Chapter 5
Using Graphs in Developing Educational Material

Thanasis Hadzilacos
Open University of Cyprus, Cyprus & Research Academic Computer Technology Institute, Greece

Dimitris Kalles
Hellenic Open University, Greece

Dionysis Karaiskakis
Hellenic Open University, Greece

Maria Poulilopoulou
Research Academic Computer Technology Institute, Greece

ABSTRACT
Distance learning institutions need to find a way to transplant the benefits of conventional tutoring practices into the development of digital content that is conducive to students’ learning needs. Therein lie two great challenges: promote real distance learning effectively and, at the same time, try to accommodate the ability of students to learn via collaboration. The authors have proposed the development of learner’s open-and-distance-learning (ODL) courses as both a theoretical model and an applied methodology to be one of their key priorities and describe how this concept co-evolves with Web mining and institutional infrastructures to address the needs of emergent communities of practice within their university, primarily of students and secondarily of tutors.

INTRODUCTION
Developing an educational experience for a learner has at least two cornerstones: the existence of educational material and the organization of activities with that material. For example, a textbook is a repository of educational material. Reading it chapter by chapter is an educational activity. Consulting selected book parts when trying to solve an exercise is a totally different activity.

Meaningful educational experiences are usually based on the organization of carefully designed activities on quality educational material. The shrewd organization and the careful design necessarily cover some aspects of resource planning, such as how much time the learner is supposed to dedicate to the activity or, what is the sequence of activities that will
Using Graphs in Developing Educational Material

best attain the educational goal. They also cover conventional aspects of design, such as the target audience and, the combination of tools to attain the goal. Detailed planning of learning activities, apart from the significant effort needed by the course designer, reduces the control students have over their own learning (Evans & Lockwood, 1994). Learner support services (Simpson, 2000) were proposed to provide individualized advice, but usually at a significant cost, especially in large scale applications and in Open and Distance Learning (ODL). Also note that educational experiences can be turned into educational material themselves. For example, watching a fellow student carry out an experiment in chemistry certainly produces an educational experience.

Furthermore indirect collaboration (based on observation, for example) can also significantly enhance the learning experience. Social Navigation (Höök, Benyon & Munro, 2003) can be direct but also indirect based i.e. on the traces of others. Those are quite significant in ODL where learners are supposed to have control on planning and implementing their learning. Collaboration and what comes with it is also the core concept in Communities of Practice. However when we deal with dispersed communities of practice, such that are formed in distance learning, collaboration can only be supported by technological means.

In this contribution, we present a conceptual artefact, termed a Learner’s ODL course, which, we claim, is a generic model that is suitable for accommodating the practices of the educational process, both solitary and collaborative, while still allowing room for developing new abstractions. Its real importance is in that it serves as a conceptual framework around which we attempt to integrate the technologies that are available to us, at any given time point.

We are careful to note that the educational process comprises of observable and explicitly initiated activities, as opposed to the learning process which is ad hoc and may or may not be a direct or indirect outcome of the educational process. After all, education does not necessarily result in measurable learning.

The rest of this paper is structured in five sections. We first briefly review the key stakeholders of the educational process in the context of Communities of Practice and Distance Learning. We then move to present a theoretical model of that process, outline its relation to learning design and argue why this model is a good springboard for the deployment of sophisticated data analysis applications (in the web mining context) that can spur the development of personalization services. We then discuss the practical issues of tool deployment and relate these issues to a large on-going application, before concluding by highlighting the context of an organization that is heavily investing in integrating its ICT infrastructures.

BACKGROUND: LONG DISTANCE EDUCATION AND COMMUNITIES OF PRACTICE

The educational system, at any level of specification, form or organization, cannot exist without teachers and students. Even in the case of delivery of courses through Learning Management Systems on the web, where students can have absolute control over the process, there has to be an instructor that will provide the educational material and will apply his teaching skills in creating it. Students can participate in groups, independently, from a distance or in a classroom. Any formation still includes both these necessary components.

All students have the same goal, to learn. A practical observation that we all have from personal experience is that although students work on their own when studying or solving exercises, they still interact with each other and exchange ideas and views on the process they follow or their approach in a given problem and their perception on the concepts that they are taught about. Such an interaction can affect their personal views and lead towards an attitude influenced and enhanced