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SYNTETA, Paraskevi, SCHNEIDER, Daniel

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EVA_PM: HOW XML CAN SCAFFOLD PROJECT-BASED LEARNING

Paraskevi SYNTETA (Paraskevi.Synteta@tecfa.unige.ch)
Daniel K. SCHNEIDER (Daniel.Schneider@tecfa.unige.ch)
TECFA – FAPSE, Univ. of Geneva, 40, Bd du Pont d’Arve, 1211 Geneva, Switzerland
http://tecfa.unige.ch/, Fax: +41 22 7059379

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INTRODUCTION
Project-Based Learning (PBL) is a teaching and learning strategy that organizes learning around projects. By projects we mean complex tasks based on challenging questions, that involve students in design, problem-solving, decision making or investigating activities that give them the opportunity to work autonomously and culminate in realistic results. Even though PBL is considered to be a profitable learning strategy, its implementation faces several challenges. Students have difficulty to:

- Initiate inquiry; coherent research questions
- Define a research project; good research design and appropriate methodology
- Direct investigations; find resources
- Manage time; keep deadlines, estimate time needed to do a task
- Collaborate and give feedback; articulating work of others and give regular feedback
- Follow-up the project; revise products, thing that requires critical thinking skills and cognitive self-awareness (Schneidermann, B., et al. 1998).

Many researchers believe that PBL is a beneficial learning strategy and have worked out several methods (referred to as “scaffolding” by Guzdial, M., 1998 or “procedural facilitation” by Scardamalia, M., et al., 1999) to support and improve it. While most of them were focusing on a specific problem, EVA_pm is a method and an environment that tries to enforce PBL and overcome several of its weak aspects.

This study uses structured text (in XML format) as a cognitive tool; to scaffold students to construct basic knowledge on research design, to get a project done, to reflect on their work and facilitate the tutor’s role.

EVA_PM COMPONENTS AND FUNCTIONALITY
The most important components that form EVA_pm are:
- EVA_pm ML; an XML grammar (DTD) for project design that is used as cognitive tool to scaffold students during the projects
- commNcontrol; a web portal that provides several tools to support the method like awareness tools, versioning system, file transfer tools, discussion tools and tutor evaluation tools
- Virtual Book; the web portal that joins the results of the projects (papers) and plays the role of the socio-constructivist “product” element by giving the chance to the students to expose the common result of their work
- EVA_paper ML; an XML grammar (also a DTD) for the paper that describes the results of the project, serves as cognitive tool and help students reflect on their work.
More precisely, students have to edit an xml file in several phases (Figure 1), that describes the project (specification and management) and which can be uploaded and shared online through a versioning system with the other members of a group. Viewing and interactions can be done through the "commNcontrol" where students and tutors can log in. The project culminates with students writing a paper that describes the product (as an xml file) and an online "Virtual Book" is being created with all the papers produced.

Figure 2: Project procedure according to tutors scaffolding

IMPLEMENTATION

The method that has been used for the implementation is close to participatory design and specifically to cooperative prototyping. This approach is well suited for exploratory research and reduces the risk of not meeting the needs of users. From XML technologies the DTD and XSLT+FO have been used. JAVA servlets technology and Xerces Java parser (SAX and DOM API) from Apache Project was used for scripting and parsing the XML files. Figure 2 shows the architecture of EVA_pm.

Figure 3: Architecture of the system

TESTING EVA_PM

EVA_pm is the result of four years work on this project, and has always been tested with the students of STAF\(^5\) diploma at TECFA, University of Geneva for the course on "Teaching and

\(^5\) STAF (Sciences et Techniques de l'Apprentissage et de la Formation) is a MSc diploma in Educational Technology

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learning in Virtual Space”. The most complete study (a master thesis) has been done with sta-f-2001 students (12 students = 9 men and 3 women, 8 projects = 4 from pairs and 4 from individuals). The course was organised around several phases and was in mixed format (one week in presence and 4 weeks by distance). There are two things that have been evaluated, the learning environment (usefulness and ergonomics) and the students learning on research design.

CONCLUSIONS
The initial goal of this research was to develop a Scaffolding Learning Environment that would improve PBL efficiency and help to overcome the most common pitfalls. To reach this goal MarkUp Languages (XML grammars) were conceived to describe the student’s projects and final results and an online environment was implemented with several tools to facilitate some tasks.

For the learning environment, we could say that the grammars are mature and the toolset quite powerful. The interface though could be improved concerning usability and more features could be added to improve interaction.
For the students learning, and using a qualitative analysis approach (monitoring, evaluation of projects and comparisons with previous years, interviews and a case study), the results of this research show evidence:
• that EVA_pm could help students to initiate and develop scientific inquiry
• that it scaffolds students to direct the investigations needed when running a project
• that it helps students to better manage the time and respect the given deadlines
• that EVA_pm ML helps students avoid having or overcome writer’s block
• that students acquire at least some basic knowledge on project and research design
• that the environment improves team management and to some extent also collaboration (especially its versioning system)
• to some extent, it makes students reflect on their work
• that using EVA_pm motivates the peers and undoubtedly distributes the projects to bigger audiences.

Of course, all the above are happening only and with the precious contribution of the tutor(s).

As for the tutors, there is evidence that EVA_pm scaffolds their role in PBL and facilitates monitoring and evaluation tasks.

Lack of powerful XML editors is the weak part for the moment of the method, and students need to be trained in order to work with XML grammars.
Based on the above preliminary findings, EVA_pm has a lot of potential in it. There are several things that will be improved in this ongoing project. We will make it possible to adapt the grammar to the level of the students and the needs of the project, we will work on the usability of the interface and we will add new features for the interaction between tutors and students. EVA_pm will be freely distributed at a later stage as a servlet 2.3 compliant Web Application Archive File and/or as a pre-configured information and communication micro-portal.

REFERENCES

URLs
comnNcontrol: http://tecfa.unige.ch/tecfa/teaching/staf18/files/h/EVA_pm/comnNcontrol.html