DESIGNING TECHNOLOGY-ENHANCED LEARNING FROM A PROCESS-ORIENTED PERSPECTIVE

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Introduction

This paper discusses the theoretical framework and the process-oriented model guiding the introduction of Technology-Enhanced Learning (TEL) at the Faculty of Education, University of Malta. The Programme in TEL (PiTEL) evolved from the previous ‘Programme for the development of Resources in ICT Education’ that promoted the acquisition of a range of competences in use of ICT applications, especially those for developing instructional resources. The new programme addresses a number of demands arising from the current national socio-economical reality that constantly challenges educational and training institutions to tune to learners’ evolving needs in a knowledge society. The current political drive to align all sectors of the national economy, ranging from micro-electronics, tourism, health and national heritage, on research and innovation demands skills in creativity, design and innovation. The job market increasingly demands skilful interaction with digital technologies especially in the context of learning and research communities.

The main objective of the National eLearning strategy is the promotion of policies and provision of resources during the formal educational process to prepare young people for the ever changing economical scenario. It promotes investments in a range of digital technologies and learning management systems to enhance classroom practices and stimulates innovative ways of learning through technology. This in turn creates a need for training programmes that impart the vision, skills and attitudes needed to be an effective and efficient educator in the knowledge era. Also the development in TEL on an international and local level triggered reflection about the need for a programme that meets the educational needs of the Faculty and local educational system in the knowledge age.

The widespread use of learning technologies amongst students, teachers and academics necessitates the formal integration of these technologies within academic programmes and classroom practice. This need has become more urgent when considering the contrasting technology-intensive learning style of the digital generation that constantly challenges the traditional didactic classroom model of learning. While students constantly use digital technologies for learning and entertainment at home, classroom practices all over Europe show lack of uptake of ICTs and negligible change in pedagogical practice. ‘While 86% of pupils aged 15 frequently use a computer at home, 50% of students in countries belonging to the European Union declare that they have not used a computer in the classroom in the past 12 months (OECD 2008)’. ‘Although ICT take up in schools has been progressing well, and almost all European schools are connected to the internet (Empirica 2006), ICT has not changed teaching and learning processes (Punie et al. 2006). ‘At the same time, it is generally acknowledged that we need a fundamental transformation of Education and training throughout Europe, to modernise educational systems and to increase quality, equity and personalisation in the provision of lifelong learning for all (Redecker et al. 2009, Pg 15).

Different categories of learning technologies are extending and transforming the learning experience beyond the traditional transmissionist approaches integrating more constructivist
and constructionist epistemologies. ‘Web 2.0 implies both a set of tools and technologies and more collaborative, participatory, learner led approaches to learning and teaching’ (Becta 2009, pg1). ‘Learning spaces are being reconfigured to facilitate new modes of learning that support personalisation’ (Becta 2008, pg5). Learning management systems are integrating course/content management, with on-line administrative tools, social networking and ePortfolios. ‘Investment in virtual learning environments (VLEs) is increasing, particularly at school level. Curriculum innovations, including support for collaborative and cross-curricular learning, are being implemented’ (Becta 2008, pg4). These developments are creating an urgent need to redefine our pedagogical frameworks so that pedagogy drives technology and not the other way round (Stellenbosch declaration, 2005). Content oriented pedagogical models are becoming increasingly deficient in capturing the totality of the learning experience that blends acquisition, participatory and contributory modes of learning. New forward looking pedagogies are needed that promote curriculum innovations, including support for collaborative and cross-curricular learning and develop in next-generation teachers skills in exploiting technology for creativity and social networking, besides their current instructional role.

‘Learning by designing’ is increasingly becoming an integral component of any pedagogy. Besides preparing young citizens to develop knowledge acquisition skills, an important role of the formal educational process in a knowledge society is to develop knowledge building skills. Knowledge jobs are mostly technology-mediated involving interactions with conceptual artefacts (Berieter 2002) mostly in the form of software applications. Technology-mediated creativity, research and innovation, together with team skills that enhance participation and contribution to the development of new solutions, should form the core part of the personal portfolio of learners. From the early stages of formal education, besides technology-enhanced instructional approaches, the curriculum should also include technology-based design projects to develop these creative and collaborative skills. ‘Learners are becoming participants in and co-creators of learning: Technology enhances opportunities to engage learners in designing and creating their own learning,’ (Becta 2008, pg5).

