-click adventure games for educational applications; and EUTOPIA[3], a free of charge tool for designing multiplayer educational scenarios in a 3D environment. In total, 60 GBL scenarios were created, and are currently being implemented in real teaching contexts.

The main objective of the study is to analyse the conditions needed to stimulate the creativity of educators by engaging them in GBL design processes. This paper presents first results in school settings, considering creative GBL from the point of view of teachers and students.

Creativity and game-based learning

Creativity in educational contexts can be seen from two perspectives. NACCCE (1999) made a distinction between teaching creatively and teaching for creativity. The latter refers to forms of teaching that are intended to develop students' own creative thinking and behaviours. On the other hand, the former refers to teachers using imaginative approaches to make learning more interesting, exciting and effective. Teachers can be highly creative in developing materials and approaches that foster children's interests. Sale (2005) provides a simple operational definition of creative teaching: *"Creative teaching occurs when a teacher combines existing knowledge in some novel form to get useful results in terms of facilitating student learning".*

Often teaching creatively has the major aim to make learning experience interesting, relevant to learners, as well as to assure the relevance of the curriculum to the learner, leading to increased understanding and learning (Jeffrey & Craft, 2004). However, there is a close relationship between these two approaches, as *"teaching for creativity involves teaching creatively. Young people's creative abilities are most likely to be developed in an atmosphere in which the teacher's creative abilities are properly engaged"* (NACCCE, 1999).

This study mostly focuses on fostering creative teaching practices and, through it, influencing students' creativity.

[1] Lifelong learning Programme, Key Action 3, 2010/2011 – Website: http://www.proactive-project.eu
[2] http://e-adventure.e-ucm.es/
[3] http://www.lanas.unina.it/eutopia/

How can games enhance creative teaching / learning practices?

GBL is a good candidate to promote creative teaching practices that make learning experience engaging for learners, and that improve learning achievements while matching the curricular objectives. Indeed, digital games represent a good medium to promote active learning and improve students' problem-solving skills instead of simple fact memorization. It has been demonstrated that for certain target groups (e.g. school students), they can increase personal fulfilment and lead to higher performance (Blunt, 2007). Furthermore, digital games can provide challenging experiences that promote the intrinsic satisfaction of the players, keeping them engaged and motivated (Gee, 2007). Moreover, players have fun while playing a game because they have to learn it (Prensky, 2001). Indeed, in games, the challenge and fun usually increases as long as the game goes on. Therefore players need to improve their skills and learn new strategies until the game is completed. Furthermore, GBL has proved to promote authentic learning (Mims, 2003), "learning by doing" processes (Aldrich, 2005), and meaningful learning experiences by simulating highly interactive scenarios (Gee, 2007).

Some barriers to the implementation of GBL in formal learning settings by using commercial off-the-shelf games have been identified (Williamson, 2009), such as the lack of integration of most games with the current curriculum and assessment framework, time constraints, and teachers and parents concerns over the content of some games (e-safety). The big companies tend to ignore the educational market because of the difficulties posed by a wide and varied curriculum, a lack of interest on behalf of educational policy makers, the inability of schools to find the sort of money that commercial games tend to command and also the security issues associated with large institutions with small IT budgets.

In this context, educators may benefit from the ProActive approach where they are given the opportunity and the means to develop games for themselves that have direct relevance to their teaching practices.

The ProActive approach

ProActive offers to educators the possibility to use GBL as an innovative and imaginative approach in their teaching practices, in order to provide challenging experiences to the learners, that promote their intrinsic satisfaction and offer opportunities for authentic learning. To overcome the obstacles of introducing GBL in formal learning settings, a constructivist approach is adopted, in which teachers design their own GBL scenarios. The following figure summarizes the approach of the study. It links the concepts of creativity and GBL, in order to draw a four stages circle of creative GBL.

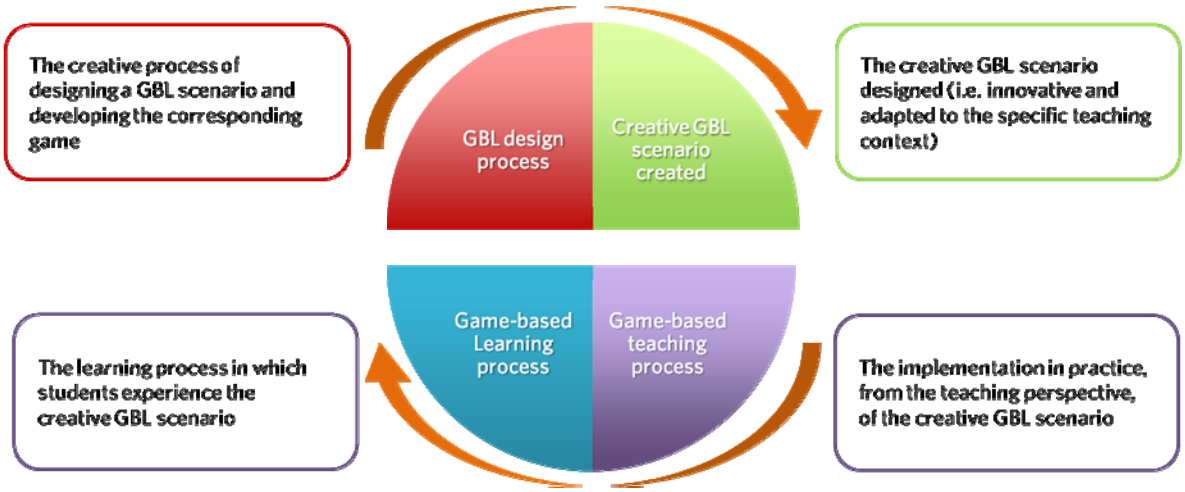

Figure 1 The integrated model of the creative GBL approach

The study proposes an innovative model through which educators become creative GBL instructional designers for their specific teaching purposes. The objective of the study is to explore each of these stages in order to analyse the conditions needed to stimulate the creativity of teachers by engaging them in GBL design processes.

Various activities were conducted in order to define the project methodology, concretize the approach and achieve the research objectives. This includes user needs analysis, GBL co-design process, and creation of GBL scenarios and their implementation in the classroom.

Research design

At the beginning of the study, 15 focus groups were organized by the ProActive consortium in the different project countries with more than 70 educators. The main objective was to explore educational practitioners' use and attitude towards ICT and GBL in their teaching methodologies. Collected data enabled the identification of educators' interests and needs for developing their own creative GBL scenarios.

Many practitioners shared the idea of educational settings where learning happens in more natural and playful, student-centred ways. GBL perfectly fits in this vision. Furthermore, they stressed the importance of establishing a link between a subject and its application in real life context. Educational games were seen as a relevant solution, as they provide a safe environment where students are encouraged in exploring and experimenting. Practitioners also stated the importance of adapting their teaching methodology to students' actual computer skills and to society's changes, filling the generational gap. Indeed, pupils live in a society full of images, sounds and action, so that the concept of book, that is a static tool, cannot be claimed to be central to their repertoire. They feel that GBL approach is appropriate to respond to these issues. Finally, all participants positively valued the design approach proposed by the project, as it can provide them a context for bringing diversity and innovation to their daily teaching practices.

Among 23 pilot sites, more than 100 educators have been trained to the use of the ProActive pedagogical approach. Through both face-to-face and virtual training, practitioners were introduced to the ProActive approach to GBL and learnt how to use the two game editors. On this basis, an ongoing collaboration process took place during three months, in which the ProActive research team provided support to the participating teachers to help them in the GBL scenario design process. Support was given through regular meetings (co-design sessions) and online (Moodle, e-mails, etc.) and was related to pedagogical aspects (definition of learning objectives), game design strategies (writing of games' storyboards, definition of game dynamics and mechanisms) and technical guidance (help on the usage of the game editors).

In total, 60 GBL scenarios were created by teachers and trainers in the different project countries. They are related to a wide range of learning subjects (e.g. History, Physics, Computer Sciences, Language Learning, etc.) and address different educational levels (primary-secondary education, universities and professional training).

Exploring creative GBL: initial results

First pilot implementation was organized in two pilot sites in Spain. During two classroom sessions (one in a primary and another in a secondary school) four games were tested in secondary school level, and one in primary education. In total, 14 teachers and 47 students were involved. The games, created with the <e-Adventure> game editor, were related to multidisciplinary subjects, such as local History and physical education.

In order to explore creativity in depth, data collection tools were designed and are being used at different stages:

- An open-ended questionnaire aiming to explore the characteristics of teachers' and trainers' GBL design creative process, linking the creative process with the GBL design process. The questionnaire was validated by recognised experts in the field.
- A questionnaire (validated by recognised experts in the field) aiming to evaluate the creativity of the designed GBL scenarios, according to three criteria: gaming, learning and technical aspects.
- In-depth interviews with teachers and students exploring the field implementation of the GBL scenarios created.
- Participant observations where researchers examine teachers' and students' behaviours during the field implementation.

The following sections explore the three evaluation axes that were examined at this stage: a) the creative process of the GBL design, b) the game-based teaching experience and c) the game-based learning experience.

The creative process of GBL design

Results obtained outline some well-defined stages that appear to be critical during the GBL design process. These stages do not appear in a particular order in time, as they can be revisited by teachers at different moments of the process:

- *Exploration of GBL and game editors*: This stage consists of acquiring relevant knowledge about how to create a quality educational game and explore the affordances of the game editors proposed.
- *Idea Generation:* Teachers' ideas of GBL scenarios mainly emerge from an exploration of the functionalities of the game editors. Furthermore, the examples of games showed within the training or found by teachers were an important source of inspiration. Generated ideas always took into account their specific teaching objectives and the students' profile. Furthermore, in many cases, ideas took into account external constraints (time available and editors' limitations). While some teachers chose to develop an idea which was rather easy to develop, according to resources available, other did not mind choosing challenging ones, as their objectives were to develop innovative resources.
- *Idea Validation:* Ideas evolved through the design process, as teachers adjusted them according to time constraints, editors' affordances, and their own skills to manage the editor. In some cases, ideas were discarded because they were not possible to implement with the toolset, or were perceived as too time-consuming or difficult to develop.
- *Detailing game dynamics:* Teachers found it very useful to write a storyboard in order to effectively expand their ideas into the plan of a full consistent game, by planning details about the game dynamics, the forms of gameplay, the content of scenes, and the progression of the narrative.
- *Using the game editor:* Implementation activities were interwoven with cycles of testing and redesign. Problems or gaps sometimes become apparent, prompting revision. Continuous adjustments of the game elements were necessary before the achievement of a working game.
- *Incubation*: Most of the teachers stated that they experienced incubation phases, during which ideas and solutions occurred while they were away from their games, e.g. while walking back home after an intensive day working on the game.
- *Evaluation*: Through an iterative process, the GBL scenarios were continuously reviewed by teachers according to their teaching objectives, in order to evaluate their appropriateness, usefulness, correctness, and value. Sometimes, teachers called out students, peers or experts in order to evaluate the quality of their scenarios.

In addition, the following elements appeared as important factors that have notable impacts on the creative GBL design process:

- *Intrinsic motivation*: Motivation in conducting the task was fundamental to achieve the objective. Besides their educational interest in GBL, many teachers are personally interested in games *per*-se, and were intrinsically motivated by the design process itself. Most teachers considered the process as enjoyable, fun and entertaining. However, some teachers felt pressure (because of time constraint) and frustration (because of some interactions with the editor).
- *Time constraints*: Time constraints acted according to a double dynamic within the design process. On one hand, it constituted a limitation, as teachers had to adapt (or in some cases discard) their ideas and strategies according to the time available. On the other hand, time acted as a motivation element by pushing teachers in achieving their goal within a limited period.
- *The editors' affordances:* The game editors appeared to have two roles in the design process. On one hand, they acted as mediators, by shaping the game dynamics and profiling its mechanisms, as well as facilitating the production of ideas. On the other hand, they acted as constraints, as scenarios are conditioned by the limitations of the software.
- *Collaboration:* In many cases, teachers collaborated with peers to create their games. This was perceived as very positive, as teachers highly valued sharing opinions and gathering new ideas, and felt involved in a common goal. In other cases, teachers involved their students in the design process, which enabled them to continuously evaluate the adequacy of their games for the targeted audience. Thus, collaboration acted in the form of inspiration, feedback, and guidance.

The game-based teaching experience

During the implementation of the games created in classroom settings, some important observations could be made regarding game-based teaching practices:

- *New methodology*: Teachers highly valued the fact of having learnt how to use videogames as a teaching tool, as they have to constantly evolve, renew and mature their teaching practices.
- *Get closer to students*: The teaching experience was perceived as very rich, as it enabled teachers to enter in their students' culture and reality by using tools that fully integrate their everyday environment.
- *Visibility*: Teachers considered that the experience contributed to the visibility of their teaching activities in the eyes of the public administration, the local educational policies and communities.
- *Role of the teacher*: The teacher's role in the classroom evolved from transmitting knowledge to flexibly tutoring and guiding students, by giving them appropriate feedback when needed.

The game-based learning experience

Regarding students' learning experience and interactions with GBL scenario, the following observations were made:

- *Improving learning achievement:* GBL practices appeared to contribute to the achievement of high learning outcomes. For students, it is easier and richer to learn with games, as they feel more actively involved in the activity than in a lecture: "*I have the impression that I am more attentive with the game"*. Furthermore, teachers reported that students effectively learnt the knowledge embedded in the game, and that they would better remember the information taught, as the activity was engaging and the game appealing.
- *Motivation and engagement***:** A high level of involvement of students in the GBL activity was observed. Students considered games as a new way to learn that is pleasant and enables them to "*learn without realizing it"*. They expressed their preference for GBL sessions regarding normal classes. They especially enjoyed the visual and interactive aspects of the games (e.g. to be able to walk and to take objects), as well as the humorous elements. Some students even stressed that they would like to participate in the design process of the games. They positively valued the games as interesting, fun and well designed.
- *Self regulation:* Students showed a high level of autonomy during the GBL sessions, as they perfectly managed to interact with the computer and with the game interface. They naturally learnt how to interact with the game environment, to take objects and to speak with characters.
- *Collaboration:* A rich collaboration among students was observed. Mostly, students collaborated in order to help at each other or to arrive at an agreement before deciding which action to take in the game.

Conclusions

This paper presented an innovative pedagogical approach where teachers become game designers and experience creative educational practices. The game development is supported by two game editors especially made to facilitate the creation of powerful educational environments. The result is a learning artifact (i.e. an educational game embedded in a learning scenario) tailored to the learning needs, institutional and curricular constraints and which can be shared with students. Creativity appears to be more a shared process rather than an individual skill. A scenario-based creativity emerged, in which students, teachers, games, domain and social culture are at stake.

Through a first evaluation cycle, initial results enabled to describe key aspects of the creative process of GBL design, which is characterised by certain creative stages, and is influenced by a series of factors (intrinsic motivation, time constraints, editors' affordances and collaboration). In addition, the implementation of the created GBL scenarios in real teaching settings proved to promote creative teaching practices in which high educational objectives were achieved, through the active involvement of students in rich learning processes. The approach directly addresses transversal competences needed in the information age, such as self-regulation and learning by doing. The successful implementation enabled validation of a concrete tested methodology for contributing to the development of creative competencies that match the challenges of the digital culture, and contribute to bridging the innovation skills gap.

The next steps of the study will provide a wide range of examples of innovative practical teaching experiences put in practice in real settings and validated, as well as contribute to the creation of active local and international communities of practice sharing a creative view on GBL. Such examples promote new models for integrating GBL approaches in creative teaching and learning practices applicable to various learning contexts.

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PROFESSIONAL DEVELOPMENT ONLINE COURSE IN eTWINNING

Angelos Konstantinidis, Secondary School of Xiropotamos, Greece

Introduction

Robinson argues that schools kill creativity, as students are being educated to become good workers, rather than creative thinkers (2006). However, this situation is likely to change due to several initiatives in Europe, such as the eTwinning action, that purport to make schools more effective in their effort to facilitate the development of lifelong learning skills and attitudes of their students, scaffold their creativity and optimize their capacity to learn. In order to achieve reformation of educational practices efforts should be centred on teachers' professional development, since there is a direct relationship between teaching and students' learning (Bransford et al. 2000; Stigler & Hiebert 1999).

The eTwinning action, an initiative coordinated by European Schoolnet that aims to foster school collaboration via Information and Communication Technologies (ICT) use, offers numerous opportunities to teachers for professional development through educational conferences, seminars, workshops, online courses, and through participation in the eTwinning community (Crawley et al. 2010). Although all teachers working in a school of the European Union are eligible to partake in the wider eTwinning community, only those who nurture a general, at least, interest in eTwinning, will take the initiative to know more about it (Hogenbirk et al. 2007), and it can be safely hypothesized that training opportunities such as conferences, seminars, workshops, and online courses, provide an introductory incentive to eTwinning. Hence, for example, European-wide Professional Development Workshops (PDWs) are aimed at teachers who want to know more about eTwinning (Vuorikari 2010, p.13). Despite the fact that PDWs have been successful in terms of participation numbers (approximately 45 PDWs organized since 2005 and nearly 3,500 teachers participated), it was soon realized that only a small percentage of teachers had the opportunity to enter into a PDW (Vuorikari 2010, p.14). Additionally, the total expenditure for each PDW is presumably rather high due to travel, accommodation, feeding, and tuition costs. On the other hand, e-learning can be a cost efficient way to train teachers, since it can eliminate geographical barriers, it affords flexibility in time and greater accessibility, and, most important, it significantly reduces re-run costs (e.g., Salmon 2002, QUIS team 2005).

Online training courses organised by the Central Support Service (CSS) of the eTwinning action have been very successful in terms of participation numbers (23 online courses ran during 2009-2010 and more than 3,400 teachers participated) (Vuorikari 2010, p.14), and in how participants rated the learning experience (Crawley et al. 2009, p.39). These courses usually examine broader issues and concepts (i.e., creative writing, internet safety, etc.), or train participants in using online tools (i.e., mindmaps, web-based video, etc.). While been intensive, their duration is short (approximately 10 days), and their objective is to offer an introduction to a topic, stimulate ideas and develop skills without longtime commitment (Vuorikari 2010, p.14). The Hellenic National Support Service (NSS) of the eTwinning action also organizes and runs online courses with the intention to promote the concepts and practices of eTwinning among Greek teachers. During 2010, the Hellenic NSS offered six online courses and, overall, approximately 400 teachers participated (Hellenic NSS of eTwinning 2011). This paper presents the design, implementation and evaluation of one of the aforementioned courses.

Although there is plentiful research around general online education principles, there is lack of empirical studies focusing on professional development courses on eTwinning. The objective of this paper is to provide a resource for creators and instructors of online professional development courses.

eTwinning and eTwinning Projects

Since its launch in 2005 eTwinning has been constantly growing: more than 90,000 schools have been involved and the total number of registered teachers is close to 130,000 (eTwinning NSS desktop 2011). CSS of the eTwinning action is operated by European Schoolnet, and there is a NSS in each country. Registered teachers can use the eTwinning online platform to meet virtually, communicate, exchange ideas and practices. Thus,

eTwinning is the meeting point for all teachers interested in a European collaboration and it has slowly evolved to become 'the community for schools in Europe' (Vuorikari 2010, p.12).

The main focus of the eTwinning action is the development of collaborative pedagogical projects, called "eTwinning projects" (Vuorikari 2010). In order for a project to be implemented, a minimum two schools from at least two different European countries is needed. Partner teachers are free to decide on the topic of the project with the only requirement to use ICT to carry out their work. Face-to-face meetings are not required; all communication and collaboration is made via the internet (eTwinning CSS Portal 2010).

Learning-Oriented Assessment (LOA)

The chief teaching methodology in the course was LOA, a strategy which seeks to bring to the fore the aspects of assessment that encourage or support learning (Carless 2007). The LOA framework involves three principles:

> *Principle 1: Assessment tasks should be designed to stimulate sound learning practices amongst students. Principle 2: Assessment should involve students actively engaging with criteria, quality, their own and/or peers' performance. Principle 3: Feedback should be timely and forward-looking so as to support current and future student learning. (ibid, p.59).*

Course Design and Implementation

Course Overview

The theme of the course was devoted to the European Year 2010, namely poverty and social exclusion. The course ran at the end of November 2010 and 110 teachers had applied to participate. However, 106 teachers proceeded in registration, while only 72 successfully completed the course. The training duration was 10 days though peer discussions were continued for several days after the end of the course. The course was delivered asynchronously mainly through the Moodle platform. A website and a private wiki were also set up; the website to serve as a public repository of the syllabus and the course material (see Konstantinidis 2010), and the wiki to provide an additional opportunity for participants to upload their drafts and get peer feedback.

Course Aims and Learning Outcomes

A critical part of the design process is the specification of the course aims and learning outcomes for they should: (a) guide the choice of teaching/learning/assessment strategies (D'Andrea 1999), (b) facilitate the participants' orientation to the subject being studied (ibid), (c) indicate what the essential learning is (Moon 2002), and (d) prescribe the criterion for attaining the learning outcome, and, in that way, ensure course quality (ibid). The course was addressed to teachers of both primary and secondary education who were keen to develop an eTwinning project with reference to poverty and social exclusion, therefore the aim was to raise teachers' awareness regarding poverty and social exclusion and to help them develop eTwinning projects that engage students with these issues. Based on this aim, the chief learning outcomes of the course were to enable participants to: (a) demonstrate a critical understanding of poverty and social exclusion issues, and (b) assess possible pedagogical and social benefits of developing an eTwinning project regarding poverty and social exclusion. Learning outcomes make the learning process explicit and transparent (D'Andrea 1999) and they were specified both in terms of topic content (e.g., pedagogical benefits of developing an eTwinning project regarding poverty) and the level of understanding that participants should achieve (e.g., evaluation level). A clear definition of the learning outcomes with appropriate verbs (e.g., see Moon 2002) was employed for participants should be able to demonstrate their understanding (Biggs 2003).

Organization of Content and Instructional Strategies

Course structure – the core to carry out the training goals – should be divided into manageable sections (Salmon 2002, p.88), and in a way that facilitates conceptual understanding (Bransford et al. 2000). In the "poverty and social exclusion" course, instructional emphasis was placed on knowledge construction, collaboration, and reflection, while activities were learner-centred, socratic, and authentic (Rovai 2004). Throughout the course,

tutor's feedback encouraged tutor and peer dialogue and facilitated self-assessment (Nicol & Macfarlane-Dick 2006). The course was organized into three sections, analysed in more detail below.

The first section aimed to raise participants' awareness regarding poverty and social exclusion. Learners have diverse needs and learning styles therefore the learning materials should be designed as flexible as possible to serve those styles and needs (Holmes & Gardner 2006). People are inclined to focus on different types of information, they handle that information differently, and they reach understanding at different pace. What is more, a mixture of media can make an online course more appealing (Weller 2002). Thus, the course syllabus was a combination of up-to-date source material accompanied with automated interactive exercises, and selected images and video clips (see Konstantinidis 2010), while participants had also multiple opportunities to explore additional readings and tasks. Deliberate efforts were made to create an atmosphere of constructive dialogue, self-esteem, and mutual respect. The opening message to welcome the participants was friendly, brief, and encouraging (Salmon 2002) and it functioned as both an ice-breaker activity to encourage self-revelation and a spark to initiate discussion about poverty and social exclusion issues, vulnerable groups, and national policies for combating the phenomenon.

According to the registration questionnaire, the majority of the participants were novices in eTwinning (68% had not completed an eTwinning project), therefore it was necessary to acquire basic knowledge regarding eTwinning before serious study could take place. Hence, the second section began with a précis of the eTwinning action, eTwinning projects, and the chief evaluation criteria of the eTwinning projects and then moved into a presentation of seven exemplar classroom activities (suitable to be integrated into eTwinning projects) about poverty and social exclusion. Each exemplar contained theme, grade level, learning outcomes, proposed ICT tools to be utilised, and step-by-step description. Participants were requested to analyze and critique the exemplars, examine how they can be integrated into their teaching and classroom settings -while keeping in mind the eTwinning ethos- and discuss their views with their peers. By studying the exemplars, novice in eTwinning teachers were learning the whats and hows of eTwinning activities, and subsequently, they had to, considering their individual educational settings, apply their knowledge to demonstrate understanding. In that way, they were building new knowledge based on their current knowledge and previous teaching experiences. What is more, they were exposed to different viewpoints, and, as they had to explain their thoughts to their peers, they were forced to reflect on their ideas and consequently improve their knowledge. The tutor was assisting learners in their own discovering process via active dialogue engagement.

