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PROJECT-BASED E-LEARNING IN HIGHER EDUCATION: THE MODEL AND THE METHOD, THE PRACTICE AND THE PORTAL

This study (a PhD dissertation) is an intervention, developmental and action research where we will try to improve Project-Based Learning (hereafter PBL) in higher education, by decomposing this *model* to its components and features, and propose a *method* for its successful application, which literature shows that is challenging. This method will leverage from C3MS (Community, Content and Collaboration Management Systems) Internet technology, which the author explores in the framework of a European project (SEED¹) and develop a *portal* to *practice* the proposed method. Here are the three strands of our research. First, it is the study of the state of the art on PBL, in order to gather descriptions, features, pitfalls and best practices. Second, the challenge (both conceptually and technically) to develop a method supported by an online environment (ePBL portal) that will improve, scaffold PBL and make it bloom in all possible directions. This method has as a goal to help teachers implement better PBL (increase effectiveness, avoid pitfalls) in an affordable way. The technological environment will provide support to the method by including the features and components that will have defined. The whole system (method and environment) will evolve according to qualitative feedback gained from several case studies that we will conduct.

¹ Seeding cultural change in the school system through the generation of communities engaged in integrated educational and technological innovation, IST, 5th European Framework, 2000 Action Line SOT (School of Tomorrow)

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Introduction

An emerging trend in education worldwide is to move the focus from that of *teaching* to that of *learning* (Lin B. & Hsieh, 2001). Among the most popular models is PBL, a constructivist teaching and learning model that is believed to be effective in certain situations. Despite the positive attitude for PBL, it lacks a universally accepted model or theory (Thomas & Mergendoller, 2000; Thomas, Mergendoller, & Michaelson, 1999; Thomas, 2000a, 2000b). In addition, it demands more effort and more resources than traditional models.

There are many open questions (Kehoe, Guzdial, & Turns, 1998; Means & Olson, 1995; Synteta, 2001; Thomas, 2000b). Students have difficulty to: (1) Initiate inquiry; have coherent research questions, (2) Define a research project; good research design and appropriate methodology, (3) Direct investigations; find resources, (4) Manage complexity and time; keep deadlines, estimate time needed to do a task, (5) Collaborate and give feedback; articulating the work of others and give regular feedback. Known problems concern planning, operationalisation and monitoring (van der Veen, B. Collis, & Jones, 2001), (6) Follow-up the project; revise products, thing that requires critical thinking skills and cognitive self-awareness (Schneiderman, Borkowski, Alavi, & Norman, 1998). On the other hand, teachers or designers have difficulty to: (1) Design a PBL course; design projects that support learning of specific concepts and skills, (2) Follow-up several projects; monitor progress, give feedback and support where and when is needed and generally classroom management, (3) Use technology especially as a cognitive tool; incorporating technology is challenging, (4) Design assessment; assessment that require students to demonstrate their understanding.

Lately, PBL has been revived in tandem with the emergence of new technologies, and there are a lot of researchers that have shown that technology can scaffold PBL in various ways. The author works in this direction the last three years and already has developed a method and an on-line environment, used as a cognitive tool, to scaffold PBL that showed very positive results (Synteta, 2001).

In the university level education, projects are a frequent model for assignments (semester projects, thesis or dissertation). It is very rare though to find a rigorous structure and support of PBL model. On the contrary, in earlier stages of education, we meet more often exemplary PBL instances. If we add the fact that in higher education projects are

used in blended learning formats, we believe that there is a need for a well-structured method and an online environment that could support it.

According to our extensive literature review (Barron et al., 1998; Chalvin, 1996; Grant, 2002; Moursund,; Reginald & Laferrière, 1999; Schneiderman, 1988; Thomas & Mergendoller, 2000; Thomas et al., 1999; van der Veen & van Diepen; WebQuest; Wrigley, 1998), interviews with expert teachers that do PBL, and our own teaching and research experience (Synteta, 2001; Synteta & Schneider, 2002), we have drawn our own list of important phases that contribute in making PBL better and successful. We identify three main phases in a PBL course: *Pre-project phase* (preparation), *Project phase*, and *After-project phase* (concluding). We have also drawn a long list of detailed sub-phases that are needed to conduct better PBL. Not to mention that there can be many others that might emerge according to course specific needs. During all the above phases, guidance and scaffolding are extremely important (Blumenfeld, 1991; Greening, 1998; Kehoe et al., 1998; Synteta, 2001). We have studied all these points and we have defined them in details as our proposed method for conducting PBL.