To be relevant in a knowledge society any institution of higher education faces the need to propose innovative initiatives in ‘teacher education’. The situation where higher percentage of learners prefer to follow flexible, technology-intensive courses demands that future teachers should be equipped with knowledge and skills for designing, managing and evaluating technology-enhanced learning and integrate them in flexible learning approaches. Teachers trained in technology-intensive flexible learning systems are the complement required by the Faculty of Education to meet its future mission of providing a ‘balanced education’ (traditional and technology-intensive) to all (Bonanno 2004).

In 2009 the PiTEL was launched emphasizing the integration of epistemology, pedagogy, technology, design and innovation management within a coherent teacher training experience. Inspired by constructivist, constructionist and connectionist epistemologies and guided by recent developments from various fields of research, a set of guiding principles were identified for developing an innovative process-oriented methodology. This model is discussed in Bonanno (2010a) that elaborates on the underlying processes and interactions characterizing the deep structure of TEL. While in objectivists models of assessment learning outcomes were considered as end products of interactions with a particular domain of knowledge, such approaches are very limited in developing assessment instruments to capture learning in collective entities. Collaboration and distributed cognition demand systematic approaches rather than analytic ones. A different set of conditions exists in TEL where the main pedagogical emphasis is not acquisition of facts and information but knowledge and
skills that promote participation and contribution to the learning community. This surely demands a paradigm shift in considering interactions themselves as learning outcomes. The type, frequency and directionality of interactions that are stimulated in learning environments can be used as indicators of potential learning dimensions and as a means of assessment (Bonanno 2008). Identification of patterns of interactions along organising dimensions can lead to the development of learning profiles that may be very beneficial pedagogically, especially for designing TEL.

The proposed model attempts to operationalise such process-oriented approach. The model is designed to capture interactions along three dimensions and three pedagogical levels. These include: the domain dimension for recording interactions leading to the acquisition of domain knowledge and skills; the social dimension captures the socio-emotional climate and interpersonal interactions manifesting underlying bonds, relationships and roles within contiguous groups or on-line learning communities. Through interactions with different forms of technology, learners acquire a thorough understanding of the surface and deep structure of the digital tool in use and thus identify and manage relevant psychomotor, cognitive, affective and social skills, that is, their idiosyncratic experience of TEL. The model also proposes a reflective component for each of these dimensions - a meta-management dimension that focuses on interactions intended to create more awareness and control of individual and collective learning.

The proposed pedagogical levels progress in emphasis from ‘acquisition’, through ‘participation’ to ‘contribution’ modes of learning. Through imitations and apprenticeship, one ‘learns from others’ basic competences in the three dimensions. ‘Learning with others’ promotes the participatory skills of negotiation and argumentation. The utmost pedagogical level describes how highly competent learners ‘mediate others’ learning’ and contribute to innovation through design and evaluation of TEL. These three levels also represent the evolution of needs satisfaction during the learning process. The learning experience must addresses the basic personal need for competence, after which, the more socially oriented needs for relatedness, affiliation and self actualisation are satisfied manifesting themselves as higher levels of commitments to the task and learning group. This model has been developed in the context of designing and evaluating learning in Web-based communities (Bonanno 2005). This was then further elaborated in the context of collaborative game-based learning (Bonanno, 2008) and Technology-Enhanced learning (Bonanno 2010a).

With this framework as back drop, the content and methodology for the Programme in Technology-enhanced Learning was developed. Following recommendations by Law, Pelgrum & Plomp, 2009, an ICT-oriented approach was avoided as this leads to traditional transmissionist instructional approaches. The programme strives to orient student-teachers and teachers to evolving 21st century skills that need to be developed in schools by adopting a more experiential and connectionist approach. This epistemological stance determines the process-oriented pedagogy to be adopted which in turn identifies the relevant digital tools to be used according to the learning and knowledge building processes to be promoted. Consequently, the programme includes modules related to epistemology, pedagogy and use of digital tools for designing learning experiences.