In the third section the focus shifted to activity design. During the second section participants had been engaged in evaluation of, and discussion about, eTwinning activities, hence they were adequately prepared for the culminating task of the course: to devise and design their own eTwinning activity. Participants could employ their newly acquired knowledge to solve a real-world problem which was of personal/professional interest. In order to facilitate and direct discussion based on each school's context, participants were allocated into four groups (each group comprised 18-34 participants) according to their school type (primary school, secondary school, high school, vocational school/other). Each participant designed an activity about poverty and social exclusion, while each activity was been discussed by peers in the group. In that way participants benefited from peer comments, while they had the chance to revise and improve their draft before final submission. Additionally, they developed their self-assessment skills by commenting on their peers' work. Towards the end of the course, as participants were becoming more competent, tutor's role gradually faded and was limited to interventions in order to focus discussion or to answer questions.

Description and discussion of course assignments

Formal assessment tasks

Following the 1st principle of LOA, assessment tasks were well-aligned with course aims and learning objectives. That is, assessment tasks in the course were closely related with designing eTwinning activities. The assignments were: critical review of activities (weighting 25%); activity planning (50%); activity evaluation (25%).

The critical review of activities assignment was set during the second section of the course and invited participants to write a brief article (around 200 words) that discusses the advantages and disadvantages of one or two of the proposed activities and suggests ways to improve or enrich them. Participants had some freedom of choice; that is they could choose which of the proposed activities they wished to negotiate. This assignment

engaged participants in studying and reviewing exemplars (2nd LOA principle). Additionally, each participant individually received detailed high-quality feedback from the tutor (3rd LOA principle) on their assignment. Serious attention was paid to the introductory paragraph of the feedback message, so that to ensure participants that the current feedback was an evaluation of their performance in context, not of themselves as persons. Similarly, the closing phrase of the feedback message encouraged positive motivational beliefs and dialogue around learning. Participants had also the opportunity to act upon the tutor's feedback (received in the critical review of activities assignment), in order to improve their performance in the activity planning assignment.

The activity planning assignment was the central aim of the course and involved participants in devising an eTwinning activity with reference to poverty and social exclusion. Participants were advised to reflect on the traits of their school (e.g., cooperation with other colleagues, access to the computer lab, etc.), class (e.g., domain of the lesson, lessons per week, etc.), and students (e.g., age, socioeconomic status, foreign language and ICT competency, internet access from home, etc.) while tackling the task. This task was to be submitted by the end of the module, however due to participants' inexperience in eTwinning, the short time frame of the assignment, and participants' request and willingness to work more on this exercise, a 3-day extension was granted.

The activity evaluation assignment involved participants in an anonymous peer assessment procedure (2nd LOA principle). The prerequisite to partake in this task was to submit on time the previous assignment (activity planning). The assignments that were produced by the participants were subsequently commented on (anonymously) by other members of the cohort (each participant having to give feedback on two assignments). Participants were informed that their contribution to this task was neither mandatory nor would affect the course certification (since they had completed successfully the activity planning assignment), nevertheless they were warmly prompted to join in for both themselves and their peers would have an extra opportunity to receive more thoughtful peer-feedback (3rd LOA principle).

Assessment tasks not only indicated how well participants have attained learning outcomes, but also focused participants' activity. Assessment tasks were well-sequenced to allow participants build effectively on previous learning and spread out evenly so as to engage participants' effort and attention throughout the module. Particular emphasis was placed on participants' involvement in assessment so as to help them become more autonomous in their learning. Group tasks were eschewed due to the short duration of the module, still participants had ample opportunities to contribute to their peers' work and get help from the cohort. Grading was generally avoided (participants received a grade only in the first assignment) for the reason that a low grade can negatively affect a learner's self-efficacy (Gibbs & Simpson 2004-05).

Informal assessment tasks

During the module participants were required to complete several brief, but carefully structured, formative exercises which helped them develop their understanding of the key concepts targeted by the course (1st LOA principle). Furthermore, most formative assignments involved participants in a series of giving and receiving peer feedback which helped them develop a better understanding of the learning goals and of what good performance is (2nd LOA principle), while most of the feedback was about their current performance on the task-at-hand and on ways for that to be improved (3rd LOA principle). In short, teaching methods, assessment tasks, and the learning environment increased the likelihood that participants will engage in the activities designed to achieve the learning outcomes (Biggs 2003).

Firstly, participants were asked to post on the forum a brief personal introduction (including their name, hometown, teaching domain, school, and something about themselves) along with their perspective regarding the broad issue of poverty (e.g., what is poverty, who are poor people, who are socially excluded, etc.) and to comment on at least three peer posts. Participants were free to choose which issue of poverty they would discuss in their post and to improvise regarding the way of presentation (e.g., lyrics, photo, collage, etc.). Secondly, the course syllabus contained plenty of self-checked quizzes and other forms of interactive content. Thirdly, participants were asked to critically read and evaluate the proposed activities about poverty and social exclusion, and subsequently discuss their thoughts with their peers. Fourthly, they were asked to post a draft of the activity they had devised on their group forum and to constructively comment on at least three draft activities posted by their peers. Optionally, participants could also upload their draft to the course wiki and help each other polish their work.

Infrastructure Design

Infrastructure design was based on three rules: (a) to provide a good conceptual model (Norman 2002), (b) to make things visible (ibid), and (c) to present things in a friendly manner, for knowledge and use of technology is important yet attention should be focused on learning and not on technology (Holmes & Gardner 2006). In line with the 1st rule, the "front page" of the course contained all fundamental course elements (all three sections, help forum, general discussion forum, course description, groups, assignments), while each section had an individual page for section syllabus and forums. There was a separate forum for each exemplar activity (during the 2nd section of the course), and, of course, each group had its own forum (3rd section). Following the 2nd rule, each element was represented by an intuitive icon accompanied with an explanation phrase. Icons provided visual clues of "how things work" (e.g., 1st section forum: handshaking on a computer screen, Assignments: a to-do list, Vocational school group forum: Bob the builder, etc.; for more see Konstantinidis 2010) so that participants could effortlessly figure out how the learning environment "works". Finally, formal language was eschewed and text was written in a personal style and friendly tone, in order to help participants "feel like home".

Evaluation of the Course

Trainee teachers' perceptions regarding the course were evaluated using an online questionnaire. The learning outcomes for the most part of trainee teachers were very encouraging as they engaged in critical discussion of poverty and social exclusion issues and as it was evidenced by their assignments. The percentage of participants who fulfilled the course requirements and received certificate was nearly 70% (72 out of 106 teachers), whereas the rest gave chiefly family/personal (87%) as reasons for withdrawal. Throughout the period of the course, the average participant wrote 15 comments/posts and spent 16-20 hours for studying the material, participating in discussions, and performing assignments. Almost all participants classified the quality of the course as high or very high, and considered that they learned quite a lot or a great deal of value. The majority of participants ranked the course as "very organised" and "very interesting" and they prognosticated that is likely to be of significant value in terms of their future professional practice. Finally, practically all participants reported that they would recommend the course to other teachers unhesitatingly.

The course was successful in its aim to inspire teachers towards the eTwinning action. By the end of the course, all participants reported a positive or strongly positive inclination towards eTwinning projects. What is more important, the great majority of participants (94%) had the intention to start an eTwinning project regarding poverty and social exclusion.

Conclusion

Several initiatives in Europe aim to improve schools and students' learning, yet teacher training is the key to educational development. This paper presented an online professional development course for teachers in the eTwinning action. Evaluation indicated that the course was effective in its pedagogical design and implementation, and it achieved its aim to spread the practices of eTwinning in Greece and to increase eTwinning's popularity among Greek teachers.

It is for sure, though, that teachers need much more support so as to develop eTwinning projects that are motivational and sophisticated. Moreover, approximately one out of five participants expressed reservations regarding the short time frame and several complained for the intensiveness of the course as they had work commitments the same time. It should be taken into account that the course predominantly targeted at teachers who were experienced in developing eTwinning projects, albeit the vast majority of participants had never accomplished one, resulting in reduced effectiveness of course delivery. For instance, a participant who had carried out more than three eTwinning projects reflected as follows: 'It would have been more interesting for me if the participants were already working on a relevant project, or on an eTwinning project so there was better interaction in designing and creating activities during discussions'.

In order to achieve better effectiveness in future implementations, participants' suggestions should be considered and some issues need to be worked out. To begin with, the time duration of the course should be increased to about 12 to 15 days, while keeping workload constant. Secondly, some pre-course guidance activities should be provided for participants with little or no experience of online learning so as to hone their technological skills, since

it was emerged that many participants had never used Moodle before taking this course and approximately one out of five participants who had withdrawn encountered ICT-related difficulties. As a final point, it would be proper to incorporate a collaborative assignment for it would reflect more accurately the joint nature of eTwinning projects.

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ERATOSTHENES' MEASUREMENT OF EARTH'S CIRCUMFERENCE

Eleftheria Tsourlidaki, Ellinogermaniki Agogi, Greece

In this activity students attempt to measure Earth's circumference using Eratosthenes' method. The activity combines a simple experimental procedure with the use of digital materials and on line applications while it also fosters teamwork as it requires the collaboration between two schools from different countries. Students practice on using proportional quantities and making measurements of angles and lengths using goniometers and rulers. The deployment of basic skills, which is essential for young students with the use of computer applications that is close to their out of school interests contributes to the modernization of current teaching methods. The activity is designed so as to be easy to carry out in the framework of either schools of secondary education or during the interdisciplinary courses of primary education schools (5th and 6th grade).

SCIENTIX – BUILDING SCIENCE EDUCATION COMMUNITY IN EUROPE & THE SPICE PROJECT CASE STUDY

Premysl Velek, Agueda Gras-Velazquez, European Schoolnet, Belgium

Introduction

The European Commission's 6th Framework Programme (2002-2006) offered explicit support for the development and testing of new methods to stimulate young people's interest in STEM (Science, Technology, Engineering and Mathematics) and promote dissemination of experience and best teaching practice. However, although there were a number of highly innovative demonstration projects funded under the FP6, teachers and other users not directly involved in those projects (in fact the over-whelming majority) had little chance to hear about the results obtained or new tools developed within these projects.

One of the main reasons to create Scientix was to ensure that the experience, knowledge and results of science education projects are exploited more efficiently and reach larger audience. Another key motivation behind Scientix was to encourage cooperation and networking of teachers at the European level.[1]

The objectives of the Scientix project are thus twofold: (1) Dissemination of know-how and best practices in the field of science and maths education and (2) Building a Europe-wide community of science teachers, researchers, science education project managers and other professionals involved in teaching STEM subjects.

The project started in December 2009 (the website was launched in June 2010); it is managed by European Schoolnet (EUN) on behalf of the European Commission. EUN is a network of 31 Ministries of Education in Europe, providing major education portals for teaching, learning and collaboration. EUN has gained a sound experience in addressing the lack of interest in STEM education and developing innovative science teaching methods (e.g. Kearney, Gras- Velazquez, Joyce 2009; Gras-Velázquez, Joyce, Kirsch et al. 2009).

Scientix as an information platform

The Scientix portal (www.scientix.eu), as a platform to disseminate information and best practices in inquiry-based science education and other innovative methods, collects and presents teaching materials and research reports produced by science education projects financed by the European Union under the 6th and 7th Framework Programme (Directorate-General for Research and innovation), the Lifelong Learning Programme (Directorate General for Education and Culture) and various non-EU national and international initiatives.

The platform covers a wide range of subjects linked to science and maths education: from nanotechnologies and astrophysics to biology, geometry, meteorology, geology and chemistry.

Targeted especially at teachers, schools and researchers, the portal features:

- Library of science education and science communication projects
- Resource repository[2]

[1] In 2006 the European Commission appointed a group of experts, chaired by M. Rocard (Member of the European Parliament and former French Prime Minister) to examine cross-section of on-going initiatives in STEM education at national and European level. The need to promote more widely inquiry- and problem- based- based science education methodologies in primary and secondary school, and to support teachers' networks are listed among the recommendations proposed by the group (Rocard et al. 2007: 12-15).

[2] For the past 10 years, EUN has been running the *Learning Resource Exchange* (http://lreforschools.eun.org), a service that enables schools to find digital educational content from many different countries and providers. It includes content from Ministries of Education and other partners working with EUN in large-scale European Commission-funded projects. The *LRE* infrastructure consists of a federation of systems that provide learning resources and offers a seamless access to these resources.

- Translation on-demand service
- Online training courses (the Scientix Moodle platform)
- News and events
- Newsletter

The content of the portal is available in six languages: English, French, German, Italian, Polish and Spanish. However the teaching materials, reports and online training courses are accepted in any of the 23 EU official languages.

The shift towards more dynamic, user-centred approach in digital communication has also allowed Scientix to be seen not as a mere information transmission mechanism but rather as a *knowledge building platform*.

Complementing the top-down information flow, the user-generated content includes tagging, commenting and rating of the teaching resources. Users can also suggest new projects, events, news and resources.

Since the second release of Scientix in September 2011, new networking tools have been available. The Scientix users are now able to find each other via their public profiles communicate and create users groups. The individual user profiles contain information about users' country, profession, science fields they are interested in, areas of expertise and links to their activities (projects, best practices, materials, events etc.).

Scientix as a community

To ensure that the Scientix network lead to sustained collaboration and cross-fertilisation among science education professionals, Scientix organises thematic workshops to animate the community. The aim is to present, share, highlight and inspire good practices, linked to the specific content on the Scientix portal, taking into account the latest development in the field and the results achieved by projects and initiatives at the EU or national level. The workshops and other on-site events are an integral part of the project intended to deepen involvement in exchange and networking among Scientix stakeholders.

The workshops provide participants with information to use effectively the Scientix tools. Each workshop is also tailored to specific groups and covers a specific topic: teachers learn about teaching materials and classroom activities developed by various STEM education projects, researchers and project managers exchange their ideas and results concerning science education research and policy. Scientix also offer a limited number of travel and accommodation grants to attend the workshops.

Five Scientix workshops have been so far organised in France, Denmark, Hungary and Greece. The last workshops were organised in August 2011 as part of the programme of the SPICE Summer Academy in Prague, Czech Republic (see chap. 4).

The main event to support the community development was the Scientix European Conference held on 6-8 May in Brussels. The conference, attended by over 350 participants from 37 countries, presented on-going STEM education projects both at European and national level and discussed the main issues in science education for the years to come. Besides teachers, researchers or project managers, representatives of the European Commission and national science and education bodies participated. The conference was opened by Robert-Jan Smits, the Director-General of the Directorate-General for Research and Innovation of the European Commission, the keynote speaker was Sir John Holman, former Director of the UK's National Science Learning Centre and advisor to the British government.

The Scientix community is also supported by the Scientix Teacher Panel. The members are science teachers at primary or secondary level who promote Scientix in their own countries and in their native language. The panel consists of 23 members from 22 EU countries.

Collaboration Scientix – SPICE: a case study

The example of the cooperation between Scientix and the EU project SPICE (Spicing up Maths and Science classes by sharing initiatives between European teachers)[3] illustrates the full scope of the Scientix activities and its networking potential.

SPICE is a science education project funded by European Commission in the framework of its Lifelong Learning Programme. The primary objective of the project is to collect, analyse, and validate innovative pedagogical practices using inquiry-based learning. The project results are a series of good practices validated in classroom trials and an analysis of (current and foreseen) national measures to increase students' interest in pursuing STEM careers (Kearney 2010).

The presentation of the project was published on the Scientix portal in July 2010. The project's good pedagogical practices were developed using the Scientix Moodle platform (http://moodle.scientix.eu) and are now freely accessible to any registered user of the Scientix portal. The analysis is available through the Scientix portal as well, indicated as one of the results of the SPICE project in the Scientix resource repository (Report library). SPICE was also presented at the Scientix conference in May 2011 in Brussels.

Moreover, Scientix was invited to take part in the SPICE Summer Academy, held in Prague in August 2011[4]. As part of the Academy programme, Scientix team organised several workshops for teachers, presenting the Scientix tools and highlighting good examples of science education practice.

Cooperating with various European projects, Scientix could also facilitate participation of several other science education projects (eg. SCeTGo or Photonics Explorer) in the Academy. The participants – mostly teachers directly involved in the SPICE project – were thus provided a broad overview of the current landscape of science and maths education in Europe, including an opportunity to take part in some of the project presented.

Conclusion

The annual survey of Scientix users and community members showed that it has managed to reach the target groups and deliver the right content to them.[5] The feedback we have received from the Scientix conference participants also indicates that there is a strong demand from both teachers and researchers for building a sustained European community for science and maths education and that Scientix has the potential to contribute greatly towards this end.

Given the example of the collaboration between SPICE and Scientix, it can be seen that the involvement in Scientix is beneficial both in disseminating research results and new teaching practices to a wider audience and in facilitating cooperation among science education professionals at the European level.

By the end of the first stage of the project (December 2012) we expect to have at least 200 projects and 1,100 teaching materials presented on the portal. The next phase of the project should focus more on involving the EU Member States in Scientix activities, close cooperation with Ministries of Education and other stakeholders at national level is therefore envisaged. The detailed strategy of the second stage will be based on an analysis of the outcomes of the currently on-going activities, including feedback from users and experts (FP7 Work Programme 2012, Science in Society: 31-32).

[3] The SPICE (http://spice.eun.org) project (2009-2011) was carried out by European Schoolnet, together with Direcção Geral de Inovação e Desenvolvimento Curricular (Portugal) and Dum Zahranicnich Sluzeb MSMT, Czech Republic.
[4] More information about the event can be found at: http://spice.eun.org/web/spice/spice-summer-academy
[5] More than two-thirds of the users are teachers at schools or universities (followed by researchers, policy-makers and education experts). They usually look for project information, news, teaching materials, most of the time they find the information useful; one in three survey respondents has used one or several resources from Scientix in the classroom (The data come from the last annual survey carried out in September 2010, the results of the 2011 survey will be available in November 2011).

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ONE CENTRAL QUESTION: CHANGING TECHNOLOGIES AND PROVEN PEDAGOGIES IN ODL

Elissa Raffa, Minnesota Online High School, United States of America

Introduction

When considering instructional design and the potential for new technologies to transform learning and schooling, one question should provide a central focus: *What will learners create?* In an online environment where relationships are mediated by technology, the question immediately gains a second dimension—*and how will they share it with others?* This two-part question, applicable to all levels of online learning in both formal and informal settings, is all too often obscured by discussions of content delivery. If kept in view by policy makers and educators at every juncture, the question of what students will create and how they will share it has the power to illuminate decisions about all aspects of online learning from funding and accreditation through content delivery to performance objectives, quality control, and learner and program assessment.

As a pedagogical question, *What will (online) learners create and how will they share it?* can accommodate all learning theories. At the behaviourist end of the spectrum, learners create documentation of increasing mastery; sharing typically occurs between the learner and an interactive computer program, often with monitoring by an instructor. At the constructivist end, learners create meaning, and sometimes knowledge; they share it through synchronous and asynchronous discussions, reflective journals, and early, middle, and late drafts of original works. In practice, many online programs, designers, and instructors adopt an eclectic approach [1], tailoring learning activities to the learners' skill levels and needs and also hoping to find a middle road in terms of labour invested.

In spite of countervailing pressures, *What will learners create and how will they share it?* provides a worthy foundation for the development of an online learning program in which sound pedagogical choices are supported by current and forthcoming technologies--as illustrated in this paper by the case of Minnesota Online High School.

An Institutional case study

Minnesota Online High School (MNOHS) is a publicly-funded charter school serving part-time and full-time students in grades 9-12 across the state of Minnesota who because of special scheduling needs or learning styles can more fully engage with the learning process in an online environment. Students attending MNOHS full-time have the opportunity to earn a high school diploma through the end of the academic year in which they become 21 years old; those attending part-time earn course credits which they can then transfer back to their district schools. Now in its seventh year of operation, MNOHS was founded by a team of educators who ten years earlier pioneered the award-winning Mindquest Learning Network—one of the first online diploma completion program in the United States. Mindquest served adults aged 17 and above who had left school without a diploma; cuts to the adult education budget at the state level made it necessary for the team to reorganize and to accept the under-21 age cap imposed by legislative funding.

MNOHS provides a full array of learning opportunities in the fields of mathematics, science, language arts, social studies, Spanish, health, music, visual and media arts, and career and educational exploration. The school also provides student and parent services and activities such as academic and career assessment and advising; special education and English as a Second Language (ESL) services; a book club; a student council and leadership program that gives students the opportunity to initiate school improvement projects—as well as a wide variety of venues where students and/or adults interact informally in an online setting. All of the above is delivered through the interactive tools of our learning management system (discussion boards, journals and blogs, and chat rooms); through the school webinar; through email and telephone; and through a few beloved online tools that we have adopted, especially VoiceThread. Students residing in the Twin Cities metro area can visit the school office in person, but rarely have reason to do so.

In the United States, online education programs are proliferating rapidly. Three characteristics distinguish Minnesota Online High School from most other secondary-level programs:

- MNOHS is a school, not a course vendor or re-vendor. MNOHS administrators, counsellors, and teachers coordinate their efforts to serve the whole student and their family. In the case of supplementally enrolled (part-time) students, this collaboration extends to the administrators, counsellors and teachers at the district school as well.
- All MNOHS courses are developed by MNOHS faculty. Conversely, all MNOHS teachers are also course developers. When first hired, a MNOHS faculty member is enrolled in Teaching Online; he or she completes a 60-hour training course which covers the basics of online pedagogies, course writing, and course management and which allows the instructor to experience the learning management system in the student role. After completing the initial training, MNOHS instructors remain enrolled in Teaching Online, the site of ongoing professional development, reflective practice, and both formal and informal discussions among colleagues—organized by the Professional Development Committee and more recently Literacy Strategies Committee.
- All MNOHS courses contain some components that could be characterized as constructivist--emphasizing performance-based objectives and authentic assessments and promoting interaction among people [2] rather than interactivity between the learner and the machine [3]. Technology is deployed to support interaction.

At MNOHS, teaching practice is fully de-privatized. Teachers have decided by consensus to provide one another with student-level access to all courses through a generic login and have developed protocols and email templates for informing another teacher when planning to visit his or her course and also for commenting on what one finds there. Throughout MNOHS's sever-year history, in spite of an increasingly difficult state funding situation, faculty turnover has been close to zero percent.

Designing mathematics at MNOHS: What will students create and how will they share it with others?

The specific case of mathematics education at MNOHS and the history of its development (beginning at Mindquest) provide perhaps the clearest example of the impact the "central question" can have on program design.

The first mathematics course developed at Mindquest was a geometry course which students needed in order to meet a state graduation requirement. Early discussions about designing the course focused on content and content delivery; members of the development team reviewed and evaluated a long list of teaching materials in print, on the Internet, and on CD ROM. The best multimedia materials typically require students to manipulate learning objects created with dynamic modelling software such as *JavaSketchpad* and to respond in writing to inquiry-based questions. But even in the best cases something was missing: All of the models reviewed lacked a means by which the student could create original work and share it with others—that is, a vehicle for communicating mathematically.

At this point, we decided that it was imperative to provide students with dynamic modelling software; we chose *The Geometer's Sketchpad*, but there were and are other products to choose from. In addition to working with and responding to learning objects created by unknown others, students themselves could create and could share their creations with one another and their instructor simply by attaching a Sketchpad document to an e-mail message, an assignment form, or a discussion board posting.

Providing online students with dynamic modelling software gave them a vehicle for reasoning and communicating mathematically. Simultaneously, it provided instructors with a vehicle for authentically assessing students' understanding of the course concepts. Instructors could check and respond to a student's work quite efficiently, bringing personalized mathematics instruction within reach (see work sample in Figures 1-3 below) and also helping teachers to ascertain that online students were indeed doing their own work.