C3MS, the candidate environment

A portal gathers a variety of useful information and communication resources into a single, 'one-stop' web page (Looney & Lyman, 2000). Therefore, it is a collection of objects (information bricks) and services (operation on these bricks) that can be accessed from the same central page. The scaffolding medium for the PBL method that we propose in this study is an integrated, easily configurable, highly modular WWW portal (ePBL) that will be administered by the teacher(s) and which will include most if not all of the core components that will be needed by our proposed method.

Design and development of such an environment from the very beginning could take many men-years. Luckily, several very popular Open-Source projects can provide the core environment for such a portal. We coin these systems C3MS for Community, Content and Collaboration Management Systems (Schneider, Synteta, & Frété, 2002). Portals can be adapted for specific communities and sometimes users can tailor them to their needs. More sophisticated systems of portalware like PostNuke (www.postnuke.com) or PhPWebSite offer a good set of core portal func-

tionalities, such as a good user administration system, a news/journal system, web links sharing, search, FAQs, Polls and much more not forgetting that they can easily be multi-lingual. In addition, an impressive amount of extra modules (many from autonomous developers) like collaborative hypertexts (wikis), picture galleries, simple content management systems, event calendars, chats, project managers, file-upload, glossary management are available. Many web-applications popular in education, which existed beforehand as stand-alone applications (e.g. Forums and Wikis), are adapted (or being adapted) for integration into portal systems like PostNuke. The architecture of these portalware is strongly modular to such extend that someone can built extra applications upon them in the form of "modules", thing that makes them expandable and configurable, thus an interesting candidate for our PBL environment. In this research, we suggest making a careful selection of such software and built on it all the core features to address specific needs like the ones defined in our research in PBL and let each teacher to add others or adapt it to his specific needs.

Methodology of the study

This research is at the same time an *intervention, developmental and action research* (Richey & Nelson, 1996; Van Der Maren, 1999). Based on the literature of evaluative research on PBL, we will draw the synthesis of the pitfalls of the PBL model, intervene with a more structured method of PBL (the way that we perceive it as optimal) and describe the state which we want to achieve, choose technology and develop a scaffolding environment (ePBL portal) that will support most if not all of PBL features, test the workability of our system (both method and environment) in the classroom, and keep regular track of the effects and adjust the system until it will achieve the set up goals.

Conducting research for PBL is challenging, given it's complex nature (more open than traditional instructional models). It is almost impossible to make strict quantitative analysis and come up with precise measurements. In addition, we will evolve our method and it's environment according to feedback gained from latest experience, so every experience will be different from the previous one. Thus, within this research, we will use qualitative research methods that have become increasingly important modes of inquiry for the social sciences and applied fields such as education (Marshall & Rossman, 1995). Some of the techniques that we

will use to collect data are participant observation in the setting, in-depth interviewing that will feed narrative reports, survey questionnaire, and analysis of the project products.

This study will be focused in PBL in higher education for several reasons. First, it is a level of education where although PBL is highly needed there are not many studies done yet, and we hope to provide some new outcomes. Second, there exist specific problems for its application (e.g., less time for the design of projects). Third, it is the level in which is implicated in teaching the author of this research thus is focused its interest mostly.

Conclusions

This research will lead to four (4) results: (1) a method that will describe how to conduct better PBL based on research outcomes with a detailed documented procedure, (2) a CLE (Constructivist Learning Environment), that will include the specification, design, implementation and configuration of an integrated portal for PBL (ePBL portal) with all the functionalities needed to implement the above method developed, (3) dissemination material for the method like conceptual manuals for teachers and students on how to profit the maximum from the above portal, and technical manuals, and (4) the results of a qualitative research on using ePBL system in classrooms and description of all corrective measures that we took in order to achieve our initial goals.

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