The PiTEL is organised in three major sections: an introductory, a core and a project section. The introductory section focuses on epistemology and the role of technology in learning and knowledge building. The implications for teachers of the elaborated digital skills profile of the younger generation is discussed in relation to the paradigm shift that is demanded in responding to their needs. ‘Teachers’ pedagogical orientations, such as their understanding of
the changing demands of citizens in the knowledge economy and their readiness to employ more collaborative, inquiry-oriented learning activities, to create a more open and connected learning environment and to take on more facilitative roles, make a major difference to the way teachers utilize ICT in their classroom, (Law, Pelgrum & Plomp, 2009, Pg 275). Thus the introductory section of the programme outlines the process-oriented methodology to be adopted during the course and elaborates on guiding principles, policies and evaluation techniques derived from the connectionist epistemology. The ePortfolio framework is introduced as a tool for capturing, recording and evaluating learner interactions within any identified content domain, while using digital tools and interacting within and between learning communities.

The core section of the programme develops the pedagogical component of the course focussing on the learning processes mediated by different categories of learning technologies. It is designed around five modes of learning: ‘learning through instruction’, ‘learning through gaming’, ‘learning by collaboration’, ‘learning by designing’ and ‘learning through reflection’. This attempts to capture the learning process within and across the three pedagogical levels of the proposed model. At the basic level, ‘learning through instruction’ develops competence in the use of productivity, communication and knowledge sharing tools for acquiring domain knowledge and for interacting with the other members of the learning community. ‘Learning through games’ is a pedagogical approach based on a different conceptualisation of domain knowledge and learner role. Exploiting the pedagogical potential of simulated, immersive environments, games promote a learning experience that is fundamentally different from those characterising didactical approaches. The domain model upon which the game is based, especially those simulating expertise, promotes new insights into a particular domain, many times accompanied by relevant attitudinal change. The active role assumed by the user and the exploratory approach that has to be adopted while playing the game offer a motivational pull that energises and changes radically the process of learning.

‘Learning through collaboration’ addresses the social needs of learning (need for relatedness, affiliation and intimacy). Through the processes of negotiation and argumentation, ‘learning with others’ develops one’s idiosyncratic knowledge structure, promotes the adoption of digital tools as mediating frameworks and establishes one’s identity within the group. The highest form of identity is related to the leadership status normally occupied by competent learners, who through their insight into community functioning propose new modes of interaction within the learning group. Communication, knowledge sharing, group management and social networking tools are adopted and adapted to cater for these various social needs of learning.

‘Learning by designing’ is the highest mode of interaction along the domain, technology and community dimensions assuming refined levels of competence. Through their creative flair, highly competent learners propose new ways of interacting with a particular domain, modify or elaborate existing digital tools or even develop new ones for interacting with the domain. Technology-enhanced creativity-support systems include the design and programming of robots, designing games and interactive story-telling, 3D-modelling, media processes comprising the design and development of picture, audio and video-based documentaries and the design of interactive on-line learning experiences or others linked to interactive TV.

‘Learning by reflection’ promotes individual and collective metacognitive skills, an essential goal and outcome for technology-enhanced learning. The proposed process-oriented model prescribes pedagogical interactions both at the experiential and metacognitive levels. The
former involves interaction with the external environment, while the latter are interactions within the intra-world of a person’s cognitive, affective, conative and social experience. Such interactions are mediated through a range of monitoring, management and evaluation digital tools including integrated learning management systems, personal or group/community websites, e-portfolios, and learner/professional networks. These enable continuous evaluation of the learning experience or group situation through which context specific strategies aimed at optimising performance, interaction and one’s personal profile are employed.

The project section of the PiTEL proposes design and development activities through which the identified modes of learning can be contextualized, captured and evaluated. Since processes and interactions can be captured effectively through ePortfolios, participants have to develop their personal ePortfolio, to record all the artefacts and reflections developed during the different course units. The major course outcome from participants will be the design and development of a technology-intensive course that contextualizes and integrates the design activities in their area of specialization. This designed course has to be developed in an identified course management system, evaluated with learning groups and then presented to their colleagues for further peer-evaluation. The process of reflection and evaluation has to be captured through various tools in their personal ePortfolio.

Hence, the proposed process-oriented model serves as a design tool that can be applied at the macro level of course development for prescribing course content, methodology and evaluation techniques. It can also be applied at the micro level to develop modules focusing on particular categories of pedagogical interactions. Bonanno 2010b elaborates on how this interactions-oriented model was used to develop design templates and evaluation instruments for assessing the complex pedagogical scenarios that may be encountered in ubiquitous learning. The same theoretical model may be employed to justify, design and organize the physical infrastructure and resources demanded by this process-oriented methodology.

References


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