Without a solution like the one described here, online mathematics assessment tends toward auto-graded multiple choice worksheets, quizzes, and tests. As a very simple example, a student studying the point-slope form of a line might be asked to match graphs with their equations, an interaction between the learner and the machine. When provided with mathematical modelling software, that same student is equipped to draw graphs, and to

demonstrate for teacher and peers what happens when the values of *m* and *b* are changed. This sort of basic activity, commonly carried out with graph paper and pencil or with dynamic modelling software in a bricks-and-mortar classroom, is all too often absent in an online setting. Asking what students would create and how they would share it allowed the development team to ensure that our online students had access to a complete, first-quality mathematics education.

As Mindquest gave way to MNOHS, a college-preparatory high school offering a full range of secondary math courses from basic skills to calculus, the development team soon decided that *every* MNOHS math student would install and use *The Geometer's Sketchpad*. We conceptualized this as equivalent to providing every student with graph paper, plain paper, pencil, straightedge, compass, and perhaps even a graphing calculator in a face to face classroom, and as necessary to high quality online education as a word processing program. We later discovered David Jonassen's work on Mindtools [4]—that is, on students learning *with* rather than *from* technology--as an important source of validation for this curricular design choice.

Other curricular areas

The mathematics case detailed above is simply an example. All instructional design and curricular development at MNOHS begins with the same central question. The answers are varied, and are subject to annual review. Over time, and depending on the courses taken, students become familiar with a few basic tools and techniques—more importantly, they become familiar with the *expectation* that they will create and share their creations with one another, and that they will pursue learning that suits their own situations and styles. All MNOHS students use word processing programs to create and communicate. Math students use Sketchpad and spread sheets—as do some science and social studies students. Music theory students use music notation software and music editing software; Spanish students use free MP3 voice recorders. Visual arts students might rely on hardware rather than software—for example, they may create pencil drawings or acrylic paintings and share them with others with the help of a scanner or digital camera. At times only Internet resources and the tools of the learning management system are employed—for example, when Chemistry students collaborate to develop a winning strategy for an online game, simulating early research into the structure of the atom, or when Media Arts students use the commenting and doodling features in VoiceThread to give peer feedback on one another's photography portfolios.

Countervailing Pressures

In case all of the above seems unremarkable, consider some recent examples that indicate otherwise:

- In the U.S. the *Digital Learning Now!* Report [5], signed by former Florida governor Jeb Bush, a Republican, and former West Virginia governor Bob Wise, a Democrat, is touted as a model of bipartisan collaboration on behalf of all students and has gained great traction since its release ten months ago in shaping both the discourse around U.S. educational policy and in some cases state legislation. By focusing on students' access to online content, the report prioritizes the relationship between a student and a content provider (publisher) and eclipses relationships among students, teachers, and the core performance tasks of their academic disciplines. The Foundation for Excellence in Education, which published the report, is chaired by Jeb Bush and has also drafted a "state digital learning report card." The report card has taken the report's rather innocuous recommendation that students should progress through digital learning based on demonstrated competency and has identified only testing as an appropriate measure of competency. In this vision of education, consistent with federal policy under No Child Left Behind, students will create standardized test scores and sharing is irrelevant.
- The newest release from Key Curriculum Press, makers of The Geometer's Sketchpad, is the Sketchpad Explorer iPad app which allows students to download and manipulate applets, but of course not to create anything. One can't fault the publisher for marketing to iPad owners, but we do lament the fact that a web-based version of Sketchpad has not yet been released. MNOHS spends hundreds of student and staff hours per year maintaining a keyed version of Sketchpad on our own server; this requires students to go through a complicated multi-step installation process and makes it impossible for students to work on public library computers or any other computer where they don't have administrator privileges. MNOHS is planning to invest in desktop virtualization in order to solve this and other important program design issues.

- Very often in conversation with state and local education officials, MNOHS administrators and faculty need to politely shift the focus from synchronous direct instruction (perhaps ten percent of what we do) to asynchronous learning based on students' demonstrated competencies in completing core performance tasks (on a good day, the other ninety percent). Visitors to MNOHS are unhappy with a login and a chance to look at an asynchronous course; they want to sit in on a webinar lecture.
- The default settings on many learning management systems tend to support the content delivery view of online pedagogy [6]. At MNOHS we are currently experimenting with using the customization function in Blackboard to make a course wiki the class entry point. This way, students and teachers can create and post announcements that will be seen by all upon login. However, flaws in the Blackboard course copy process (scheduled to be fixed in Service Pack 8) make it quite labour intensive to replicate this choice without losing some teacher-generated content when the course is copied at the semester break.

As a leading institution in the field, MNOHS is committed to the central question, *What will learners create and how will they share it?*, and to the realistic and rewarding daily teaching and learning experiences that arise out of answering it. We have assembled a faculty of nineteen teachers from across the state who share this commitment, and who work with persistence and humour to put theory into action. All parties involved recognize the evolutionary nature of the work. What students create tends to have a stable core; how they share it is subject to many changes including new technological developments and shifting legislative funding priorities.

Administrators and teachers in online learning are subject to the same time and funding constraints as those in bricks-and-mortar schools—and these concerns are often exacerbated by the lead time required to create written learning activities and enter them into a learning management system. *Can we afford to teach like this?* and *How will we cover all of the state-mandated content?* are two commonly-heard questions. MNOHS administrators and faculty members are committed, individually and collectively, to contributing to the public discourse examples of affordable solutions for student-centred online learning and for keeping on the table what we think is the central policy question: *Can we as a society afford* not *to teach like this?*

Assignment 9-2 – Dividing Polygons into Triangles -- Open a *Sketchpad* document and draw any polygon with four sides or more. (It should not be a regular polygon--that is, it should not have all sides and all angles equal.) Take a look at the red octagon and the yellow hexagon below for examples. Find a way to calculate the area of your polygon using what you know about the area of a triangle.

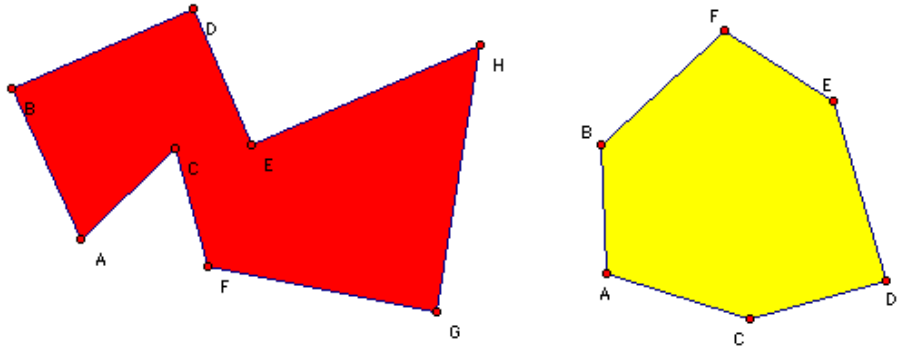

Figure 1 Sample online student-teacher interaction using *Sketchpad*:
In the original assignment, the red and yellow figures (created in *Sketchpad*) were simply illustrations; they were not dynamic.

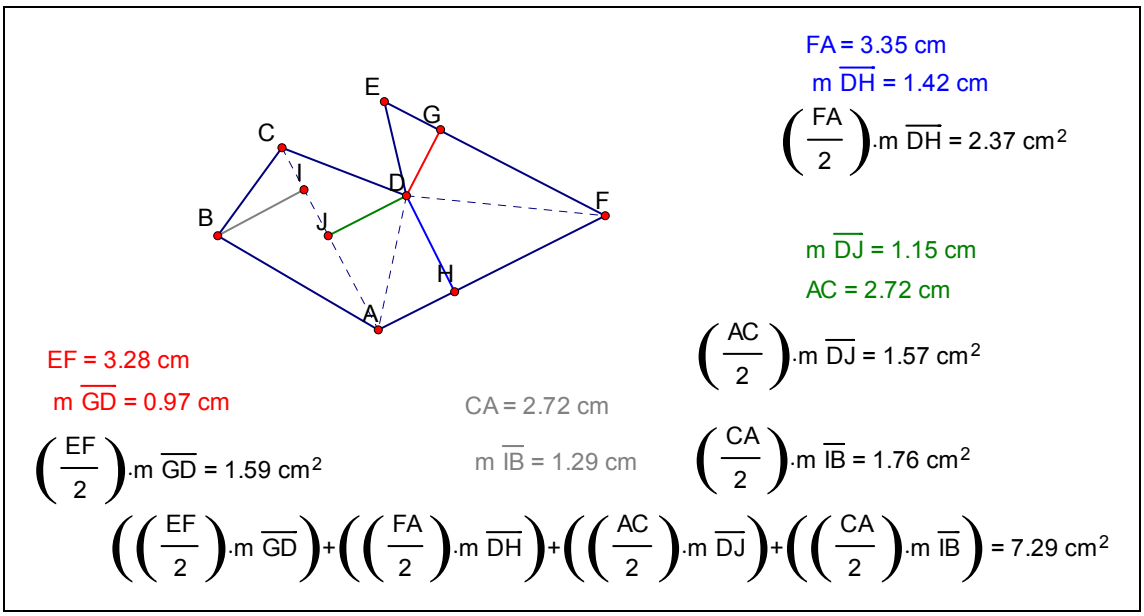

Figure 2 Sample online student-teacher interaction using *Sketchpad*:
The student submitted a dynamic sketch. This is a non-dynamic screen shot of her work.

Hello, _____

The work you did on this one is excellent. As a final step, I was able to check your calculations by selecting the six points of your original hexagon (see illustration below), constructing the hexagon interior (under the Construct menu) and measuring its area. As you can see, the area that Sketchpad gives is the same as the one that you arrived at by measuring all the bases and heights of the triangle and multiplying. Even better, if you go back into the dynamic sketch (attached) and drag any corner of the hexagon, the areas will change but the calculated area and the one given by Sketchpad will always be the same. This is the beauty of a properly made construction. If you had merely drawn the altitudes to look perpendicular to the bases, none of this would have worked.

You're really using the tools of this course well. I'll look forward to hearing from you about the rest of Lesson Nine.

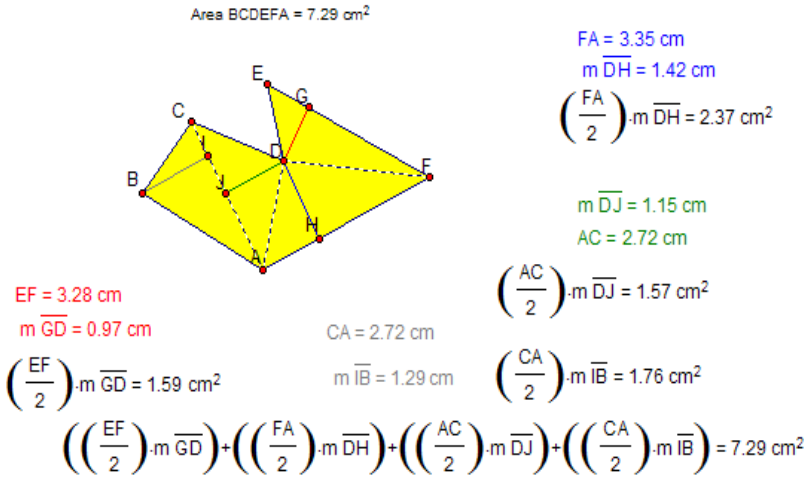

Figure 3 Sample online student-teacher interaction using *Sketchpad*:
The instructor's response. Within a dynamic sketch, it is very quick and easy to assess a student's work, and also to make changes – for correction, clarification, confirmation, enrichment, etc. In this instance, the teacher altered the student's sketch and uploaded it for her as a dynamic attachment. This is a screenshot of the contents of that attachment.

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THE INNOVATION MANAGEMENT ECOURSE: ADVANCING THE 21ST CENTURY ENTREPRENEURSHIP SKILLS IN EUROPE

Sophi Danis, Niki Lampropoulou, Intelligenesis, United Kingdom

Summary of the Good Practice

Innovation Management eCourses are intensive workshops offered by Intelligenesis in two forms: a simplified version free to everyone and an advanced one for MSc students (Moodle1 at http://intelligentq.net/e-learning/ and Moodle2 at http://globaloperationsdivision.net/e-learning/). In these 5 day long eCourses students start with their enrollment on the first day; they create teams with assigned roles based on role-play, and assign their preferred location on earth. Then they study the educational material and work on the related activities and tasks scripted for each day towards a 'real' innovation plan to apply for funding.

The combined pedagogies implemented in the eCourse accelerate students' daily active engagement via different learning styles anchored in Project-based Computer Supported Collaborative eLearning (CSCeL). All team-based activities are designed to promote the innovation cycle in practice by supporting students' idea generation and implementation in actual project proposals for real funding opportunities. The objectives, daily activities and tasks are macro- and micro- scripted to promote students' improvisation depending on their field of interest and practice i.e. not over- or under-scripted. In this way the e-tutor orchestrates the learning activities and intervenes only if needed to support the quantity and quality of group interaction and coordination. Also the transactive time and cost is reduced to minimum. Student evaluation is based on 3 different areas: critical thinking (30%, 6 marks), real life team project (30%, 6 marks) and an online questionnaire (40%, 8 marks).

Unique integrations of pedagogical approaches are implemented as tools in Moodle (http://www.intelligentq.net/e-learning/) and course evaluation. Three sets of tools support motivation, self-reflection and evaluation connecting educational tasks with students' activities. They enable students' self-regulation and enhance their shared motivation. The tools are HySynTag, Participation Avatars and the Visualisation Interaction Tool. Hybrid Synergy is a five-level, non-linear, collaborative creativity analytical framework for micro-scripting that allows the discussion participants to attach qualitative metadata to their posts via visualising their cognitive levels. The Participation Avatars represent the individual's level of activity, this is low, medium and high which is calculated on the highest poster's number of sent messages. The Visualisation Interaction Tool produces a real time sociogram for each discussion forum. It is based on Social Network Analysis (SNA) depictions that can be used to visualize communication between a set of actors. The sociograms consist of nodes (the actors of study) and its relations (the strands between actors).

In conclusion, the Innovation Management intensive 5-days e-course has proved to accelerate students' learning as they implement their newly acquired knowledge and skills directly into practice. The enhanced Moodle2 forums support learning scenarios and have been proved effective for formative feedback supporting self-regulation, critical self-reflection and monitoring one's performance and autonomous learning. Consequently they can help the tutors to deal with the diversity in e-learning environments to support both individualistic and social learning in CSCeL.

Background

The Innovation Management eCourse is designed to bend the e-learning time based on scripted team- and project- based collaborative learning activities. The acquisition of knowledge and its relation to students' competencies and implementation as knowledge in action has been suggested to be the major change in education in the 21st century. Nowadays computers and the Internet are more integrated in education than ever before. Educational organisations are forced to support a new wave of networking and collaboration directed by the Web 2.0 applications which fused the educational boarders with the real world. The use of technologies in the classrooms is increasing and converging as blended learning replace strictly classroom teaching hours. In both modes, student engagement is central to learning and is evident in appearance of excitement, enthusiasm and

commitment to their studies as hard work and investment on learning. Also evaluation in CSCeL needs to address the students' knowledge and skills acquisition on both and individual and social basis. For this reason the new evaluation methodology is based on e-tutor's assessment as well as evaluation supported by enhanced Moodle2 tools.

For the aforementioned reasons, project based Computer Supported Collaborative Learning (CSCeL) is proven to be the preferred method of study to accommodate the contemporary needs of society towards the need for students' entrepreneurship and innovation knowledge and skills. Because CSCeL is inherently complex there was a need for new tools and methods for observing and analysing interactions to increase understanding of the collaborative learning social mode where learners are actors i.e. they co-construct the information space and their learning context.

Objectives

- Promote entrepreneurship and innovation knowledge and skills in action within authentic environments
- Recommend a pedagogical approach to reduce the transactive cost for eLearning which accelerates team-based learning by condensing a semester in a week
- Support the importance of creating sense of belonging in a working group towards a specific purpose for a specific time span
- Advocate the orchestration of group convergence of activities coordination and knowledge team building
- Promote synergy for direct fit between social needs, working demands, educational tasks and the methods and tools chosen to pursue it

Project based Computer Supported Collaborative eLearning (CSCeL)

Project-Based Learning (PBL) was selected to support the team projects related to today's implementation context. PBL facilitates collaborative learning as the students are motivated and engage to develop their natural talents in design, problem solving, decision making, and evaluation and presentation activities. Such learning activities facilitate the user-generated context to be the backdrop for the development of new ideas and solutions via collaboration. Teasley and Roschelle provided a clear distinction as tasks are divided between participants: "*each person is responsible for a portion of the problem solving*". However, an individual may be both cooperating and collaborating at a task, and be unaware of their contributions. Based on this distinction, the students applied different roles within their team.

Collaboration Scripts in CSCeL

In order to ensure idea generation, the learning approach was anchored in (a) individualistic/constructive and collaborative learning, and (b), the multidimensional role of the e-tutor as moderator and orchestrator of activities, as well as being a model him/herself for the vicarious e-learners. This process suits the CSCL scripts; the 'script' is the pre-description of the learning activities for the learning context organization and knowledge convergence. A script describes the way students have to collaborate: task distribution or roles, turn taking rules, work phases, deliverables, etc. There are two types of scripts, micro- and macro-scripts: (a) Micro-scripts are dialogue models, mostly argumentation models, which are embedded in the environment and which students are expected to adopt and progressively internalize. We used the Hybrid Synergy argumentation model; and (b) Macro-scripts support pedagogical models, i.e. they model a sequence of activities to be performed by groups. An example of the macro-script is the pedagogical model for the elearning design. We used Participation Avatars and the Visualisation Interaction Tools to support students in depicting and reflecting on their online activities.

Tools to support CSCeL Collaboration Scripts

The HySynTag tool works as a micro-scripting tool; the students visualise their cognitive levels by tagging their post as: Inform, Feel, Explore-Idea, Evaluate, Summarise and "Other" when the five levels of Hybrid Synergy do not seem to cover their argumentation. Finally, they have the opportunity to post something without tagging ([-]) either because the available tags are not suitable or because they do not want to tag their messages. The tool, placed at the bottom of the "Reply" message, can also aid metacognition. The overall view of the thinking levels in one discussion can enhance the spiral and non-linear creativity mobility allowing the "Aha!" experience to occur.

The Avatars represent the 3 active participation levels, low, medium and high. These levels are calculated by the number of posts sent by the most active e-learner. The Visualisation Network Tool is anchored in Social Network Analysis and represents the nodes between the e-learners (actors).

Course Evaluation

The students and course evaluation aid at the quality assurance of the course and its objectives and targets for objectives, team participation, individual and team learning oriented evaluation. The e-tutors provide individual and team feedback at the end of each day during the course. The final students' evaluation is based on three main categories in a total of 20 marks: Groupwork Critical Thinking Assessment (30%, 6 marks), Group Real Life Project Product & Presentation (30%, 6 marks), and Individual Questionnaire on Innovation Management (40%, 8 marks). The team project evaluation is based on the tutor's evaluation (15%, 3 marks) and the overall teams' evaluation by the students themselves (15%, 3 marks). As an example, the IT Project proposal evaluation criteria are the following: (a) Usability as ease of use, (b) Accessibility as ease to access from different target groups, (c) Learnability as easy to learn to use the interface, and additional issues such as Eco-friedly as Green Computing, ethical investment, social innovation or other. Also, the IT Project group presentation and group evaluation criteria is based on Delphi technique. Other than the recommendations to their peers, the students also evaluate the other teams' project presentation with the following criteria: enthusiastic about their idea, slide design, presentation structure, quality of presentation, and if they worked as a team. (The course evaluation and results is presented in the related section.)

In conclusion, the pedagogical and methodological approaches with the tools used supported the direct fit between social needs, working demands, educational tasks and the methods and tools chosen to pursue it.

Innovative aspects

- **Implementation of knowledge and skills in action** to promote and support sets of skills needed for the 21st century following the national and European directives for the Digital Agenda 2020.
- **Compact a semester's course in a week** by implementing a pedagogical approaches to reduce the transactive cost for eLearning and accelerate learning anchored in students' own interests in authentic working environments.
- **Promotion of the sense of belonging in a group** by intensive teamwork and role play towards a specific purpose by converging activities coordination and collaborative learning during an intensive eCourse.
- **Implementation of a direct fit** between a social need for development, innovation and entrepreneurship, and working demands as well as educational tasks and the methods and tools chosen to pursue it.
- Creativity, entrepreneurship and innovation skills enhancement for the 21st century *for all* not only the experts.

Recommendations to other institutions/organizations

- **Develop eCourses Networks:** A wide range of high quality interconnected, short and intensive eCourses can be offered to students, apprentices and training employees on demand following the real life requirements and changing needs.
- **Support Different Learning Styles:** Learning paths differ for each student; scripting needs to be flexible and adaptable enough in order to support teamwork as well as individual students in eLearning Management Systems.
- **Promote Team-projects:** The team projects need: **(a)** team culture, the leverage of expertise of others based on everyone's expertise and advance on others; **(b)** shared desire and meaningful ideas to each member; **(c)** each member's significant contribution; **(d)** a wide spectrum of expertise; and **(e)** students' full brain utilisation and imagination in a very short period of time.
- **Design for Learning Apps:** Tools and applications in the purpose of learning is best to derive from user/learner requirements anchored in solid pedagogical approaches implemented in everyday educational practices; otherwise the tools will not be used

- **Support Students' Future Skills:** Educational organisations need to develop their learning objectives, strategies and targets by planning from the future backwards rather than applying methods from and for the past.

Results and Evaluation

For the course evaluation the measurements and data analysis are anchored in quantitative, qualitative and social network methods: students send a self-reported questionnaire; the Non-Negative Matrix Factorization algorithm is run on the text in combination with qualitative analysis; the outcomes from the tools implemented within the forums; and a team work skills questionnaire (Lambropoulos et al., 2011). The most quoted students' comment is that they work hard for one week however they enjoy working intensively in teams. When comparing the results from the algorithm and the argumentation analysis from both the HySynTag and the e-tutors' own using Atlas.ti it appears that the algorithm can provide evaluation for the macro-script and the 'manual' analysis for the micro-script. This means that the algorithm is able to acquire the most used words from great number of data and verify the success of the macro script and thus the success of the CSCeL pedagogical design. The algorithm alone cannot provide enough information from a cognitive and psychological perspective. The results indicated that the pedagogical design, methodology and associated tools can be useful in supporting collaboration for idea generation and innovation management in intensive eCourses.

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WHY A SIGNAL SOUND IS HEARD WHEN THE NEW GENERATION CARS ARE PARKING IN NARROW AREAS?

Bulent Cavas, Merve Kocagul, Yasemin Ozdem, Dokuz Eylul University, Turkey

The practice is implemented using Lego Mindstorms NXT 2.0. in the primary science and technology course. The main aim of this activity is to show how to robotics can be used to teach science (physics) concepts which perceive by students as difficult subject. Inquiry based Science Education (IBSE) is used as a didactic approach. In addition to this approach, three stage model from PARSEL Project philosophy is adapted to design learning modules.

Summary

The title of good practice: Why a signal sound is heard when the new generation cars are parking in narrow areas?

In daily life especially in crowded cities, people have problems about parking their cars. Most of the new generation cars have parking sensor which enable drivers to park their car without hitting the wall or cars. The activity is based on the working principles of ultrasonic sensors in other words parking sensors. In the activity the properties of the ultrasonic sensors are integrated to the science (physics) topics such as sound, reflection of sound etc. When students are working on the ultrasonic sensor, they will have also possibility to learn the physics concepts mentioned above.

This good practice presents a science learning module for sixth grade students using Lego Mindstorms NXT 2.0. The main science background of this activity is on the properties of sound and learning gains are from sixth grade Turkish science and technology curriculum. In this activity, students will discuss the usage of sensors in parking.

The activity is built on the information of :

- Student recognizes that sound is spread in waves to each direction
- Student explores with an experiment that when sound wave hits a surface, it reflects.

The activity also includes construction of robot and ultrasonic sensor which enable to detect objects at a max range of about 250 cm. In the activity, a robot car is constructed and ultrasonic sensor is attached to the robotic car to detect the objects behind or front of car. It is aimed in this study that students will understand not only physics concepts but also will understand how a scientific inquiry can be implemented using robotics.

Background

This unique teaching-learning material is intended to guide the teacher towards promoting students' scientific technological literacy by recognizing learning in 4 domains – intellectual development, the process and nature of science, personal development and social development. Its uniqueness extends to an approach to science lessons which is designed to be popular and relevant. For this the approach is intentionally from society to science and attempts to specifically meet student learning needs.

This uniqueness is specifically exhibited by:

1. a society related and issue-based title (supported in the student guide by a scenario);
2. student-centered emphasis on scientific problem solving, encompassing the learning of a range of educational and scientific goals;
3. Including socio-scientific decision making to relate the science acquired to societal needs for responsible citizenship.

The 3-stage Teaching MODEL	Stage 1	Stage 2	Stage 3
The teaching-learning approach	Real life title and scenario to motivate students; (A KEY FOCUS) emphasis is on student derived motivation to trigger science learning	Teacher facilitated, student constructed, IBSE learning incorporating scientific problem solving (motivation applied to science learning)	Teacher guided, student centered, socio-scientific decision making Applying science gained to a social setting
Educational Skills Developed	Oral communication; prior learning, critical thinking, education through science	Planning, process skills, presentation skills, drawing conclusions, problem solving Interpersonal skills	Interpersonal skills, reinforcement of the scientific concepts, argumentation, social skills, social values, decision making
Science Education Learning	Identifying science in context; Constructivist teaching, identifying scientific inquiry questions	Conceptual learning, concept mapping, IBSE skills	Transference of conceptual learning to new situations
The Key Role of Motivation	Stimulating popularity (interest) and relevance (INTRINSIC MOTIVATIONAL ASPECTS)	Enhancing relevance through activities (STUDENT CONSTRUCTED, STUDENT CENTRED LEARNING)	Strengthening relevance and enhancing scientific literacy VALUING SCIENCE IN SOCIETY (GOING BEYOND AWARENESS OF USES)

Objectives

The students are expected to:

- Decide with justification, how the new generation cars park in a narrow area using an ultrasonic sensor.
- Constructing a robo-car to test ultrasonic sensor to prevent crashing the surface when the car is parking.
- Controlling the sensitivity of ultrasonic sensor writing suitable program using NXT 2.0
- Cooperating as member of a group in designing and carrying out an investigation project.
- Concluding results of the investigation:
  - Attaching ultrasonic sensor to detect objects behind or front of the car.
  - Setting the ultrasonic sensor at different distances from surface.

Description

Information and Communication Technologies play a crucial role in educational systems of information age so that integration of ICT into education has been an important concern in many countries (Cavas, 2009).

The need for individuals to adapt to technological development is increasing by countries. The vision of Turkish Science and Technology Curriculum, regardless of individual differences is to educate all individuals in science and technology literate. But unfortunately, researches show that much less attention has been given to the

attitudes that children have toward science (Ayers and Price, 1975). For this reason, curriculum of many countries have focused on different methods such as constructivism and one of its application inquiry based science education (IBSE).

Constructivism is a paradigm which learners construct their experiences in their mind by social interactions (Winnie Wing- Mui SO, 2002). Constructivism is the most important factor effecting students' learning is based on the idea that the accumulation of existing information (Özmen, 2004).

In constructivist theory, it is emphasized that inquiry based learning is one of the most effective ways to enable students' learning (Duban, 2008).

The purpose of inquiry based learning is to make students gather information through life and develop skills, attitudes which can extend this information by using scientific process and problem solving skills (Wilder & Shuttleworth, 2005). Constructionist IBSE approach in school subjects are based on letting pupils design and construct the empirical facts (Arlegui and others, 2010). One of the ways are used during inquiry based science teaching is Lego Mindstorms robot applications. Lego Mindstorms is a line of programmable robotics/construction kits and include 619 pieces such as programmable sensor blocks (touch, light, sound and distance) and NXT Intelligent Brick. Lego is designed for children and is based on hands-on exploratory investigation (Piaget, 1964). A European Union FP6 Project, PARSEL has developed learning modules which include three stage models as an example of IBSE. These stages (phases of implementation) are:

- **Stage 1:** This is the introduction to a social issue, as reflected in the title of the module. Relevance is enhanced by linking the title to a society situation rather than attempting to introduce unfamiliar scientific terms. This means that the initial teaching concerns the social aspect and it is put into an appropriate context by means of a 'scenario'- a story, a situation, an elaboration of the title or other such triggers to initiate discussion. Based on the considerations in stage 1, students are led to realize that they lack the scientific ideas, which are important for a more in-depth discussion. This realization forms the basis for Stage 2.
- **Stage 2:** The scientific ideas, the scientific problems to be solved, and the associated process skills, personal and social attributes, are now incorporated into the teaching. The approach within Stage 2 should be familiar to teachers and the module take this opportunity to guide teachers towards guided- or open-inquiry style learning and maximizing student involvement in the learning process. Stage 2 is the major component of the module and inevitably takes the majority of the teaching time. Stage 2 is, in substance, purely scientific, although educational skills, such as, cooperative learning, scientific communication, and the development of perseverance, initiate, ingenuity, or safe working, are also intended.
- **Stage 3:** Here, the students consolidate their science learning by transferring the learning to the socio-scientific issue introduced in Stage 1 and though discussion and reasoning, arrive at a socio-scientific decision. This stage involves argumentation skills, leadership skills, the ability to reason using sound science ideas, and balancing these against other considerations, such as, ethical, environmental, social, political and, of course, financial (Holbrook, 2008).

Lego Mindstorms is popular and effective way to teach science and technology. It provides students to learn by doing and experiencing in or out of the classroom. Students develop positive attitudes towards science and technology which is taught difficult to learn in the learning environment equipped with Lego Mindstorms (Whitehead, 2010). The students see Legos as a game rather than educational tools which are very important factor motivating students to learn (Komis, 2005).

Robotics allows students to learn in an active way and experiencing concepts in meaningful ways (Druin & Hendler, 2000; Bauerle & Gallagher, 2003; Wagner, 1998).

Equipments for the activity: Lego Mindstorms NXT 2.0 Kit, Ruler, A4 papers, small boxes.

Results and evaluation

Lego Mindstorms NXT 2.0 is an effective tool to teach science topics to young students for many reasons.

First of all, students have an opportunity to develop their problem solving skills since they designed, developed and tested their robots to explore a socio scientific issue (for example: **"*Why a signal sound is heard when the new generation cars are parking in a narrow areas?"***)

Research shows that students' motivation, science process skill, scientific literacy and scientific creativity are increased by robotics. When students doing this, they saw their mistakes immediately after trying to run their robots if they have any problem with the programming. Such mistakes are great learning experience for students.

Although the findings of this study indicate advantages of the robotics on students' attitudes and motivation towards science and technology, there are also logistical issues, such as money and time, associated with implementation within the formal school curriculum.

It can be concluded that robotics seems to be an excellent tool for science and technology education. However, as it is indicated in the report of the TERECoP project (Alimisis, 2009), the pedagogy of teaching robotics is still in its infancy and the research regarding robotics learning in science and technology is limited (Penner, 2001). For this reason, further research is needed to clarify the educational use of robotics in science and technology education.

Innovative aspects

- The activity provides a new teaching method to the teachers who still use the traditional methods to teach sound topic.
- The activity also develops students' not only scientific literacy but also develops technological literacy. In this learning environment, students work with the robotics which requires science process skills. (Identifying and posing appropriate scientifically oriented questions; Contextualizing research questions in current literature/resources; Making prediction / Developing hypothesis; Designing and conducting investigations; Identifying Variables; Collecting data; Analyzing data to develop patterns; Communicating and connecting explanation; Socio-scientific Issues) and also computer programming skills. The NXT includes software for programming robots which is very easy to use by students.
- The activity also increases students' motivation toward science which is a kind of problematic issues in not only in Europe but also all over the world.

Recommendations

It is recommended to other institutions to use this activity as a new teaching material and share their experiences with us. The researchers of this activity would like to create a network on the development of new teaching materials based on the Lego Mindstorms for primary science and technology curriculum. If anybody is interested in joining the network, it is recommended to contact one of the presenters of this activity.

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CASE STUDY: LEARNING ENGLISH AS A FOREIGN LANGUAGE IN SECOND LIFE

Jens Kjaer Olsen, Ungdomscenteret Glostrup, Denmark

Introduction

30 students aged 16-17 and 3 teachers took part in this project at my School.

It was carried out in weeks 12 – 14, Spring 2011. The 30 students were spread across three 10th grade classes. The 10th grade is optional, and therefore many 10th grade schools have creative and practical subjects that allow students to get a feel of different trades and professions.

The purpose of the project was to work with English as a foreign language in the virtual world Second Life. One of the goals of English as a second language is to give students the opportunity to speak the language. The teachers behind the project felt that a virtual world would be the perfect setting for language teaching because the students could "hide" behind their avatar and thus overcome some of the embarrassment that might be involved. Also, it was believed that Second Life would provide more realistic communication situations (speaking, reading and writing/chatting) than speaking English with your fellow Danish students. Another important goal of the project was to enable the students to pay virtual visits to sights in the UK and the US, so as to intrigue them and create a desire to see the places in real life.

A secondary purpose of the project was to pose creative tasks to the students that would allow them to work with digital audio and video as part of the subject "junior computer driver's license".

During the first week of the project, the students were given an introductory course to familiarize them with the relevant functions in Second Life and to give them time to create an avatar. The students were given the assignment to visit different places in Second Life all relating to Berlin and to create a photo story with music and text. This exercise was linked to an actual study trip to the city of Berlin. The second and third week of the project were devoted to the Robin Hood Quest which is available in Second Life at the British Council Isle. The students worked in groups to solve the riddles and tasks in the quest. They had to use English when communicating with each other and when seeking help from the guides (their teachers and teachers from Austria and Italy who were also engaged in the AVATAR course) in Second Life. Again the students were asked to create a photo story with English texts and with music. It turned out that only by collaborating could the students solve the tasks of the quest, which made the project very successful.

In addition to Second Life, Photo Story 3 for Windows was used

Some students felt that the Robin Hood Quest was very difficult, and they had much help from their teachers and fellow students. However, the students quickly got a good grasp of how to navigate in Second Life, how to change appearance etc. due to their knowledge of e.g. World of Warcraft. Precisely this prior knowledge of online computer games also meant that some students behaved offensively towards other avatars. They were soon introduced to netiquette to set things right.

With regards to the goal of learning English as a second language, the students spent time communicating in English and were able to understand the English language instructions that they received. They thus had a lot of practical training and had good fun in the process. However, it was mostly the reading, understanding and writing (chatting) skills that the students were practicing and less their oral English. When communicating with each other, the students used Danish probably as a result of the very complex tasks they were facing. As a side effect of the project, some students formed a band and chatted with avatars from other countries.

Success factors

- Introducing the students to netiquette, so that they can interact with other avatars in the virtual world without causing offence
- Supporting the students in-world by offering note cards with SLURLs, instructions etc.
- Providing a framework of modules and deadlines that explain the task
- Several teachers took part in this project. This meant a lot in terms of supporting each other in the process of getting to know Second Life and in terms of supporting the students in-world. The group of teachers counted both English and Computer Science teachers.
- Virtual worlds add an international dimension to language teaching
- The AVATAR course proved to be virtual competence development for the participating teachers

Challenges

- Ideally, the students should have worked in groups across the countries in the AVATAR project. This proved not to be possible within the timeframe
- The Robin Hood Quest at first seemed ideal for language teaching. However, it turned out to be a complex task to solve the riddles involved. Using already existing resources in Second Life may not be an easy task. It is recommendable to contact the institution behind the resources you wish to use and get the necessary documentation and information before using the resources with your students
- Bad timing. Would have been ideal to carry out the project in the autumn i.e. in the beginning of the semester
- Mastering Second Life – teachers pointed to a steep learning curve

Links and further information

- The Robin Hood Quest
- The aim of the quest is to free Maid Marion. In order to free her, a code is needed. The code is obtained by solving different tasks and solving a cross word puzzle.
- Sherwood Forest of the British Council Isle:
- http://robinhoodquest.wetpaint.com/
- British Council Introfilm to our Quest: http://www.youtube.com/watch?v=Sty91tJZyqA
- Intro to the British Council Isle http://www.youtube.com/watch?v=aERvhgSjiH0

The student films are available here

- http://www.youtube.com/watch?v=sVx_ZH5zNfg
- http://www.youtube.com/watch?v=Jxi4qZDUsJA
- http://www.youtube.com/watch?v=hVpKjCXzXXc
- http://www.youtube.com/watch?v=ocCc1ksCMpU

Inspiration about Quests etc. in Second Life

- http://avalon-project.ning.com/profiles/blogs/virtual-worlds-games-and-inter

SPLASH, DIVE AND DEEP DIVE – INTRODUCING SOCIAL MEDIA TO TEACHERS

Ari-Matti Auvinen, HCI Productions Ltd., Finland

Summary

This case study of good practice introduces a three-level training course implemented by the Finnish AVO network in various educational institutions in Finland in 2010-2011 to accelerate the use of social media in education. The training for the teachers (and also supporters) in these educational institutions was divided into three levels: an introductory one-day "splash into social media", a four half-day workshop series "dive into social media" and a five half-day workshop series "deep dive into social media".

The innovative element in the training design was to provide various levels and stages of social media training and thus to ensure that all teachers and supporters within an educational institution have at least the basic knowledge of the potential of social media. This was also ensured by providing them access to a wiki, which was designed to support the training effort and which included various resources and cases of good practice across educational sectors.

The teachers within educational institution with additional needs were provided with hands-on practical workshops during which they could train in practice the use of blogs, wikis, shared documents, user communities, tweets, mobile media applications etc. In addition, they were provided with important knowledge of educational design principles, organisation of peer production, quality assurance, immaterial property rights (IPRs), open source approaches etc. The participants of the advanced training courses were also expected to present their own practical project in using social media in education – this project work was supported by the trainers of the courses.

The trainers were working as a team –in the training of the largest single educational institution in all eight experts were involved. This also ensured that there was available a wide and versatile experience for the participants.

Background

The students in secondary education, vocational education and tertiary education are active users of social media. According to the information provided by the Official Statistics of Finland (Use of ICT in Finland in 2010), the age groups vary significantly in the use of social media.

age	uses Internet several times per day	has used e-mail in the last 3 mts	read papers/ watched TV over Internet in last 3 mts	registered for a social media community	follows daily a social media community	has written messages to social media	has read blogs
16-24	99 %	76 %	92 %	83 %	67 %	84 %	64 %
25-34	100 %	78 %	92 %	76 %	60 %	74 %	58 %
35-44	96 %	65 %	85 %	44 %	25 %	48 %	42 %
45-54	92 %	53 %	74 %	29 %	12 %	29 %	34 %
55-64	75 %	43 %	61 %	15 %	5 %	15 %	25 %

Figure 1

Most teachers do not understand fully the potential of social media as a part of their educational provision, let alone use the various social media effectively in their daily teaching.

Thus within the AVO project (Open Networks in Learning), a Finnish partnership under the coordination of the Finnish eLearning Centre, we planned and implemented in 2010-2011 a series of training events mainly for teachers in vocational education and higher education to accelerate the use of social media in education.

Objectives

The objective of the training was to provide both an introductory approach as well as training for the developed use of social media. Thus the objectives of the training were a) to introduce the use and the potential of social media for the teachers using practical case studies, b) to train the teachers to use social media tools in their work (in particular, the use of wikis, blogs, and shared documents), c) to train the teachers to use effectively various developed media tools (such as streamed audio and streamed video) as a part of their daily work.

Description

The framework of the training was based on three separate, but intertwined, components, which we named splash, dive and deep dive into social media. The expectation was that all co-workers of an educational institution would participate to the "splash" course and selected teachers and co-workers (by application) to the "dive" course and the "deep dive" course.

The learners were provided access to a structured wiki (structured according to the various stages of the training) to which the teaching staff of the courses collected a wide variety of various resources on the use of social media. This wiki was available for the learners also after the course. The key idea was also to share good practices of the use of social media in education from Finland and other European countries with the learners.

The "splash" course was a one-day introductory course presenting the width and richness of social media and it was directed not only to teachers, but also support staff on an educational institution – administrative staff, project officers, IT support staff etc. The one-day course was based on lectures by experts in subject areas such as introduction to the world of social media, various social media applications (such as Wikipedia, Facebook, LinkedIn, blogs, Google.docs etc,) and their use, "netiquette" of social media, and IT security and social media.

The "dive" course was implemented as four half-day workshops per learner group (with an interval of two weeks between workshops). Each half-day workshop had one-two specific themes – such as using blogs in education, using wikis in education, and using Google.docs in shared working. In this part, the learners also created their own userIDs to various applications. The communication between the learners and the teachers was taking place in discussion groups of LinkedIn. The learners were also expected to undertake project work of a subject related to the development of their own teaching – this was supported by the teachers.

The "deep dive" course was implemented as five half-day workshops per learner group (with an interval of two weeks between workshops). In the deep dive course the learners were asked to define specific needs they would have and the course design was based on these expressed training needs. Thus the half-day workshops had themes such as using streamed audio, using streamed video, educational design principles, quality assurance in social media etc. The approach in the deep dive workshops as a "hands-on" approach and thus really concentrating in assisting the learners to implement their educational provision through social media (including also rich media). Also in this course the learners were also expected to undertake project work of a subject related to the development of their own teaching – this was supported by the teachers.

The training setting for the "splash" course was an auditorium (as there were 60-80 learners per course), but the "dive" and "deep dive" courses were implemented in a computer class, which ensured access to various tools but also personal learning for each learner.

Results and evaluation

The evaluation was done by questionnaires after each training segment. In general, the feedback of the participants was positive and encouraging. However, it was obvious that the level and experience of the various learners was varying widely. The learners appreciated, in particular, the practical hands-on training parts, during which they could directly develop and enrich their own learning provision. The practical case studies were also highly valued as well as the support in the use of the social media tools.

However, within the educational institutions there are still a number of restrictions in using social media effectively in educational provision. Some of these issues are related to the actual use of various social media tools, to the access of social media tools and the possibility to use them, to the restrictions by the LMS (Learning Management

Systems) of the educational institutions etc. In addition, many learners expected that the use of social media might add their already heavy workload as teachers.

Innovative aspects

The innovative aspects of the training were, in particular, the following:

1. providing various levels of structured training in the use of social media for teachers and supporters of educational institutions
2. providing practical hands-on training in the use of social media as a serie of dedicated half-day workshops to accelerate the actual implementation of social media in educational provision
3. collecting a consortium of experienced experts and trainers from various Finnish organizations
4. providing a permanent resource (as a wiki) for the educational institutions to support the use of social media in education.

Recommendations to other institutions/organizations

The use of social media in education has large potential, as most of the students use fluently social media in their daily life. However, the introduction to the use of social media requires also training of the teachers and supporters – it does not happen by itself.

Based on our experiences, we recommend that the educational institutions start effective training of their teachers in the use of social media, construct credible strategies and action lines how to use social media in educational provision and ensure the access to various existing social media tools for the teachers as well as for the learners.

THE FIGURATIVE EDUCATION AS A SENSITIZATION VEHICLE IN ORDER TO RAISE ENVIRONMENTAL AWARENESS: A VISUAL ART-ENVIRONMENTAL GAME FOR THE PRESCHOOL AND PRIMARY SCHOOL EDUCATION

Argyro Markou, Antonis Vaos, University of Patras, Greece

In this research an effort has been made in order to record and interpret views and attitudes of educationals in the teaching of figurative education, in environmental studies at kindergarten and in the first two grades of elementary school, as well as the implications that arise from these teaching practices when, under the interdisciplinary educational process, connections between these areas are attempted.

It was mainly attempted an investigation of the terms on which figurative material can be imported and used in the environmental educational programs , so that a very privileged frame of figurative education can emerge in which the environmental sensitization can be developed as far as the essential content is not cancelled, altered or abandoned.

In this frame, an original educational application is presented, called “Afisarmonika”4 which is based on concerns of how the objectives of figurative education and environmental education, as they are specialized in specific actions, can be compatible and consequently, the coupling of these two areas can provide useful educational tools. Specifically, the educational activity which has included original training material, whose implementation was realized in two phases and completed in one and a half teaching hour per class. The first phase included the acquaintance of the researcher and the theoretical approach of the topic so that can be treated by the students and the second phase was dedicated to the implementation of the actions and the development of activities by the students, after its completion.

The methodology was based on both quantitative and qualitative data in order to ensure the best interpretation possible of the results (questionnaires and interviews in teachers as well as the implementation of educational actions- observation of students).Concerning the teacher questionnaires, the research sample consisted of 11 schools, while in the interviews and in the implementation of the pilot action of original art environmental game, 2 kindergartens and 2 primary schools, with a total of 230 students, participated. The research lasted two months and the researcher visited the participating schools on a daily basis, after consultation with the school counsellors, school principals and teachers.

LET US SHARE THE MUSIC

Petros Stergiopoulos, Ellinogermaniki Agogi, Greece

Summary

"Let Us Share the Music" is an on-line collaborative creation of a student musical-event using video-conference and other ICT-based technologies. The good practice aims to enrich methods of engaging music classroom activities in sharing music creation with remote classes and educational environments through the use of teleconference and streaming facilities. The key activity of the procedure is an online music event that takes place after a series of rehearsals and preparations that follow a schedule of pre-compiled educational activities that remote teachers with their classes (or student groups or even individual students) have agreed to follow in advance. Various kinds of digital or non digital educational material gathered by the students can contribute to the final purposes of the event. Live music creation and performance is shared in consecutive manner from one place to another with all the sites linked together at the same virtual environment that follows a pre-defined "link schedule". Local cultural characteristics and music traditions play the role of the common element that is used as an asset for inter-regional, national or even international communication through the use of ICT streaming features. A series of six phases provide the main corpus of the good practice and may be used as a flexible template on which teachers are invited to determine the details. Students can follow the details given by their teachers but they are also allowed to contribute with their findings, their ideas or results made through collaborative communication. The final concert summarizes the basic educational objectives that the teachers have already defined from the first phase or enriched throughout the procedure. Parental or local community environments being the main source of music inspiration linked to the local tradition are encouraged to influence the students-activities more than the mainstream globalized mass-media culture. The result is the final performance of an event with unique identity derived from the differences and similarities of the various sites that participate.

Background

A music lesson is often introduced within a limited workspace-infrastructure such as a local school or a music school. Through the use of ICT technologies music education can be a tool for social networking activities that link educational process with culture as a social need. Similar web-conferencing practices in music have already been applied in a variety of educational environments including classroom and masterclass sessions or individual training. Despite advanced state of the art systems that outline future standards, such as POLYCOM, barriers of sophisticated or expensive hardware equipment can limit the potentials for a regular classroom to gain access to web-conference facilities featuring music. "Let Us Share The Music" offers an "on-hand" application with the least hardware requirements supporting flash content. Being part of the "Distance learning Music Agoge" project, the proposed good practice has already been applied on Multiple-Site-Links.

Objectives

- To motivate music teachers on developing ways of dividing sophisticated music education content into small comprehensive elements.
- To introduce the idea of creating a cultural event built by the above elements used as mosaic pieces of music knowledge.
- To inspire music students towards sharing music knowledge with remote students by using the above mosaic pieces as contribution to a larger image.
- To enhance music education through team-work and interplay not only within local student groups but between remote places in Greece or abroad.
- To get students and audiences aware of the fact that music is a global language that can link humanity through the use of ICT technologies.

Description

The pedagogical approach combines collaborative learning practices with the blending of formal and informal learning. The educational scenario consists of the following phases:

1) All participants (sites/institutions) initial agreement

During this phase an outline of the internet music-event characteristics including repertoire, educational tasks and the nature of the concert is defined by the event coordinator. All sites are invited to agree or to alter them according to the local needs. A final agreement about the general idea of the concert is reached. In this phase the actual rooms or halls that will be involved in the multicast are defined. Types of internet connection and connection-material needs are defined as well. In this phase all participants (sites) of the final concert agree on a rehearsal schedule that includes dates for the rehearsals and the final-concert. An ICT literate representative from each site (presenter), usually the music teacher or a person in collaboration with him/her, undertakes the responsibility of communicating with the event coordinator. An example of the needs covered in this phase (concerning link on a special theme) you may find on http://connect.ea.gr/ealinkinfo_11_10/ and on http://connect.ea.gr/ealinkapplform_11_10/.

2) Preparation of the music material by teacher(s) / student(s) or both

Music is prepared according to the scenario agreed above. Sophisticated music material such as information about a specific kind of music (such as traditional or composed), about a composer or selective repertoire is gathered by the coordinator and the teachers. Educational material is divided and simplified in work-packages perceptible to the targeted student group. Teachers hold most of this responsibility nevertheless students are encouraged to contribute. An example of this phase procedure took place during the preparations for the Student-Concert-Triple-Site-Link in June 28th 2010, and it is described as follows: A special arrangement of a controversial work by Fr. Chopin, "Introduction and Variations on a theme by Rossini" originally for flute and piano (Brown 9, circa 1824,) in five movements, was adopted by the coordinator for four flutes (http://connect.ea.gr/pscr4flutes/) with a simplified theme melody (http://connect.ea.gr/pscrsimple/). The arrangements were delivered to teachers and students as part of the concert's repertoire.

3) Teleconference platform familiarization

An Adobe Connect Pro E-learning Platform environment is specially designed and adopted by the coordinator in order to support rehearsals and the concert event as well. An introduction to the basic characteristics of the teleconference platform is sent by the coordinator to all participants explaining details about the link. Additional web based material such as manuals and video-tutorials are sent as well.

4) Rehearsal schedule implementation (virtual & actual)

The implementation of the rehearsal program is carried out as planned on phase 1. During this phase the actual rehearsals involving all participants take place in order to achieve results as close as possible to the standards defined on phase 1. This schedule may vary as additional tasks and needs may occur during the procedure such as minor/major planning alterations or additional interaction with the uploaded e-content or even need for uploading new one. Referring to the Student-Concert-Triple-Site-Link in June 28th 2010 this was the phase when young students with recorders and percussions were trained in Dymi-Achaia. Four flute students in Levadia-Viotia were also trained on the rest of the piece. Four rehearsals (one per week) took place according to schedule.

5) Final Rehearsal according to the defined plan

The final rehearsal is the final concert run-through as it will be conducted the day of broadcast. Minor corrections and comments finalize the overall characteristics of the event.

6) Concert Day – Multiple Site Link

In order to secure a stable connection during the event, all parts of the Multiple – Site – Link enter the virtual environment two hours before the actual event. A series of broadcast layouts that support different features (such as PowerPoint – presentations) is multicasted according to plan.

Equipment needed: A broadcast room or hall, an ADSL or similarly fast internet connection, a PC or Projector and Screen used as terminal in order to establish visual contact with each site, a built-in or external audio card with extension microphone cable and a microphone, a built-in or USB webcamera (recommended) connected with an extension cable.

Results and evaluation

Evaluation scheme consists of a questionnaire available to participants and live audience (please refer to “Let Us Share the Music” – Evaluation Form attached below). The coordinator of the event investigates the impact of the process by exploring the possibilities of repeat. Thematic material can also be influenced by the student’s aspect of communication with remote areas. Teachers are engaged in investigating the above process through the student’s progress and motivation.

Innovative aspects

The present practice proposes a combination of Music and ICT learning objectives negotiated within a music lesson. Video-conference capabilities serving the needs of a student music concert can be conducted with, and prepared by, the ICT and Music teachers respectively. Thus collaborative ways of learning can be obtained with having groups of students, either on the ICT platform or on the music content, working together.

Recommendations

The proposed good practice can be applied in both formal education environments such as a primary or secondary education school-classroom and informal environments such us a Conservatory of Music. Cultural institutions such us concert halls, museums and theatres or any performance-arts institute offering educational programs can also benefit. The present practice can also serve as a bridge linking Individuals, or communities of individuals suffering from restricted or severe mobility issues, with remote (or even close) educational communities.

LEARNING AT THE "NON-PLACE": THE CASE OF MOVE-ON PROJECT (PROFESSIONAL LEARNING FOR ADULTS ON THE MOVE)

Elena Avatangelou, EXODUS, Aristotelis Alexopoulos, ALBA Graduate Business School, Greece, Chiara Cerato, COREP– Consorzio per la Ricerca e l'Educazione Permanente, Italy, Victoria Damyanova, Institute of Technology and Development Foundation (ITD), Bulgaria, Ildiko Mazar, EDEN, United Kingdom, Emanuela Ovcin, COREP – Consorzio per la Ricerca e l'Educazione Permanente, Italy, Andras Szucs, Livia Turzo, EDEN, Hungary

Abstract – Introduction

Adult learners' re-entry into the learning environment, in many instances, requires a leap of courage, and yet their learning success is integral to the health of communities and the economy. These learners, whether busy parents, young adults or seniors who would like to stay professionally active, can only (re-)enter or stay in the workforce by becoming life-long learners.

Learning on-the-move holds a promise for providing opportunities for adults to stay in-line with their career, personal and educational goals, to keep pace with professional and societal changes and with the new formal requirements in the modern labour market. Learning at the "non-place" refers to learning which takes place in spaces of temporary, transient activity (such as airports, supermarkets, hotel rooms, highways, waiting queues, etc.), in general in time and place that would normally be mostly "downtime" for a person. On the other hand, the tendency of more and more adults carrying powerful portable devices provides a well-exploitable opportunity for learning.

The MOVE-ON project (under the LEONARDO DA VINCI Lifelong Learning Programme (LLP) of the European Commission, Education and Culture DG) aims at designing, developing and validating new vocational education possibilities ready to be offered in short episodes (max 10 minutes each) during "non-place" events with the goal to increase the overall volume of participation of adults in vocational education. The present paper presents the overall goals of the project, as well as the basic MOVE-ON educational model, as this has been developed during the first months of the project. (Result of project months 1-9: January – September 2011)

The need for vocational learning at the "non-place"

Mobile device manufacturers have raised the bar with the introduction and success of sophisticated portable devices (like iPhone, iPad, Blackberry, Google Nexus, tablets, etc.) who have already demonstrated good potential for mobile learning (e.g. iTunesU). At the same time, these modern learning tools, which have the potential to alter the educational experience, seem to be entirely separated from pedagogy since they simply do not fit with existing pedagogies. This gap from modern learning tools to state-of-the-art pedagogy needs to be bridged by developing new pedagogical approaches and respective content for mobile learners.

From the societal point of view, as society becomes increasingly hectic and knowledge-based, adult employees of all professions and educational levels are obliged to adopt more vocational education activities to renew, update or certify knowledge and skills in order to remain competitive in the workplace within an ever increasing technological environment. On top of that, as documented by the "New Skills for New Jobs" priority (launched in 2008 by the European Commission), skills upgrading is critically important for Europe's short-term recovery from the crisis and longer term growth and productivity, for its jobs and its capacity to adapt to change, for equity, gender equality and social cohesion. As stated in the report, *"too little is done to increase and adapt the skills of an ageing workforce"*.

Within these frames, the main challenge of MOVE-ON is to increase the overall volume of participation of adult professionals in learning and vocational education, by focusing on the possibilities offered by portable devices widely adopted nowadays as new access media to learning. MOVE-ON's expectation is to motivate, enable and

support busy adult professionals in learning on-the-move or at “non-places” by providing an alternative educational model that fits their mobile and fast-moving way of life.

What MOVE-ON is aiming for

The goal of the MOVE-ON project is to develop and demonstrate a new practice for adult lifelong learning and personal development based on widespread portable devices, to be consumed while on-the-move or at “non-places”. More specifically MOVE-ON aims at:

- Designing, developing and valorising a novel mobile-learning pedagogical approach based on the recent developments in pedagogy, which moves away from behavioural models and more toward the constructivist models (learning from experience), while placing the active learner at the heart of activities.
- Developing and valorising an innovative and attractive all inclusive mobile-learning system that will support acquisition of knowledge while on-the-move or at the “non-place” and offer self-directed personal development in new contexts.
- Targeting adult professionals from all over Europe, users of mobile and other portable devices (tablets) with multimedia reproduction capabilities, who lack free-time and are conscious about their educational needs.
- Designing and developing educational material (courses) that covers a selection of subjects and skills that demonstrate growing demand from employers across all levels of employees. This material will be easily adaptable for different portable devices and organized into smaller learning units (max. 10 minute duration) fitting the transient context of mobile use and the MOVE-ON pedagogy.
- Offering a multilingual service, as the system itself and the educational material will be available in several languages.

The ultimate product of the MOVE-ON project will be a multilingual (EN, EL, BG, IT, HU) learning platform with courses available in all 5 languages. The courses that are being developed will be delivered on smart mobile devices (more specifically on iPhones) and are focusing on the topics: Project Management, Negotiations and Financial Management. Each MOVE-ON course will consist of a series of 20 ten-minute episodes and will be highly interactive as a result of a combination of informative and experimental elements (text, videos, photos, animations, exercises, games, etc.). Finally, this new educational approach will be tested and evaluated by users in several European countries.

The MOVE-ON Model

The MOVE-ON model for mobile learning is more appealing and effective than other types of professional training. Compared to “physical” training (physical presence of both trainer and trainee is needed in a specific place) the advantages of a mobile learning system are well justified: avoidance of costs (both in money and time) and the need for a physical presence are the main ones. Compared to traditional e-learning systems that, although they do not need the presence of the instructor and the student in the same place at the same time, they still do (in general) keep both of them “stuck” in a certain place, mobile learning is an innovative approach in terms of breaking this time-place obstacle and fully implementing the anytime-anyplace approach.

By creatively combining positive elements from the behaviouristic, constructivist and collaborative paradigms, the MOVE-ON model plans to go even further on the mobile-learning practice and combine the autonomous, self instructed learning with the advantages of communication and peer contribution. This approach will be supported with innovative, highly motivational mobile learning tools, and will lead to the certification of the knowledge acquired. Building on this approach the MOVE-ON model includes all these dynamic features (like videos, animations, mobile technology games, simulation games, etc.), and communication tools (mobile forum platform) that constitute the learning experience a pleasant and constructive one.

The basic educational unit of MOVE-ON is the course. Each course covers one specific and distinct knowledge area (e.g. Project Management, Negotiations, Financial Management, etc.). The aim of the MOVE-ON course is not providing learners with in-depth knowledge that would be covered during one semester with traditional learning methodologies. Rather, the course aims at providing basic knowledge on a topic, introducing learners to it. Within MOVE-ON, a course is the equivalent of one “traditional” seminar (with a duration of 2-3 days).

Each course is divided into episodes, each covering specific parts of the course, in a manner that all of them together constitute a complete and comprehensive understanding, starting from the introductory level and proceeding to more detailed grounds. The average duration of an episode is 10 minutes, meaning that a learner would need approximately 10 minutes from start to end to go through the theoretical parts, view the interactive content and complete the episode exercises. Each episode comprises of a number of micro-modules (text, pictures, animations, games, exercises, etc.). As a rule of thumb, an episode will include approximately 3 minutes of textual information, and 7 minutes of interactive content. The episode concludes with a brief test session, comprising of several kinds of closed-type questions. Learners need to complete the test (i.e. answer all questions) in order to "unlock" the next episode. There is no minimum correct answer threshold for passing the test. Learners will be informed about their result (number of correct answers) and will be given the option to try again to improve it.

After completing all episodes, the learner will have to "sit" the course exam, which covers educational material from all course episodes. When the learner passes the exam successfully, by accomplishing a predefined "threshold" of successful answers (70% correct), he/she receives a "Certificate of successful attendance" to the course. Learners have the opportunity to "re-sit" the exam in case of an unsuccessful attempt.

A MOVE-ON course comprises in average of 20 episodes. Each episode in turn has a duration of 10 minutes. Allowing the learner to complete an episode in such a short time facilitates the idea of learning at the "non-place", as learners could easily complete an episode while waiting on a queue or for the bus. Each episode's ten minutes are divided in approximately 3 minutes of textual information, and 7 minutes of interactive content (animations, exercises, games). Based on their expertise, the MOVE-ON consortium estimates that 3 minutes of textual information cover one page of a normal document. Consequently, each course covers the equivalent of a 20-page document.

The course is a "stand alone" application which users can download to their mobile device and follow the pre-specified learning path (episode 1, episode 2, episode 3, ..., episode 20) at their own discretion (total freedom in choosing the time and place of learning). The actual duration of the course also depends entirely on the learner. Each person is free to go through the course at their own pace, for example to spend 3,5 hours (200 minutes) at once (e.g. during a flight), or to complete the course within 10 days (e.g. spending on average 20 minutes every day).

Each episode comprises of "micro-modules" of the following types:

- Text. Short paragraphs, bullet / numbered lists, long enough to fit on a mobile smart phone screen and be easily read. Text may resemble the format of a presentation slide.
- Animations. Animations present information in a lively way. They may include audio material.
- Games. Similar to animations, but with user interaction.
- Videos. Pre-recorded material.
- Questions. Closed-type.

Course participants also have the option to participate in the "course's forum", a mobile space of asynchronous communication which enables the exchange of views, posting and answering questions, submitting personal experiences, asking for assistance from peer participants, etc. This platform will also act as a "repository of knowledge", since all contributions will stay there comprising a database of knowledge assets for future reference by all users.

By implementing this approach the MOVE ON project is planning to go further down the line and beyond current state of the art in mobile learning. The main strategic goal of the MOVE ON mobile learning model is to enhance users' participation in knowledge building during the course, while at the same time keep the user's freedom in terms of place-time dimensions. This will be achieved by using all these engaging, dynamic and interactive learning tools (videos, animations, games, cases) in combination with an option of asynchronous personal interaction between the users (mobile forum). This way, the MOVE ON model aspires to combine the positive aspects of the behaviourist, constructivist and collaborative theories, preserving at the same time the basic mobile communication advantage of using it wherever the user wants and whenever he feels like doing it.

More information about the project

For more information on the project's progress, related events and publications, and to get involved in the MOVE-ON community, please visit our website: http://move-on.exodussa.com and register to our Newsletter.

Project Partners

- EXODUS S.A. (Coordinator) – GR (www.exodussa.com)
- ALBA Graduate Business School – GR (www.alba.edu.gr)
- COREP - Consorzio per la Ricerca e l'Educazione Permanente – IT (www.corep.it)
- Institute of Technology and Development Foundation – BG (www.itd-bg.eu)
- EDEN – European Distance and E-Learning Network – UK (www.eden-online.org)

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DESIGNING AND SHARING INQUIRY BASED LEARNING DESIGNS: THE PATHWAY ASK LEARNING DESIGNER TOOLKIT

Demetrios G. Sampson, Panagiotis Zervas,
University of Piraeus and Centre for Research and Technology Hellas, Greece

Introduction

During the past years, inquiry based teaching has been recognized as a pedagogical strategy for improving science education in many European countries. Within this context, teachers are recognized as key players for the effective widespread use of inquiry based science teaching techniques in school education [1]. Furthermore, it has been recognized that science education teachers could significantly improve the quality of their teaching and support their motivation for adopting inquiry based teaching practices through their participation in communities of best science teaching practices, which facilitates them to share, not only digital educational resources, but also learning designs that reflect their teaching practice, discuss about best teaching practices and reflect on each others' designs [2].

Within this framework, there are international efforts for moving beyond traditional web-based repositories of digital educational resources towards the design and development of web-based repositories of learning designs. Nevertheless, the process of developing and sharing learning designs through web-based repositories requires: (a) Learning Design Authoring Tools that can represent the pedagogical design followed in educational scenarios, that is, a structured flow of learning activities populated with educational resources and facilitated by certain tools and devices, where teachers and students participate assuming certain roles [3], (b) Strategies for using these tools so as to express the learning designs following consistent and commonly recognized terms among the educational practitioners of a given community [4].

In the field of Technology-enhanced Learning one way that provides a standard notation language for the description of learning designs is the IMS Learning Design (LD) Specification (http://www.imsglobal.org/learningdesign/). To this end, although there are IMS LD compatible learning design authoring tools available that science education teachers could use, so as to express their science teaching practices, they are lacking consistent strategies that will guide them in this process and facilitate them to express these practices as learning designs in a commonly understandable and interoperable manner and share them among the members of an educational community. In this paper, we address these issues by presenting a learning design authoring tool, namely PATHWAY ASK Learning Designer Toolkit (PATHWAY ASK-LDT) and a strategy for using this tool towards enabling science education teachers of the PATHWAY Project to design and share their inquiry based teaching practices in the form of learning designs and educational scenarios through web-based repositories

Background

From Learning Objects Repositories to Learning Design Repositories

A number of international initiatives, such as the leading initiative of Open Educational Resources (OER) movement have recognized the importance of sharing and reusing digital educational resources among educational communities [5]. For this purpose, digital educational resources and their associated metadata are organized, classified and stored in web-based repositories which are referred to as Learning Object Repositories (LORs). During the last years, a number of LORs have been developed worldwide including learning objects, which address different educational sectors and/or different disciplines. Despite the widespread development of LORs, it seems that their impact on supporting teachers and/or educational practitioners in enhancing their teaching practices has been rather limited. In our view this is due to the fact that existing LORs are lacking systematic mechanisms for relating their educational resources to their learning and educational context of use. On the other hand, it has been identified that teachers and/or educational practitioners would benefit from having access to best teaching practices, sharing their teaching practices with other teachers and/or educational

practitioners and reflecting on each others' teaching practices [6]. For this purpose, it is reasonable to consider and study the operation of web-based repositories of learning designs.

A Learning Design (LD) is defined as: "*the description of the teaching-learning process, which follows a specific pedagogical model or practice that takes place in a unit of learning (eg, a course, a learning activity or any other designed learning event) towards addressing specific learning objectives, for a specific target group in a specific context or subject domain*" [7]. An important part of this definition is that pedagogy is conceptually abstracted from context and content, so that pedagogical models can be shared and reused across different educational contexts and subject domains.

Similar to digital educational resources, LDs along with their associated metadata can be organized, classified and stored in web-based repositories which are referred to as Learning Design Repositories (LDRs). LDRs are built so as to support storage, discovery, retrieval, use, re-use and sharing of LDs and LD templates (that is, LDs without specific educational content [3]) among educational communities [3]. During the last years, a number of Learning Design Repositories have been developed such as: (a) the **Canadian LD Repository** (http://www.idld.org), which was developed in the framework of the project referred to as "IDLD - Implementation and Deployment of the Learning Design Specification", (b) the **Learning Designs Repository** (http://www.learningdesigns.uow.edu.au/), which was developed by the Australian Universities Teaching Committee (AUTC) project on ICT-based learning designs, (c) the **LAMS Repository** (http://www.lamscommunity.org/lamscentral/), which was developed by the LAMS (d) the **COSMOS LD Repository** (http://www.cosmosportal.eu/cosmos/), which was developed in the framework of the project referred to as "COSMOS: An Advanced Scientific Repository for Science Teaching and Learning "

Learning Design Authoring Tools

In order to empower teachers and /or educational practitioners to create LDs and/or LD templates and share them through LDRs, a number of LD authoring tools have been developed and used, which could be summarized as follows: (a) **MOT+ LD Editor** [4] is a stand-alone graphical authoring tool, which enables users to graphically design LDs and LD templates based on the interconnection of user defined learning activities. MOT+ LD Editor has been used for populating the Canadian LD Repository with IMS LD compatible LDs and LD templates and it can be also used for populating other LDRs that can support storage of LDs and LD templates, (b) **LAMS** (Learning Activity Management System) [8] is an open-source web-based graphical authoring tool, which enables users to graphically design LDs and LD templates based on the interconnection of pre-defined learning activities. It should be noted that users can not defined new types of learning activities. LAMS is used for populating the LAMS Repository with LDs and LD templates, which are not compatible with IMS LD specification. However, LAMS can export LDs and LD templates in IMS LD compatible format, so it can be used for populating other LDRs that can support storage of LDs and LD templates, (c) **ReCourse** [9] is an open source stand-alone authoring tool, which combines form-based and graphical-based authoring of LDs and LD templates based on the interconnection of user defined learning activities. Recourse can export LDs and LD templates in IMS LD compatible format and can publish them to existing LDRs that can support storage of LDs and LD templates, (d) **ASK Learning Designer Toolkit** (ASK-LDT) [10] is a stand-alone graphical authoring tool, which enables users to graphically design LDs and LD templates based on the interconnection of user defined learning activities. ASK-LDT can export LDs and LD templates in IMS LD compatible format and can publish them to existing LDRs that can support storage of LDs and LD templates. Additionally, ASK-LDT enables its users to characterize the learning activities used for developing LDs and LD templates based on a common vocabulary of terms derived from the "DialogPlus Taxonomy of Learning Activities" [11].

As we can notice from the description of the aforementioned LD authoring tools, some of them are developed, so as to directly support the population of existing LDRs with LDs and LD templates, such as MOT+ LD Editor, and LAMS and they can only be used indirectly to support also the population of other LDRs with LDs and/or LD templates. On the other hand, ReCourse and ASK-LDT are more generic tools that have been developed, so as to support the population of any LDR with LDs and LD templates. Additionally, a comparative advantage of ASK-LDT against other LD authoring tools is that it supports the characterization of the learning activities used for developing LDs and LD templates based on a common vocabulary of terms. This feature can support the process of representing learning designs in a standardized way following consistent terms and it can facilitate sharing and re-use of learning designs among the educational practitioners of a given community.

The PATHWAY ASK Learning Designer Toolkit

One of the main objectives of the PATHWAY Project (http://www.bayceer.uni-bayreuth.de/pathway/) is to support the adoption of inquiry based science teaching by demonstrating and disseminating best teaching practices. In this way the project targets to facilitate the development of communities of practitioners of inquiry that will enable teachers to learn from each other. Within this context and in order to support the science education teachers of the PATHWAY Project to design and share inquiry based learning designs, we defined a strategy that includes: (a) the expression of different inquiry based educational approaches, in the form of LD templates by using an existing LD authoring tool, namely the ASK-LDT, which was presented in previous section and (b) the customization of the selected authoring tool, so as to incorporate the produced LD templates and facilitate science education teachers to develop their LDs (based on these LD templates) and share them through the existing LD repositories.

The inquiry based educational approaches that were selected to be expressed as LD templates were based on the Inquiry Based Teaching Model, which is defined as "*a pedagogical approach that invites students to explore educational content by posing, investigating, and answering questions. This approach puts students' questions at the center of the curriculum, and places just as much value on the component skills of research as it does on knowledge and understanding of educational content*" [12].Figure 1 presents the learning activities flow of an indicative inquiry based LD template.

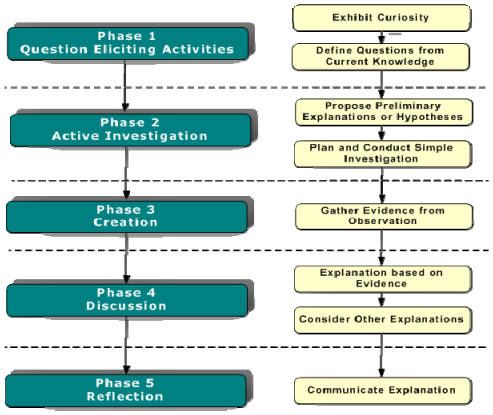

Figure 12 Learning Activities Flow of an indicative Inquiry based LD Template

The next step of our strategy was to incorporate the developed LD templates in the ASK-LDT, so as to enable science education teachers to develop their educational scenarios (based on the developed LD templates) and share them through the PATHWAY repository. The customized version of the ASK-LDT, which is used in the framework of the PATHWAY Project is referred to as PATHWAY ASK Learning Designer Toolkit (PATHWAY ASK-LDT) and it is intended to be used by science education teachers of the PATHWAY community The main functionalities of PATHWAY ASK-LDT can be summarized as follows: (a) the user can create a new LD based on a pre-defined Inquiry based LD Template - Figure 2 presents the process of creating a new LD based on the LD Template presented in Figure 1; (b) the user can characterize the learning activities of the LD by using a common vocabulary of terms based on "Dialog Plus Learning Activities Taxonomy" [12] – Figure 3 presents the process of characterizing learning activities of the developed LD; (c) the user can assign educational resources (html pages, images, videos etc.) to the learning activities of the LD Template or change the existing ones; and (d) the user can save a LD as an IMS LD Package (zip format) conformant with the IMS LD specification.

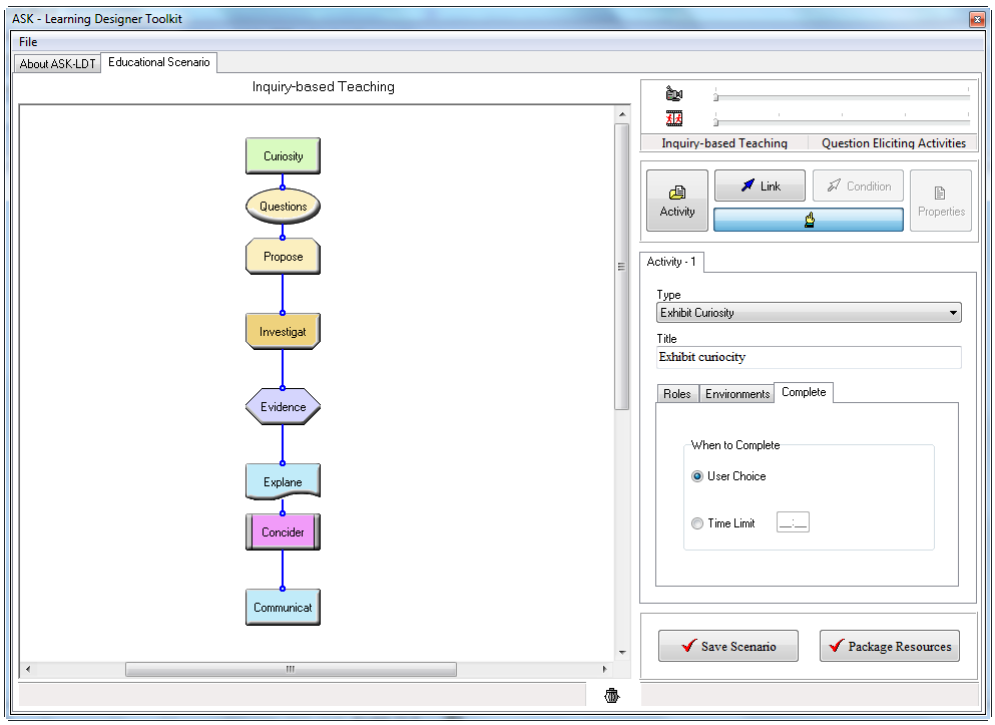

Figure 13 Creating a new LD based on an existing LD Template

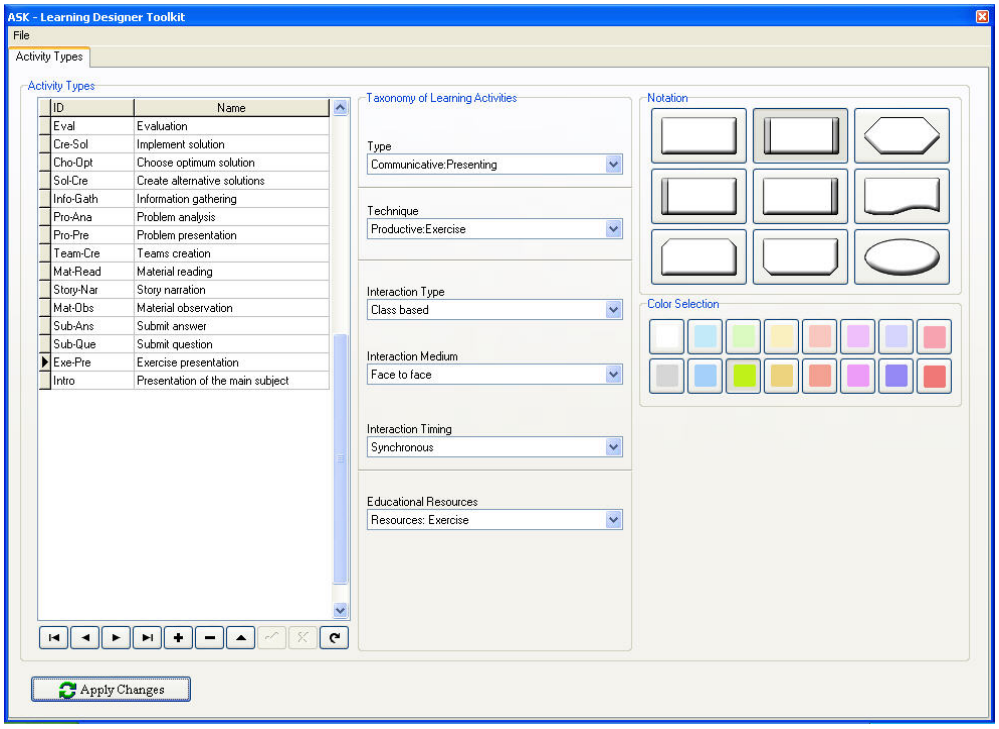

Figure 14 Characterization of the LD learning activities

Conclusions

In this paper, it was argued that teachers and/or educational practitioners are lacking consistent tools and strategies that will guide them in the process of developing inquiry based educational scenarios and share them through existing learning design repositories. For this purpose, we presented our proposed strategy that is used in the framework of the PATHWAY Project and it is based on the provision of LD templates (following inquiry based educational approaches) to science education teachers, so as to design their scenarios with the support of an existing customized LD authoring tool, namely PATHWAY ASK-LDT, towards sharing their scenarios though the PATHWAY repositories.

Acknowledgement

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AN APPROACH FOR DESIGNING EDUCATIONAL COMMUNITIES' WEB PORTALS: THE CASE OF THE PATHWAY TEACHERS' COMMUNITY WEB PORTAL

Demetrios G. Sampson, Panagiotis Zervas,
University of Piraeus and Centre for Research and Technology Hellas, Greece

Introduction

Communities of practice have become increasingly influential within several fields since they are identified as an important mechanism through which individual and group knowledge is created and transferred [1]. The concept of communities of practice has been proposed by Lave and Wenger [2], who define a Community of Practice (CoP) as: "a group of people who share an interest, a craft, and/or a profession. It can evolve naturally because of the member's common interest in a particular domain or area, or it can be created specifically with the objective of gaining knowledge related to their area of interest". CoPs that are facilitated by web-technologies are referred to as web-facilitated communities of practice or virtual communities of practice [3, 4].

The concept of CoP has also become very popular in the field of education and learning. As a result, educational communities of practice are being developed focusing on generating, sharing and reusing different types of educational knowledge [5]. The different types of educational knowledge, which can be generated and shared within educational communities of practice, can be divided into two types [6]:

- **Knowledge for educational practice**: this is formal knowledge depicted in the teaching practices that are constructed by teachers and/or instructional designers in an educational community and they can be used to improve the quality of teachers' day-to-day educational practice. This type of knowledge can be considered as explicit, since it can be articulated codified and stored in certain media [7, 8].
- **Knowledge of educational practice**: this type of knowledge is constructed: (a) by teachers based on their experiences about their students' learning and evidence of their progress in relation to given teaching practices, (b) by students based on their experiences about the delivery of given teaching practices provided by their teachers, and (c) by teachers-students interactions with these teaching practices. This type of knowledge can be considered as tacit, since it needs special effort to be codified and transferred [8].

In order to support the management of the aforementioned knowledge types within web-facilitated educational communities, in this paper we propose an approach for designing educational communities' portals by identifying a set of generic knowledge management tasks performed within web-facilitated educational communities and we apply this approach to the design of a model teachers' community portal.

Generic Knowledge Management Tasks

Tang et al. [9] have identified eight (8) Generic Tasks that can support typical knowledge management processes within web-facilitated communities of practice. For the purpose of our work, we have adapted these tasks accordingly, so as to be applicable to web-facilitated educational communities of practice and they are presented below:

- **Task A – Construct Knowledge:** During this task the members of the community (either as individuals or as members of a group) create new teaching practices (that is explicit knowledge for educational practice) and/or they provide their experiences in using available teaching practice (that is tacit knowledge of educational practice) using the available infrastructure. Both educational knowledge types can then be shared within the community (***Task C – Share Knowledge***)
- **Task B – Synthesize Knowledge:** During this task the members of the community (either as individuals or as members of a group) use the existing educational knowledge in its explicit form (namely, teaching practices) and/or in its tacit form (namely, experiences in using available teaching practices via forum discussions, blog posts, personal messages, social tagging and wikis), in order to support ***Task A – Construct Knowledge***.

- **Task C – Share Knowledge**: This task is twofold. The members of the community (either as individuals or as members of a group) (i) share the explicit educational knowledge (teaching practices) that was constructed during Task A and/or (ii) share their tacit educational knowledge through Web 2.0 tools (namely, blogs, wikis, social networks and social tagging).
- **Task D – Learn:** During this task the members of the community (either as individuals or as members of a group) use the knowledge presented in the community by either searching/retrieving it (***Task H – Search/Retrieve Knowledge***) or by using Web 2.0 tools (***Task B – Synthesize Knowledge***), so as to enhance their learning.
- **Task E – Evaluate Knowledge:** During this task the members of the community (either as individuals or as members of a group), perform some type of formal or informal (through simple reflections) evaluations on the educational knowledge which is presented in the web-facilitated educational community. The members may rate and comment on the teaching practices presented in the community by using Web 2.0 tools (***Task B – Synthesize Knowledge***.
- **Task F – Distill Knowledge:** During this task the members of the community (either as individuals or as members of a group), assess the design of explicit educational knowledge (depicted in teaching practices), in order to identify patterns that may lead to the extraction of general designs for later use and/or reuse.
- **Task G – Apply Knowledge:** During this task the members of the community (either as individuals or as members of a group) use the educational knowledge which is available in the community by applying it in their own educational practices. This can lead to the creation of new explicit and/or tacit educational knowledge (***Task A – Construct Knowledge***).
- **Task H – Search/Retrieve Knowledge:** During this task the members of the community (either as individuals or as members of a group) search and retrieve the existing educational knowledge that is available within the community, in order to support all the above mentioned tasks.

An Approach for Designing an Educational Community Portal

Porter [10] has proposed the AOF method for designing web portals. AOF method stands for Activities, Objects and Features and it includes three (3) general steps. For the purpose of our work, we have adapted these steps, so as to be applicable to web-facilitated educational communities of practice

- **Step 1 – Focus on the primary Activity:** This step includes the identification of the primary activity that the users perform in a web portal. For the case of web-facilitated educational communities the primary activity is the organization and sharing of the different types of educational knowledge (namely, explicit knowledge for educational practice and tacit knowledge of educational practice)
- **Step 2 – Identify the social objects:** This step includes the identification of the objects that users interact with while performing the primary activity defined in step 1. For the case of web-facilitated educational communities, the social objects are identified to the teaching practices that are available to the educational community members.
- **Step 3 – Choose the core feature set:** The final step includes the identification of the core feature set that will facilitate the users of the web portal to perform actions on the social objects defined in step 2. For the case of web-facilitated educational communities, the core feature set should be identified in response to the generic knowledge management tasks (presented in previous section) that the members of the educational community perform

Applying the Proposed Approach to the PATHWAY Teachers' Community Web Portal

The PATHWAY Project (http://www.bayceer.uni-bayreuth.de/pathway/) aims to support the adoption of inquiry based science teaching by demonstrating and disseminating best teaching practices. In this way the project targets to facilitate the development of communities of practitioners of inquiry that will enable teachers to share inquiry based teaching practices and learn from each other. For this purpose, in this paper we present how issues already discussed in this paper can be implements for the design of the PATHWAY Teachers' Community Web Portal.

The first step of the approach includes the identification of the primary activity that the teachers perform in the PATHWAY Teachers' Community Portal. This activity is the organization and sharing of explicit educational knowledge (depicted in inquiry based teaching practices) and tacit educational knowledge (depicted in teachers' experiences of using inquiry based teaching practices). The primary activity is achieved though the eight (8) generic knowledge management tasks, which have been identified in previous section.

The second step of the approach includes the identification of the social objects that the teachers of the PATHWAY Teachers' Community Portal interact with while performing the primary activity defined in Step 1. These social objects are the inquiry based teaching practices and scenarios.

The final step of the approach includes the identification of the core feature set of the PATHWAY Teachers' Community Portal. In order to achieve that, we identify a set of actions that can be performed by the teachers with the social objects (namely, the inquiry based teaching practices) of the PATHWAY Teachers' Community Web Portal in response to the set of generic tasks that constitute the primary activity of the PATHWAY Teachers' Community Web Portal. Table 1 presents the mapping between the generic tasks and the actions that the teachers of the PATHWAY Project should execute in response to the realization of these tasks.

Table 4 Generic Knowledge Management Tasks Mapped to Teachers' Actions from PATHWAY Teachers' Community Web Portal

Generic Knowledge Management Tasks	**Teachers' Actions with Inquiry based Teaching Practices**										
	Store	Search	Browse	View	Download	Rate/Comment	Bookmark	Automatic Recommendations	Annotate with Metadaata	Social Tagging	Discuss/ Collaborate
Task A – Construct Knowledge	✓	–	–	–	–	✓	–	–	✓	✓	–
Task B – Synthesize Knowledge	–	–	–	–	–	–	–	–	–	✓	✓
Task C – Share Knowledge	✓	–	–	–	–	–	–	–	✓	✓	✓
Task D – Learn	–	–	–	✓	✓	–	–	–	–	–	✓
Task E - Evaluate Knowledge	–	–	–	–	–	✓	✓	–	–	✓	✓
Task F – Distill Knowledge	–	–	–	✓	✓	–	–	–	–	–	–
Task G – Apply Knowledge	–	–	–	✓	✓	–	–	–	–	–	✓
Task H – Search/Retrieve Knowledge	–	✓	✓	✓	–	–	✓	✓	–	–	–

As we can notice from Table 1, all generic knowledge management tasks can be realized from at least one of the proposed teachers' actions. This means that the proposed teachers' actions have been well selected. Finally, we map the identified teachers' actions of Table 1 to specific features/modules that can be used for building the PATHWAY Teachers' Community Portal. Table 2 presents the mapping between teachers' actions and the features that are needed to support these actions.

As we can notice from Table 2, there are twelve (12) features/modules that need to be used for building the PATHWAY Teachers' Community Portal towards enabling teachers of the PATHWAY Project to organize and share explicit and tacit educational knowledge

Table 5 Teachers' Actions Mapped to Features/Modules of PATHWAY Teachers' Community Web Portal

Teachers' Actions with Inquiry based Teaching Practices	Features/Modules of PATHWAY Teachers' Community Web Portal											
	Storage Module	Search Module	Preview Module	Favourites Module	Feedback Module	Recommendation Module	Metadata Authoring Tool	Social Tagging Tool	Forum Module	Blog Module	Wiki Module	Social Networking Module
Store	✓	–	–	–	–	–	–	–	–	–	–	–
Search	–	✓	–	–	–	–	–	–	–	–	–	–
Browse	–	–	✓	–	–	–	–	–	–	–	–	–
View	–	–	✓	–	–	–	–	–	–	–	–	–
Download	–	–	✓	–	–	–	–	–	–	–	–	–
Rate/Comment	–	–	–	–	✓	–	–	–	–	–	–	–
Bookmark	–	–	–	✓	–	–	–	–	–	–	–	–
Automatic Recommendations	–	–	–	–	–	✓	–	–	–	–	–	–
Annotate with Metadata	–	–	–	–	–	–	✓	–	–	–	–	–
Social Tagging	–	–	–	–	–	–	–	✓	–	–	–	–
Discuss/Collaborate	–	–	–	–	–	–	–	–	✓	✓	✓	✓

Conclusions

In this paper, it was argued that it is important to design educational communities' web portals based on the tasks that are performed by educational communities' members for organizing and sharing explicit educational knowledge (depicted in teaching practices) and tacit educational knowledge (depicted in teachers' experiences of using teaching practices). For this purpose, we propose an approach for designing educational communities' web portals for supporting the management of the different types of educational communities' knowledge and we propose to apply this approach in the context of the PATHWAY Project for designing the PATHWAY Teachers' Community Web Portal. The results of this study can be used also for evaluating whether the features of existing educational communities' web portals are addressing the tasks that need to be performed by educational community members for organizing ad sharing the different types of educational knowledge.

Acknowledgement

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SUPPORTING NEW TEACHERS' PROFESSIONAL DEVELOPMENT IN SEVEN EUROPEAN COUNTRIES

Karolina Duschinska, Charles University in Prague, Czech Republic

The past decade different countries in European Union, supported by the European Commission, invested in supporting systems for beginning teachers, thus hoping to avoid that beginning teachers leave their teaching job. The solutions per country are very different. This contribution presents results of comparative analysis carried out in seven European countries (Netherlands, Finland, Slovakia, Bavaria, Hungary, Scotland, Czech Republic) in the area of induction phase of newly qualified teachers to investigate the different solutions. This research is part of the EU funded project "Induction Novice Teachers" (INNOTE 10/2009 – 09/2012). We present findings from the document analysis of policies in the different countries and relate this to actual conditions of beginning teachers in schools. Furthermore, we present interim results of the analysis of structured interviews with beginning teachers and will give a typology of mentoring systems in comparative perspective.

A PILOT CASE STUDY USING SCRATCH IN SCHOOL EDUCATION

Vasiliki Kapsimali, Demetrios Sampson,
University of Piraeus and Centre for Research and Technology Hellas, Greece

Introduction

Computer programming is a powerful means of teaching basic concepts implemented on mathematics, physics and logic as well as acquiring competences of problem solving. The typical way of teaching computer programming is by using a professional programming language and a number of programs full of mathematical symbols. However, this way of teaching has many limitations because the professional programming languages include a lot of instructions and syntactic rules which have to be adopted by students, occupying themselves with the technical details of the language rather than the basic concepts of programming [1].

In recent years, systematic efforts to transfer the traditional teacher-based teaching to student-based pedagogical methods are intensified. This means that the student has to research, to experiment with different things and to become more active in order to discover knowledge.

To this end, a number of educational programming environments have been developed such as MicroWorldsPro (http://www.microworlds.com) and LegoMindStorms (http://mindstorms.lego.com) to help students overcome the above mentioned difficulties of computer programming. One of these tools is Scratch (http://scratch.mit.edu), which is a famous programming environment used for teaching computer programming.

In this paper, we present a pilot case study using Scratch in teaching Computer Programming to students of senior high school and especially in supporting their understanding of the selection and repetition structures.

Scratch

Scratch [2] is a programming tool, based on LOGO, which allows young programmers to easily create multimedia applications and simple games by using its different blocks. Block programming eliminates the frustrations of syntax errors which discourage novices from learning traditional computer programming languages.

Scratch has also an online community where anyone can share his Scratch applications in a creative and educational exchange. Additionally, the community gives to anyone the opportunity to exchange ideas and opinions with other creators and to participate to a community of experience and learning.

Scratch is used globally in many schools and educational organizations. Furthermore, Scratch offers a web site for educators (ScratchED), where they can share their applications, exchange experiences and get connected to other educators who also use Scratch. There are also researchers, who use Scratch in their research studies. Next, we present two (2) of these research studies.

The first research study [3] took place in a computer science department of a summer school of Harvard University and its aim was to reveal the students' thoughts about Scratch and their easiness or difficulty in learning Java afterwards. The results showed that the students characterized Scratch as an easy-to-learn programming tool and that the majority of them without any previous programming experience consider Scratch as a positive influence before starting programming with Java.

The second research study [4] took place in a department of Preschool Education in Greece and its aim was to get undergraduate students familiar with Scratch in order to be able to produce their own educational scenarios and resources. The results showed that the university students learned Scratch very easily and that most of them developed solid educational applications with Scratch.

Thus, in our study we aim to conduct a pilot case study on using Scratch in supporting senior high school students' towards understanding the selection and repetition structures in Computer Programming. This work has

been conducted as part of the first authors MSc Thesis work in the Masters' Programme "Technology Education and Digital Systems" (Area of e-Learning) of the Department of Digital Systems of the University of Piraeus [5].

The Study

The presented experiment was a pilot case study, which is a small-scale investigation taking place before the main research in order to reduce the uncertainty of the parameters of the main research [6]. Our aim was to study students' opinions towards programming and their understanding of basic programming structures and curriculum's specific educational objectives. To this end, the following questions have been investigated:

1. Would students' opinion towards programming become more positive after the experiment?
2. Could the online community of Scratch help the students in developing communicative and collaborative skills?
3. Would the students understand easily the selection and repetition programming structures through this particular Scratch-based intervention?
4. Would the students achieve and to what extent the relevant national curriculum's specific educational objectives through this particular Scratch-based intervention?

The experiment was conducted with 20 senior high school students over three 2-hour sessions. At the beginning and at the end of the experiment students were given questionnaires so as to be able to compare students' opinions before and after the experiment. During the experiment, students worked in small groups of 2 people and through appropriately generated worksheets they experimented (change or expand) with existing applications in Scratch (and they created their own, based on which they were assessed).

The teaching model followed in this experiment was "The Learning Cycle" model [7]. This model is commonly used in the fields of physics, mathematics, as well as computer science discovery of knowledge in involved. "The Learning Cycle" teaching model includes the following phases: (a) **Exploration**: where the students learn through their actions, (b) **Concept Introduction**: where the teacher presents the concept to the students through appropriate visual material and (c) **Concept Application**: where the students apply the newly-acquired knowledge to new applications.

According to the aforementioned phases our educational intervention was organized in the following phases (we added another phase in the beginning because the students were not familiar with Scratch):

1. Demonstration and students' familiarity with Scratch: During this phase the teacher demonstrated to the students the different functionalities of Scratch and afterwards she provided them different applications in order to familiarize them with the programming tool.
2. Observation and experimentation of an application and its code in Scratch: During this phase the teacher presented to the students a game which had been constructed in Scratch and she encouraged them to interact with it, without revealing any programming code. Then, she revealed the code to them and she urged them to change or expand the game through a well-organized worksheet.
3. Presentation of the selection and repetition programming structures: During this phase the teacher presented to the students the different types of selection and repetition programming structures that exist in Scratch and their functionalities. Afterwards, she encouraged the students with a second worksheet to identify the previous programming structures to the code of the game with which they occupied themselves the previous didactic hour.
4. Programming structures implementation on new applications in Scratch: The students were encouraged to apply the newly-learned selection and repetition programming structures to new applications in Scratch, by changing or expanding them through a third well-organized worksheet.

The Results

Table 1 shows the results that were gathered from the questionnaire concerning the difference to students' opinions before and after the experiment. From these results, it appears that students' opinions concerning the understanding of the selection and repetition programming structures and their interaction with Scratch were positive.

Table 6 Difference to students' opinions before and after the experiment

Sentences	Possible Answers		
	Totally Disagree/Disagree	Not Agree/Not Disagree	Agree/Totally Agree
I like computer programming.	-32.58%	+18.1%	+14.48%
I feel stress during a lesson of computer programming.	+28.85%	-19.71%	-9.13%
I enjoy participating in lessons of computer programming.	-20.82%	+4.52%	+16.28%
I am afraid of computer programming.	+26.24%	-14.93%	-11.32%
Computer programming needs a lot of effort.	+33.48%	-9.05%	-24.43%

Figure 1 and Figure 2 present the results that were gathered from the questionnaire concerning the online community of Scratch. Concerning the results, Figure 1 shows that 52,94% of the students would upload their applications to the online community of Scratch, while 23,53% of them might upload their applications. Accordingly, Figure 2 shows that 47,06% of the students disagree that they would never write to the forums of the online community of Scratch, while 17,65% of them might write to the forums.

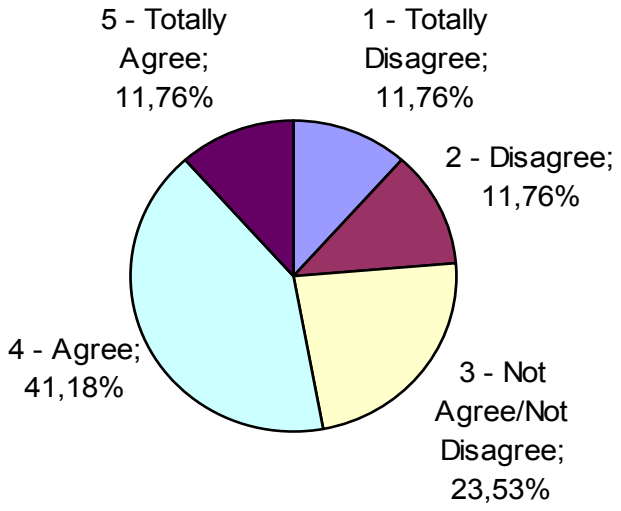

Figure 15 Students' answers to the question
"When I create a new application in Scratch I will upload it to the online community".

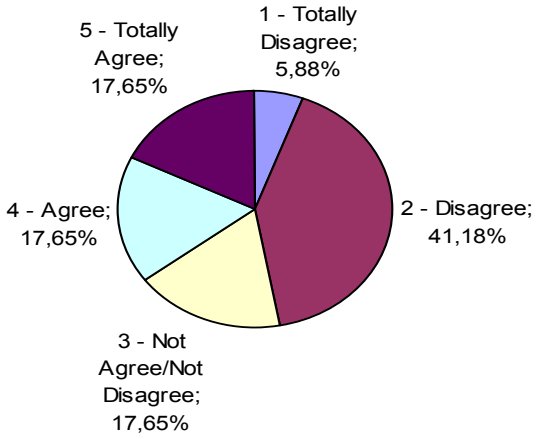

Figure 2 Students' answers to the question
"I would never write to the forums of the online community of Scratch".

Finally, concerning the results that were gathered from the students' worksheets and the observations of the teacher, 9 out of 10 teams identified and explained the function of the selection and repetition programming structures in the code of an existing application of Scratch and 8 out of 10 teams changed or expanded the new applications in Scratch through the third worksheet.

Conclusions

The students were excited with Scratch and they found it a useful tool in learning programming. By using Scratch, the students easily understood which programming structure they have to use in each case. Another very important result is that students' opinion towards programming seems to become more positive after the experiment. The visual environment of Scratch seemed very friendly to the students, as they became quickly familiar with it. Finally, the students appeared very willing to upload and share their applications in Scratch as well as participating in the forums of the online community of Scratch.

During the lessons occurred also some results that were not perceptible through the students' questionnaires. For example it seemed that the students developed critical and collaboration skills, as most of the time worked in teams and they have to take the right decision after the appropriate discussion inside their teams.

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BRIEF STRUCTURE OF THE PROCESS OF INFORMATION TECHNOLOGY TRAINING FOR TEACHERS

Ivailo Burov, Dragomir Marchev, Valeriya Ivanova, Shumen University, Bulgaria

Abstract

This Poster offers a brief structure of the process of information technology training for students that study a pedagogical specialty at the university. The proposed structure is a result of the authors' work of many years in the field. The structure is tested at Shumen University.

Content

Information technologies are one of the most dynamically developing fields. This development gives more and more new opportunities which could be applied in the modern education. Unfortunately these opportunities are usually applied mostly in the training on information technology while their application in the pedagogy practice is dropping behind.

The design of a modern educational product usually is a result of the work of specialist of from different fields – IT specialists, trainers and methodologists, teachers.

This process requires a joint connection, continuous coordination of ideas, visions and activities on its design. One of the reasons for such a dropping back is the difficulties during the establishment of a similar organization.

Even if a proper organization is created, there is another problem – the change of the curriculum. This requires new efforts for changing the teaching materials which are included in the already designed software product for training. Partially this problem is overcome by the unification of these products in the process of carrying out of the activities of projects such as: *LD-skills: Development of Learning Design Skills for Enhancing Students' Key Competencies* (Tzikopoulos, A., 2010); *The Pathway to Inquiry Based Science Teaching",* (Bogner, F. and Sotiriou, S., 2010).

As a result the design and the maintenance of a similar training product is often a commercial software at a comparatively high price.

On the other hand the universities and the schools have the resources for design of a similar product from the development of software platform to the design of the relevant didactic materials. They are directly engaged in the training process which could provide a better adapted result. A similar experience for usage of software technology for the design of didactic materials for training in mathematics at Shumen University is described in Toncheva, (2011).

For this purpose we propose a structure, whose application gives opportunity for generation of a training product as a result of the training at the university.

This structure includes the design of the program environment for training, organization and interaction between lecturers that teach different subjects, students and teachers.

As a final result in the of end of the training on IT each student selects, structures and generates educational content, presented with the latest possibilities of the information technologies, under the supervision of their university professors in IT, methods of teaching and with the participation of the relevant supervising school teacher.

This educational content is included as a part of the knowledge base of the used software platform for training and then is provided to the schools.

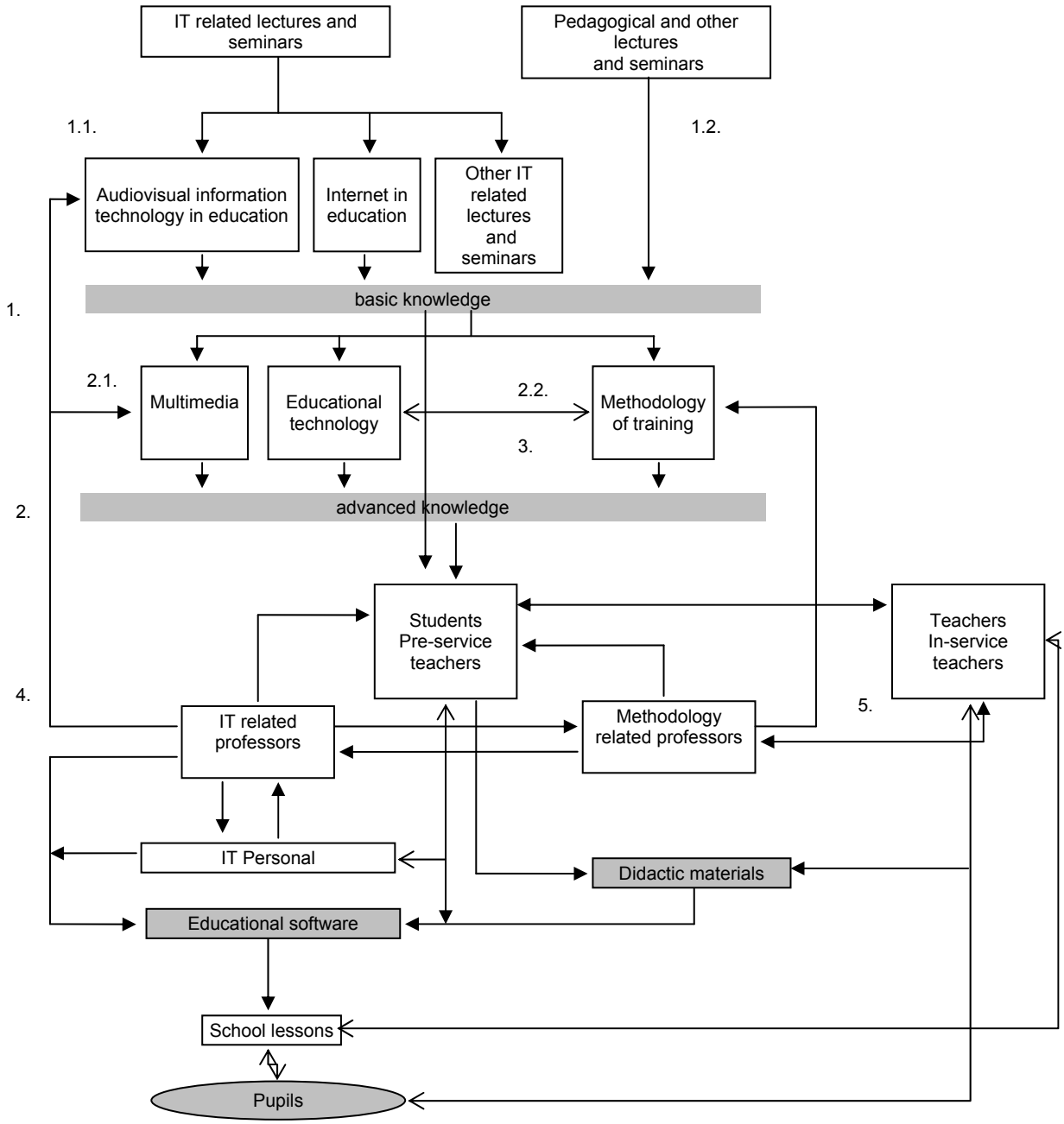

Figure 1

1. Acquisition of basic knowledge
1.1 Acquisition of basic knowledge of audiovisual information technology: Graphics processing, audio editing, video editing, web development, etc.
1.2. Acquisition of basic knowledge related to the student's educational focus
2. Acquisition of advanced knowledge
2.1 Acquisition of advanced knowledge in educational technology and multimedia: Animation, interactive methods, software development of interactive multimedia teaching materials
2.2 Acquisition of methodological knowledge
3. Interactions between advanced knowledge of information technologies and methodologies.
4. Interactions between academics, students, teachers, IT specialists
5. Interactions between University training and basic practice at School: Educational software with interactive multimedia teaching materials.

Conclusion

As a conclusion we would like to generalize that the proposed stricture offers the following advantages:

- Design of a complete product and teaching materials in training, ready for use in practice
- The acquired knowledge and developed teaching materials can be used directly in the practice of the future teachers
- The development of software and training materials are part of the learning process on campus and can be used for free by the schools
- It is not necessary to purchase expensive commercial products.
- The future teachers are authors of the lessons. Methodology, scenarios and audiovisual materials are selected by them under the supervision of a methodologist.
- Schools acquire new interactive multimedia training materials after each graduated student at the University, Thus, expanding the knowledge base in schools.
- The software is developed by experts directly involved in the education system
- The development of interactive multimedia lessons is a result of the collaboration of university professors in information technology, trainers, students and teachers

Acknowledgements:

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E-ASSESSMENT AND TRAINING TOOLS FOR SCHOOLS

Giannis Diolatzis, 4th High School of Mytilene, Greece

The suite consists of two main programs and one utility which can be installed in any PC.

The first one (e_test_teacher) is used by the teacher and the other one (e_test_student) by the students. With the use of the (e_test_teacher) the teacher can easily create questions (multiple choice questions , true/false questions and match questions) and the students, via the second program (e_test_student) which is installed to their PC's, can be trained.

Running e_test_student , student (in separate PCs), can check their knowledge in real time.

If the teacher plans an exam at a specific date, the students from their PCs could be tested and their answers are immediately sent to the teacher PC. In this way, the teacher has at once the exam results.

All these questions is only one Access Database, that the two programs share, so it's obvious that when there is a data transfer between the teacher PC and the student PC this can only be achieved if all these computers are connected to a LAN.

This suite not only does it have LAN capabilities but also the students can install their program to their Home PC and thus could be trained individually.

The suite has one more mini program update_data_base. The purpose of this program is to update the questions database. With this program question database can be downloaded from a FTP Server teacher previously uploaded to.

This project can be used in any subject and the questions can be presented in any language.

This project, also, offers the opportunity of workgroup exam.

Students are grouping to workgroups (group1, group2, group3,..) and share the questions. Then each group answers the questions and their answers are automatically sent to the teacher PC.

In that case while students are divided in workgroups, the teacher (via an option program provides) can examine each student separately

The Project has the following characteristics and capabilities

1. Examining and evaluating students or workgroups at the same time
2. Flexibility in training in different subjects and/or languages
3. Global fitting in every school worldwide, since the teacher of every school can define the level of difficulty
4. Home PC running or LAN PC's running.
5. Real time updating in questions (Upload to FTP or download via FTP).

POWER OF A POINT FROM A CIRCLE VIA GEOBRA

Dionysis Theocharis, National and Kapodistrian University of Athens, Greece

Abstract

According to the new data on education, the traditional teaching model and the focus in the curriculum vitue is not sufficient anymore, so the search for more and more educational innovations with an additional educational value is in the spotlight. This paper scenario that was created for students of high school for the lesson of Geometry (power of a point from a circle) it is an application of educational adaptation via new technologies and specific the mathematic program Geobra.

A scenario in general, as a technique is designed to cause thinking and reflection (to the children) about the future, in a strategic planning framework (Cowan, 1998), does not aim to predict, but rather to detect possible future developments in this (Kinigos, 2006). So, we will try to show how valuable and necessary is the new technologies at Mathematics

Keywords: new technologies, didactical model, individual communication

> *"Now more than ever is necessary to incorporate the Information Technologies and Communication in Greek education ...." "The new technologies in education are able to significantly the status there is in education and to contribute both the cultivation of a new pedagogical culture and the cultivation of new attitudes and skills, while providing some educational experiences that change the student from simple receiver of knowledge to a person with active participation in education ... "*

In the Information Society, classes exploit the potential of computers and of the Internet and students from home can seek fast facts and information, communicate with other classmates and professors and to electronically submit the results of their work. An example in education is the project "Training of Teachers in the Utilization of Information and Communication Technology in Education."

Programmed instruction

It is carefully designed teaching in small steps, which presents information in a linear fashion and requires the student to give a specific answer to each step.

The second phase (1970-1980) was characterized by computing approach. During this phase, the H / Y was used as a teaching tool and in addition as a learning tool. The same period was tried to learn programming and they developed programming languages like Logo and Basic. At the same time they had the appearance of the first pilots (primarily) at high school applications were mostly mentoring programs (tutorials) and practice (drill & practice). Minimum software applications were simulated and experienced instructional systems.

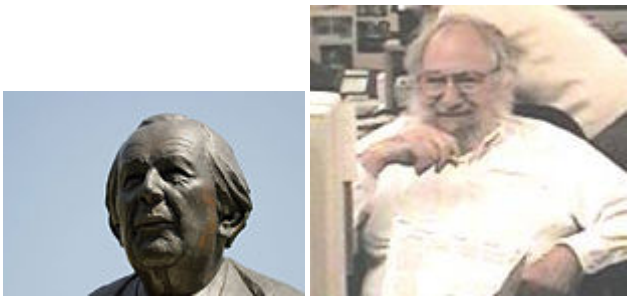

Figure 1 Jean Piaget, exponent of Seymour Papert were, founders of Logo

The third phase (1980-1990) saw the widespread introduction of information technology at all levels of education. During this period we had the huge demand for personal computers and dropped by several times the costs began developing them. During this phase we can talk about integration of new technologies in education in education and not just for admission. The data used either as a teaching and learning or as an object of education.

The fourth phase (1990-present) is characterized by the use of new technologies in education in education as a means of teaching and learning. The software is no longer behavioural type, but constructive and promote higher-order thinking processes of students / three. They have been used to wide computer networks, the Internet, hypermedia and multimedia, software simulation, virtual reality and collaborative learning environments.

Figure 2 Leu Vigkotski, founder of the social and cultural theory

Computers and teaching

In educational practice distinguish four approaches to new technologies in education use:

1. computer learning objects (learning on the computer)
2. computer in the role of teacher (learning from the computer)
3. computer associate of the student (learning with the computer)
4. underlying computer learning (learning the computer to run commands)

The first approach (learning on the computer) refines the computer literacy and also makes the computer learning object. This approach reflects the central model of integration of new technologies in education in education.

The second approach (learning by computer) places the computer in the role of the teacher knowledge and control of the student / three to teaching computer programs, practice and practice, tutorials, and experienced teaching systems.

The third approach (learning by computer) places the computer in the role of cognitive tools, partner the student's discovery of knowledge and is learning with the help of computer.

The fourth approach (learning the computer to execute instructions) puts the computer in the role of the student, the student schedules the computer with the language logo and & in this way to "teach"

According to new data on education, therefore, the traditional teaching model and the focus in the curriculum is not sufficient, so the search for educational innovations with additional educational value is in the spotlight. This job-training scenario that was implemented for the course "Teaching" of the Graduate Studies' Teaching and Methodology of Mathematics "aims to be such an innovation.

One scenario in general, as a technique designed to cause thinking about the future in a strategic planning framework (Cowan, 1998), does not aim to predict, but rather to detect possible future developments in this (Hunter, 2006).

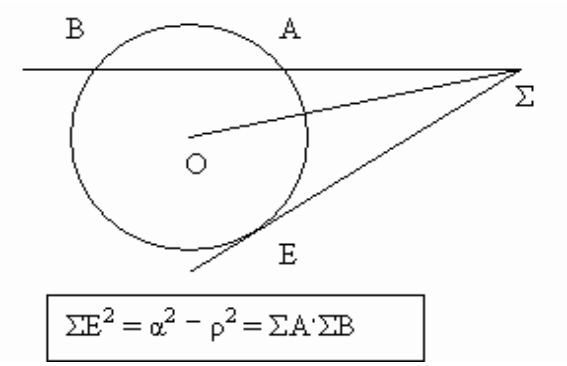

Figure 3 Power of a point from a circle

Students who primarily addressed in this scenario are high school students or older, with good knowledge of mathematics, students positive note.

- **Implementation time**
  This scenario is implemented in 6 credit hours and is divided into 3 phases, 3 two-hour. These phases may be within a week, but depending on the instructor can be made and more infrequent.
- **Area of implementation**
  Students in the implementation of first phase of the scenario that is to do by hand will work in the classroom and in the implementation of the second and third phase of the script will work entirely in the computer lab of their school.
- **Background Information for students**
  Knowledge of geometry b school power point of a circle!!!

Figure 4

“The Geometer's Sketchpad” is a powerful tool for teaching and learning of geometry, algebra and trigonometry.

This very good program is an excellent tool for the design, presentation and understanding of simple geometric shapes up complex structures.

“The Geometer's Sketchpad” is useful for teachers, students and for anyone who feeds a liking for the Euclidean geometry and plane figures (unique tool).

Around the GeoGebra has been created a large and active community of mathematicians from around the world.

The program combines features of GeoGebra dynamic geometry (Geometer's Sketchpad, Cabri, Cinderella, EucliDraw, WinGeom) and graphics programs (Graphmat, WinPlot).

Provides the ability to create dynamic worksheet format website (html). Creates graphics language Postcript (eps) but if the graphics are exported as png can be imported as images into simple Microsoft Word documents and other applications.

Analysis of activity

We invite students to draw on the sketchpad on the basis of their knowledge of geometry (b high school) circle of radius r and a fixed point outside the circle named M

I bring semi straight line the points M and intersects the circle at points A and B passing though the center of the circle

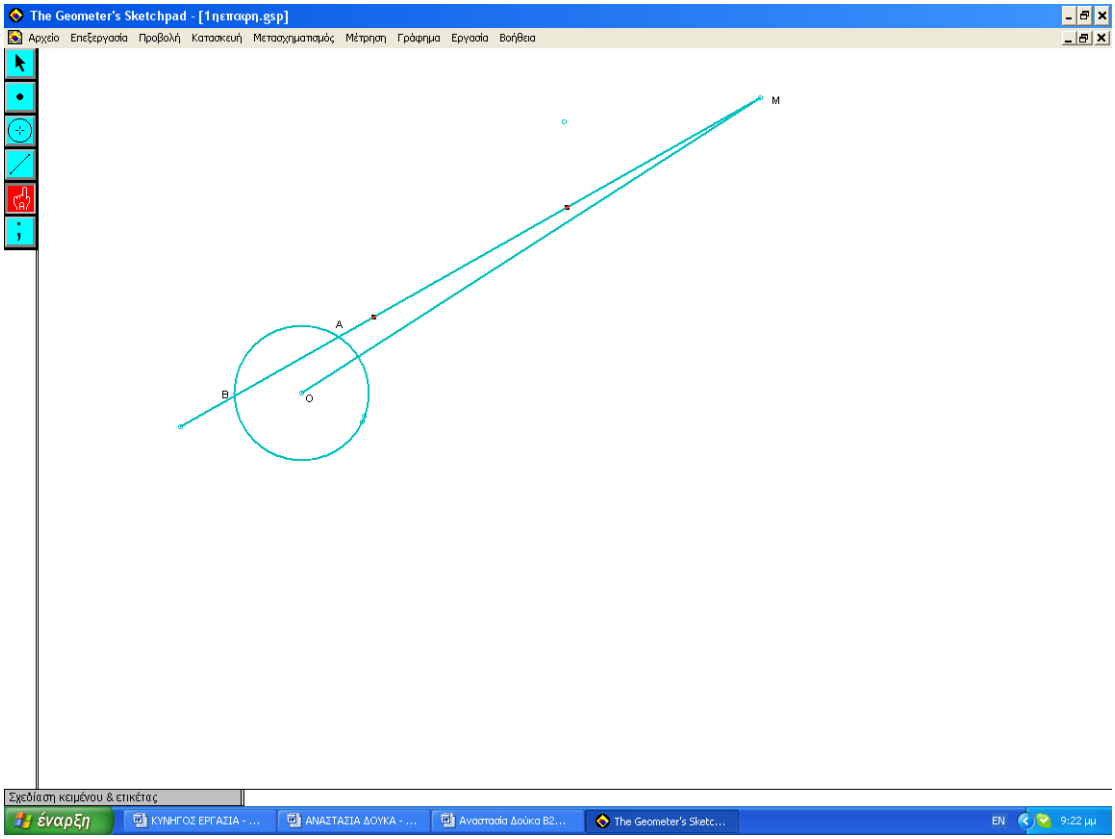

Figure 5 I MA * MB = (M - R) * (MO + P)

After telling the students the necessary theory and of course observe their reactions and moreover their comments to submit questions to see if they have a good understanding of the theory and intent of the training to become a helper in their own effort, bringing the second semi straight line not passing through the centre cycle and cuts in 2 other places we call C and D and see that gender is relevant wherever you move the imieftheia over the circle or wherever you put the point M

Extension of the activity

We simply modify the existing problem as follows:

Use a mouse to do one straight line and tangential to the circle at point A. And check if any gender theory ➔ MA2 = MO2-P2

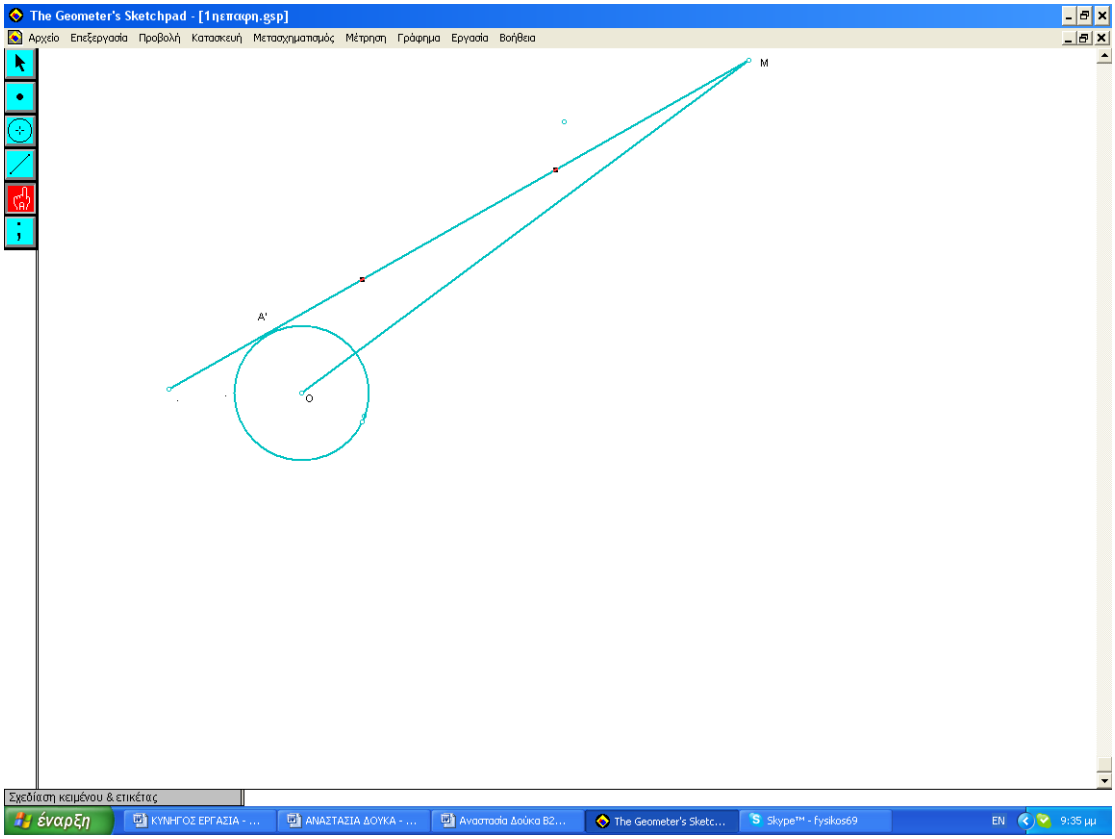

Figure 6

Exercises – applications in this scenario

1. In the figure, the PE is tangent to the circle. If AB = 9, RG = 4, DG = 5
    a. compute / find the RA
    b. The PE is equal to A.9 B.5 C.4 D.3 E.6
2. We make a circle (O, R) a chord AB and random point P of AB. To prove that
3. We make a triangle ABC inscribed in a circle (O, R), the average T of the Bf MN perpendicular to the diameter of Al (Al N). To prove that (Theorem interstitial and metric relations in a circle)
4. If circle (O, R) we make point P outside for which it is OP = 2R. A. For the price of the radius of the circle with R = 2 we consider the RAV line that intersects the circle at points A and B as RA = 2ab.
    a. To find the length of the chord AB.
    b. To find the type of triangle OVR.
    c. If the point M is the middle of the segment PB, find the distance of M from the center of the circle O.
    d. To calculate the projection of the radius of OV on the line OP. To express the power of point P on the circle (O, R) as a function of R. B. If DR (O, R) = 12 find the radius of the circle R.
5. We make a circle (O, R), a diameter AB and points C and D AB to OG = OD = d. If P is a random point of the circle (O, R) and E, G are sections of RG and RD respectively the circle, prove that: i. Dg = and GI = (d <R); ii. + = Constant.

Conclusion

Review of the scenario

We have a lot of positives and negatives that makes us understand better the use of this mathematic lesson with the help of mathematic programs:

(+) With the use of specific software that students can experiment, it is easy to design shapes that would otherwise be too complex and also they feel creative.

(+) It can be applied to a variety of ages and cause of the interest of the students

(+) The activities are relatively straightforward, however, even with some guidance achievable by all students, which creates feelings of satisfaction, the students experience success by themselves and it works very well on pupils with a negative attitude toward mathematics.

(+) The scenario focuses on teamwork and cooperative learning

(-) For data in a common classroom scenario is time consuming and maybe if time is limited, to the detriment of other issues, which in practice may be more 'useful' to the students, the development of its own course in Mathematics

(-) This scenario is difficult to implement in a classroom where students exist with significant deficiencies in mathematics, because it is addressed mainly to students with good skills in mathematics.

(-) The script requires students with a leap of inspiration for reaching the goal theorem which is done without the considerable and systematic intervention of the teacher.

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THE UNIVERSE QUEST – GAME DEVELOPMENT AS A VEHICLE FOR ENGAGEMENT IN STEM LEARNING.

Andrew MacPherson, LEARN Technology Projects Management Ltd, United Kingdom

Abstract

Working initially with 50 mostly minority young women in Oakland California and now also with young people in Portugal the Universe Quest project aims to enable newly recruited participants to learn how to gain confidence in STEM skills and careers. UQ participants are engaged in working with professionals from the Lawrence Berkeley Space Sciences Laboratory at UC Berkeley, developers from Learnit3D and the Girl Scouts of Northern California. UQ is a program of 2 hour after school workshops, along with monthly field trips and frequent video conferences.

With IT Company partners girls on the program are working to create a UQ, participant developed, internet game as the primary medium for sharing outcomes and recruiting future participants.

As part of the project a wide ranging STEM related asset pack of 3D resources has been created which along with the software tools utilized and supporting materials are available free to use by interested educators in their own classrooms with their own learners.

There is great potential for teachers and learners to establish collaborative development internationally through engagement with the UQ community.

UQ utilizes creativity with engaging, cutting edge gaming technologies which are current and relevant to children as a vehicle for exploration and sharing of STEM.

NIKANDROS PROJECT: INITIATION TO ANCIENT GREEK MUSIC IN PRIMARY SCHOOL THROUGH THE MOODLE LEARNING PLATFORM

Chara Leontari, Anastasia Georgaki, University of Athens, Greece

Abstract

This demonstration deals with the creation of an online course on Ancient Greek music (AGM). The course entitled *Nikandros* is an introduction to the theory, instruments, remained fragments, music interpretations and social issues of the Ancient Greek music (AGM) at the classical period. It has been designed on the Moodle learning platform and has been presented to fifteen students of the fourth grade in Primary School of Lampsakos (Evia) during the spring of 2011. Students had the opportunity to work at the school's computer laboratory on AGM via new technologies (Moodle LMS). The outcome of this experimental teaching and learning experience was most encouraging towards further research and development of the project.

Elements of ancient Greek music (history, musical instruments, theory, social operation, esthetics) are not included in the analytic program of the Ministry of Education neither for the primary nor for the secondary music education. Nevertheless, by this experiment we try to support that elements of Ancient Greek music should be included (under conditions) in the frame of the primary musical education of Greek students because it is directly related to their cultural heritage and the educational aspects of museology (visiting museums and archeological sites), in order to learn better the rich culture and history of the place where they are born and live.

On the other hand, the initiation in AGM may also help young students to understand the roots of the occidental music and have an interdisciplinary approach of mathematics, history, geography, other arts through music, as also make them better understand some social issues of life in ancient Greece at the classical period.

Nikandros, designed on the Moodle LMS is addressed to students of Primary School. The evaluation of our experiment during spring 2011, leads us to conclude that Nikandros stands as a very optimistic paradigm of using Moodle as a teaching tool for young students, and as a perfect media for the first contact with the field of AGM, which can be applied also in other European schools.

The scope of this demonstration is to present the realization of a project based completely on pedagogical axes that teachers of all fields are familiar with:

- Axis 1: Interdisciplinary Approach (mathematics, arts, social issues, history)
- Axis 2: Theories of Construction of Knowledge
- Axis 3: Method Project and Collaboration Method
- Axis 4: Distance Learning Method
- Axis 5. Methodology of evaluation

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THE ODYSSEY AUDIOBOOK: PROSODY AND SINGING TRAINING IN PRIMARY SCHOOL THROUGH ICT

Anastasia Georgaki, Kwstas Katsantonis, Niki Harlavti, Kwstas Pantaloudhs, Xryssanthi Zertopouli,
University of Athens, Greece

Abstract

The voice of the Greek in the time of antiquity was named («áőäŢ» av-thee). This is not an accidental word, as it emanates from the verb («Üäů» ah-though), which means I sing. As writes the great Greek poet and academic Nikiforos Brettakos…

In this demonstration we present an audio book that has been created by the collaboration of the students of the Music technology group (Music Department, University of Athens) and children of the 3d grade of the Primary school, St.Paul, focusing on the interpretation and processing of children's voice on modern and ancient Greek text. The modern text has been created by their teacher Iliana Abazoglou, and the prosody of the ancient Greek text has been taught by Dimitrios Karalis. The songs have been crated, orchestrated and performed by students of the music technology group of the Music Department, Athens University under the subvention of the Assistant Proffessor Anastasia Georgaki.

The scope of the creation of this audio book was:

1. Comprehension of the theatrical and musical issues of the voice by the feedback of the computer.
2. Comprehension of the syntax of a sentence, the differences between narration, recitation, dialogue, expression of sentiments, chant and singing.
3. Initiation to the musicality of the ancient Greek text of Odyssey (by Homer) and the power of the rhythmic recitation (tutor Dimitris Karalis).
4. Comprehension of the power of creative technology and its different issues in creating music and virtual soundscapes through sequencing and audio recording and processing.
5. Have an interdisciplinary approach of the history, ancient Greek literature, as also Greek traditional instruments.
6. Vocal preparation for the final performance on stage

The main work for recording and processing the sound material has been done at the Cubase SX environment with the use of many external MIDI and Audio interfaces.

The audio book will be uploaded in the Moodle platform and will be used by PhD candidates in the classroom for the evaluation of the prosody, quality and accuracy of voices as a tool of prosody and singing comprehension.

It is important to initiate children at the whole acoustic character of a language always known for the exceptional beauty of its writing, in its literary art-prose as well as poetry.

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AUGMENTED REALITY IN EDUCATION

Sofoklis Sotiriou, Angelos Lazoudis, Ellinogermaniki Agogi, Greece,
Hagen Buchholz, Fraunhofer Institute for Applied Information Technology, Germany

Over the last decade the rapid evolution of technology applications has yielded new ways to develop applications and approach learning. Augmented Reality (AR) is such a technology that offers a new educational approach in helping learners develops critical capacity and deeper understanding of the concepts underlying scientific investigation. Moreover, AR enriches the repertoire of learning opportunities and helps meet the challenge of "science for all", i.e., providing science education opportunities tailored to diverse and heterogeneous populations. Many augmented reality applications have been designed especially for enhancing education and promoting population's interest in science by building on the strengths of both formal educational settings (e.g. schools) and informal learning environments (e.g. museums). Our workshop aims at the presentation (some hands-on) of such AR technology initiatives in science teaching both in formal & informal educational environments that facilitate lifelong learning by offering to learners the opportunity to gain exposure to everyday science in a way that is appropriate to their individual level of understanding.

DEVELOPING PROGRAMMING SKILLS BY MEANS OF MODERN EDUCATIONAL PROGRAMMING LANGUAGES

Nektarios Moumoutzis, Technical University of Crete,
George Papadopoulos, Vasiliki Kalkani, Sotiris Sotiropoulos, Ellinogermaniki Agogi, Greece

The aim of the workshop is to increase the awareness of Computer Science teachers on the fact that programming is a core competence for advanced computer literacy (IT Fluency) for the creative usage of modern tools and to enable them in making their introductory programming courses creative and effective by particularly focusing on Educational Programming Languages. After a comprehensive analysis of a number of Educational Programming Languages (e.g. SCRATCH, ALICE, Squeak-Etoys etc), the organizers of the workshop have selected SCRATCH for training teachers and enabling them to develop the programming skills of their students in pedagogically-rich ways. To this line, the objectives of the workshop are: (a) to introduce SCRATCH; (b) to discuss its use in the classroom; (c) to have a hands-on experience with SCRATCH; and (d) to present important issues related with the design of pedagogically-driven scenarios that will enable teachers to create their own learning activities encompassing objectives, intended learning outcomes, roles and the educational environment (e.g. tools and resources deployed).

Participants are requested to bring their laptops in the workshop in order to be able to follow the learning activities that will introduce them to Scratch. It is recommended to install Scrach before the workshop. It can be downloaded from http://info.scratch.mit.edu/Scratch_1.4_Download

SCIENCE CENTER TO GO

Hannu Salmi, Heureka Science Center & University of Helsinki, Finland,
Angelos Lazoudis, Ellinogermaniki Agogi, Greece,
Hagen Buchholz, Fraunhofer Institute for Applied Information Technology, Germany

Modern technologies like Augmented Reality (AR) are often used on Science Center (SC) exhibits enabling visitors to a) experience science first hand by actively manipulating the experiments and b) enhance their understanding through the display of otherwise hidden phenomena. In our workshop we will present the "Science Center To Go" (SCeTGo) approach that goes one step further and brings similar comprehensive learning experiences out of the SC into a school's classroom and/or everyone's home. Its miniature exhibits - by "fitting into a suitcase" and operating with ordinary hardware - enable learners to experiment whenever and wherever they please. During our workshop educators will have the opportunity to interact with our five miniature exhibits that illustrate various physical phenomena linked to secondary school curricula: sound wave propagation, rigid body (double cone) motion on an inclined plane, wing dynamics, wave-particle duality and gas particles' velocity distribution. Furthermore, they will be informed about existing advanced educational materials (including pedagogically designed lesson plans, tutorials and AR software guides) that enable the SCeTGo approach to be implemented in secondary schools.

TEACHER DIGITAL COMMUNITIES: BUILDING INNOVATION TOGETHER

Agapi Vavouraki, Christina Bourouni, Eleni Smyrniotaki, Ellinogermaniki Agogi, Greece

Abstract

The workshop presents and discusses a working paradigm of a school teachers' group that operates as a community where values are shared and resources are exchanged. Its members trust each other, interact and learn from each other.

Teachers' creative work is facilitated and encouraged by a digital platform that offers a digital educational resource library and a forum. Teachers can use the digital library dynamically, in the sense that the latter is continuously updated and enriched by the teachers themselves. Most importantly, this digital platform provides teachers with a communication tool. Through the platform teachers share ideas, open and discuss new paradigms. By means of exchanging, improving and building together new examples, teachers simultaneously develop a sense of ownership and continuation but also a feeling of a creatively working community.

The participants of the workshop will also have the opportunity of hands on experience.

NATURAL EUROPE LEARNING PATHWAYS

Vassiliki Markaki, Ellinogermaniki Agogi, Nikos Palavitsinis, Tsiflidou Effie,
Greek Research and Technology Network – GRNET, Greece

The 'Natural Europe Learning Pathways' workshop aims to build upon the strengths of the non-formal learning taking place in natural history museums and incorporate it to the school environment. In this context, participants will be familiarized with the use of innovative means for the proper exploitation of digital content regarding natural history, environmental education and science. The participants will be invited to use new technologies and especially the graphical interfaces developed for the Natural Europe project in order to adapt the material of their choice and transform it to educational pathways. The workshop is divided in two interconnected sections; one theoretical and one hands-on, both of which aspire to initiate the participating teachers to a pan-European innovative educational approach. The workshop's objectives are a) to train teachers on designing their own educational pathways/field trips based on inquiry-based learning approaches, and b) to strengthen the NHM-school partnership, which offers the potential to bridge the gap between formal and non-formal science education. After the conclusion of both sessions, participants will be welcome to systematically participate to the "Natural Europe" community (user group) and become part of a large academic community applying inquiry-based techniques in everyday teaching.

The Natural Europe approach is in line with the recommendations of the High Level Group on Science Education for the provision of increased opportunities for cooperation between schools and science museums for the development of a renewed pedagogy for the future of Europe.

DISCOVER OPEN SCIENCE RESOURCES: THE REINFORCEMENT OF THE SCIENCE TEACHING METHODS BY INTRODUCING ORGANIZED OPEN DIGITAL EDUCATIONAL RESOURCES AND REAL OR VIRTUAL VISITS IN MUSEUMS

Eleftheria Tsourlidaki, Fotis Kouris, Ellinogermaniki Agogi, Greece

The Open Science Resources project aims to bridge the gap between formal and informal learning by connecting in class teaching with students' visits to science museums or science centres and to promote the use of online educational repositories as a means of upgrading the traditional way of in class teaching. In the framework of this workshop the tutors will present the "Open Science Resources" (OSR) (http://www.osrportal.eu/) educational repository which includes stand - alone digital educational materials as well as complete educational activities that follow the inquiry based teaching approach.

Participants will get acquainted with the use of the OSR repository in terms of retrieving, creating and uploading digital materials and they will have the opportunity to use the portal and its tools in order to create their own pathways using digital educational materials. All participants will be given a set of relative manuals.

THINKING WORLDS – RAPID DEVELOPMENT OF 3D GAMES FOR MEANINGFUL LEARNING

Andrew MacPherson, LEARN Technology Projects Management Ltd, United Kingdom

Thinking Worlds is available free for educational use. It is a unique 3D engine and authoring environment. It enables educators and learners to rapidly create and publish highly immersive content. Thinking Worlds provides a variety of simulation templates and an open visual authoring environment. By selecting art from 3D libraries or importing their own 3D art, a teacher or learner can rapidly create and integrate simulations into their learning projects which can be published as standalone or web delivered outcomes and can incorporate SCORM compliant data output.

Andy MacPherson uses Thinking Worlds extensively to create a range of products and deliver training and support for education projects for a diverse range of clients including Scottish Qualifications Authority (Scotland), Assessment and Qualifications Alliance (England). UK Science and Technology Facilities Council, National Science Foundation (USA), University of California (USA), Queens University Belfast(Northern Ireland).

PROMOTING SCIENCE THROUGH SPORTS AND OUTDOOR ACTIVITIES

Angelos Lazoudis, Sofoklis Sotiriou, Ellinogermaniki Agogi, Greece,
Theodoros N. Arvanitis, University of Birmingham, United Kingdom

Over the past few years we've seen the emergence of a number of technologies applied in the field of sports training and monitoring outdoor activities with the main objective to analyze and improve sports performances (acceleration, reactivity, speed, power, elevation, etc.). The influence of science is found in every aspect of modern sport. Nevertheless, only a few of these technologies are used in a reverse- approach: as devices that promote science and contribute to the development of a new generation of citizens who are scientifically literate. Our workshop presents several of the aforementioned technologies that enhance the student's/young athlete's perception of science and science education by connecting science with everyday life & outdoor activities (e.g. amusement park physics), connecting different learning environments, and involving more players in the science learning process. Workshop participants will have the opportunity to experience hands-on some these technologies and view demonstrations of others.

UNISCHOOLABS: CONNECTING SCHOOLS WITH UNIVERSITIES' REMOTE LABORATORIES

Eleftheria Tsourlidaki, Fotis Kouris, Ellinogermaniki Agogi, Greece

The UniSchooLabs workshop will be realized in the framework of the UniSchooLabs project (http://unischoolabs.eun.org/web/unischoolabs) which aims to inspire teachers of primary and secondary education into using remote and virtual labs as means of enhancing science teaching and making it more effective and interesting for their students. Participants will have the opportunity to get acquainted with the UniSchooLabS toolkit which includes a catalogue of remote and virtual laboratories, numerous good practices associated with the previously mentioned laboratories and finally a tool which allows teachers to design their own activities for their classroom using remote and virtual labs. The tutors will present all labs included in the platform, outline their purpose and demonstrate their main functionalities. They will also demonstrate how these labs may be utilized to carry out activities like those included in the toolkit, using an example activity. Finally, the tool for creating new activities will be presented and participants will have the opportunity to use the tool themselves to create an example activity based on a set of digital materials that will be provided by the organisers of the workshop.

FUNecole®: INSPIRING LEARNING INNOVATIVE TEACHING WITH ICT

Chryso Christodoulou, Digipro Computer Consultants Ltd, Cyprus

The 21st century movement calls for critical thinking, creative flexible ethical problem solving, and the development of positive interpersonal relationships. “Excellence” is the standard for global competitiveness and EU needs to face this challenge by reforming school curricula and instruction. Education institutions need to depart from the factory-model of the past and move towards student-centred practices.

EU to continue to compete and survive in a global economy requires workforce that consists of school graduates who are equipped with skills that are “exceptional” rather than “adequate”. This workshop will demonstrate how FUNecole® Creative Learning Environment supports innovative teaching and creative learning approaches that successfully integrate technology into today’s classrooms from the primary school level.

FUNecole® is the number 1 practice in innovative teaching and creative learning.

By JRC IPTS in collaboration with DG Education and Training JRC59689_TN, 2010.

UNIVERSE IN THE CLASSROOM

Rosa Doran, NUCLIO / GTTP, Portugal

The main objective of this workshop is to introduce an alternative way to address topics related to Astronomy. Participants will learn how to use planetaria software, robotic telescopes and image processing software. Examples of curriculum content that can be addressed using these resources and tools will be addressed. We will explore the potentiality of this selection to reawaken the interest of young generations for science studies. Our selection is composed of user friendly tools, freely available on the web. We will focus our presentation in the use of this material and facilities to teach curriculum content addressing different disciplines and suitable for different grade levels. The session will be divided in 3 parts: Planetaria Software, Robotic Telescopes and Image Processing.

KICKING LIFE INTO CLASSROOM

Angelos Lazoudis, Ellinogermaniki Agogi,
Michalis Gargalakos, Institute of Communications and Computer Systems, Greece,
Theodoros N. Arvanitis, University of Birmingham, United Kingdom

The incorporation of new advanced technologies in sports, education and training systems is becoming more and more important, allowing us to develop new approaches to learning, life and work. In this workshop we present a system of wearable computers and intelligent sensors that is used by students for experimentation during sports activities, data collection and storage. The recorded data can be then utilised by a specially designed User Interface to graph trends and patterns and investigate the laws of engineering and physics. The students have the opportunity to collect data from a variety of sensors, compare measurements and design new experimental activities on their own. Such activities are viewed by the young and adult learners as a craft that rewards dedication and precision but simultaneously encourages a spirit of creativity, exuberance, humour, stylishness and personal expression. Furthermore, our workshop includes, besides the hands-on activities with the software and hardware applications, presentations of educational scenarios of using the system in various sports including also extreme sport activities.

BRINGING CHANGE IN A RURAL ENVIRONMENT – THE ROLE OF EDUCATION AND TRAINING IN CHANGING THE PERCEPTIONS AND LIVES OF PEOPLE LIVING IN RURAL AREAS

Fotis Kouris, Argiris Tzikopoulos, Ellinogermaniki Agogi, Greece

Today more than ever our society is characterized by urbanization of the population leading to abandonment of rural communities and subsequently loss of skills and traditions that existed for many years. Many initiatives has been trying to change this trend and assist the rural populations of Europe to reach their full potential by providing them with education, training skills and tools that will allow them to develop their regions and remove the need to migrate to urban areas. This workshop will discuss the progress made so far in research activities and propose ideas and concepts that will further encourage the rural populations to seek development of their regions through education, training and introduction of new technologies.

LEARNING CAN MAKE PEOPLE FLY: HOW CAN TEACHERS TRANSFORM SCHOOLS INTO CREATIVE ENVIRONMENTS?

Claudio Dondi, Daniela Proli, SCIENTER, Italy, Nikos Zygouritsas, Lambrakis Foundation, Greece

In a time of fast transformation and increasing complexity, education is recognized as a key force driving social development and economic innovation and an equalizing leverage. However, school as an institution seems not to be fully exploiting the **creative and revolutionary potential of Learning.**

Change is needed, though top-down impositions requiring teachers to adapt without involving them into imagining and designing transformation seems to lose chances of success. This is how we explain the traditional charge that teachers are resistant to change, preventing the take up to school innovation.

Innovating teacher training to "*fit for the future*" is the object of the workshop, which originates from the LLWINGS project – aimed at supporting teachers in building *wings* for lifelong learning for their student through a systemic approach. Likewise, the session will focus on teachers as the centre of a transformation process which shall invest the whole system and will discuss the different factors likely to enable or hamper such change in school education.

EXPLORING SCIENCE CAFÉS IN EDUCATION – DISCUSSING: "A CRISIS WASTED?"

Pavlos Koulouris, Ellinogermaniki Agogi, Greece, Duncan Dallas, Cafe Scientifique, United Kingdom,
Tommaso Castellani, Associazione Culturale Forma Scienza, Italy,
Balazs Balint, Szent Istvan University in Godollo – ESSRG, Hungary,
Audrey Savre, University of Lyon – CCSTI, France,
Madeleine Caroline Schleiss, Digital Business Creators – DBC Gmbh, Switzerland,
Antonis Miliarakis, FORTHnet S.A., Xenia Bania, I KNOW HOW INFORMATICS S.A., Greece

Representatives of the consortium currently running the SciCafe Network (European Network of Science Cafes; www.scicafe.eu) will discuss experiences of using science cafés, and especially 'junior science cafés', as vehicles for science communication and public engagement in science and technology issues, as well as vehicles for informal learning, development of critical thinking skills and links to communities outside the school. There will be a special focus on the support and enhancement that such activities may receive through digital technologies and media. In the second part of the workshop, a 'mini' demo science café will offer participants the opportunity to practically experience themselves the 'feel' of taking part in a science café, and reflect on the opportunities and challenges of running such events in the school. Touching upon the concepts of '*crisis*' and '*educational reform*', and provocatively echoing the title of the conference, the demo science café will discuss: "*A crisis wasted?*" based on an introduction of central educational issues of vital importance to today's European societies.