Reusability and Interoperability in Practice

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The Digital University Initiative

Recently, Dutch higher education has witnessed an important initiative to move e-learning a major step ahead. April 2001, a consortium of four universities and six colleges was founded and dubbed the Digital University. Through obligatory participation fees the partners raise the working capital. The Dutch government has decided to augment this with a fund of over 10 million Euros for the first two years. The consortium’s primary aim is to innovate e-learning, both in the extended classroom mode for regular Higher Education and in the distributed learning mode, which is more suited for Further Education. However, achieving economy of scales through co-development of materials and through their reuse is a no less important objective. Currently, a number of projects is under way that seek to prepare the grounds for the content development and delivery work that is to follow from September 2002 onwards. One of the major projects is the setting up of a system for the development, storage and delivery of educational content.

Share and Innovate

Although many digital learning environments (DLEs) exist, they often focus on extended classroom situations, in which individual teachers cater for cohorts of students much the same way they used to in their face-to-face classrooms. Only tools for synchronous (most often) and asynchronous (less often) communication have been added. The ambitions of the Digital University, however, roam further and include the facilitation of various forms of distributed learning, in which cohorts may be absent and teachers less prominent. In the current DLEs the teacher simultaneously occupies the role of author/developer, tutor, mentor, etc. This hardly stimulates him or her to share educational materials. But exactly this is one of the major goals of the DU. This centrality of the teacher is not conducive to a guided process of innovation either, which is the DU’s other major objective. So, although the extant DLEs will no doubt remain to be used in the DU, the context of their usage should change significantly.

The DU does not aim to change the way teachers currently operate in their day to day situations, which would be counter productive. However, while encouraging teachers to keep doing what they have always done best, at the same time the DU tries to let them share their vast experience with other teachers in the consortium. The DU also tries to repurpose the materials they have developed and deploy these in educational settings different than the present ones.

A simple approach

Basically, there are two ways to address reuse of educational materials, a simple one and a more sophisticated one. The first approach, which very much has an information scientific view, acknowledges that in the course of their teaching teachers use files of a variety of formats, and, therefore, creates a repository for those files. Of course, just a repository will not suffice, so metadata to describe the various morsels of information are added, as well as tools for uploading the files, adding metadata, searching files on the basis of their metadata descriptions, and retrieving files. This approach has the benefit of being readily implementable, although of course all sorts of agreements have to be made about rights and licenses and all kinds of rules for collaboration have to be established. The simple approach also has the benefit of making no special demands on the DLEs. Most DLEs are able to render a variety of file formats themselves and, if not, they may
start up a new process appropriate to the format in question. So, by approaching reuse
the simple way, interoperability of DLEs seems to come about almost by default.

On closer inspection, however, the simple approach’s achievements are rather limited. The files stored in the repository have nothing that labels them as being of an educational nature, nothing that makes them specifically suitable for educational use. All the information that would make them educationally meaningful is to be added later and separately. For instance, a clip of Martin Luther King announcing his dream of racial equity may be just a piece of old news, an important event to be discussed in an American history class, or an example of a speech figure for use in a rhetoric’s class. The clip as such carries no educational relevance, it is the teacher who conveys that relevance upon it.

This example, one may argue, paints too bleak a picture. Typically, repositories contain text files that address a particular issue, say how to calculate the variance of a data set or why in various places in North America racial discrimination abounded in the fifties. Such texts are of an expository nature, they are to be read and digested by the students, and perhaps students are expected to do some exercises or complete a quiz. So, the argument goes, such a text is certainly not devoid of educational significance. The problem here is that the content and the educational scenario are inextricably intertwined. Implicitly, a particular didactic scenario has been chosen (read, digest, answer questions) that comes with the background material (what is a variance, what did North America look like in the fifties). To obtain maximum flexibility, one would want to separate the didactic scenario from the resources that act as background material. Only then the same resources could act as background material for different scenarios. However, the resources would always be used in the context of some scenario, in order to label their educational relevance. Can this be done? And can it be done while maintaining reusability of materials and interoperability of DLEs?

A more sophisticated approach

A more sophisticated approach first of all focuses on learning tasks, with learning objectives and demands for prior knowledge, not on files. This amounts to an educational rather than an information scientific tack. Second, the learning tasks will make use of background materials, resources needed for their completion. These resources will be clips, books, internet sites, and similar materials. So the video clip of Martin Luther King would become a resource for a particular task. In the texts discussing racial discrimination or the calculation of variances background information would have to be distinguished from the instructive components. The background information would end up as a resource, the instructive components as a didactic scenario, consisting of a number of tasks. Perhaps task sets could be portrayed as a road map, on which students pick a particular route, depending on the teacher’s preferences, their own preferences, or their performance on previous tasks.

Such a more sophisticated approach demands a language with which one may model various didactic scenarios (task routes). This educational modelling language (EML) would have to be able to link tasks with the resources they draw upon. It would have to be able to differentiate between roles, as both teacher and student roles will depend on the specific didactic scenario used. It would also keep track of the performances of the persons in the various roles, not just in order to establish their track record, but also to influence the precise way in which the scenario is played out. Such EMLs recently have sprung into existence. They are the subject of study of both the IMS consortium’s group Learning Design and the CEN/ISSS Workshop Learning Technologies.

Using an EML allows one to store resources and didactic scenarios separately. So reuse has been extended to cover not just resources but also scenarios. This is a huge gain. Also, resources are always stored in an educationally significant setting. This ensures that repositories of educational content are different than any old collection of resources,
it guarantees that resources make educational sense. Obviously, interoperability with respect to existing DLEs is compromised. Although the current DLEs would still be able to use the resources much the way they always have, none of them is able to run didactic scenarios specified in some EML. So far, didactic scenarios have been almost hardwired in the various DLEs, to the extent, that is, that DLE are actually capable of rendering a particular scenario. Clearly, given the short histories of EMLs, DLEs can hardly be blamed for not being able to play out EML based scenarios.

In conclusion then, although in the sophisticated approach DLEs would still be able to operate as they always have, they are as yet unable to deliver the benefits of the EML approach. However, as learning technology specification in IMS, CEN/ISS and elsewhere progresses, DLEs will no doubt change their habits.

A solution for the DU

It is this more sophisticated EML based approach that the Dutch Digital University will follow. This course is not devoid of risks. For instance, it is still unclear which way precisely the standardization bodies will go. Moreover, authoring tools specific to EMLs do not yet exist. As a consequence, for the time being some stopgap solutions have to be used. However, the simple approach is not a viable alternative. It does not reap the benefits of reuse and it does not contain enough educationally significant ideas to be truly innovative.

† The text including hyperlinked references will be available on my website in the articles section <http://www.ou.nl/open/psl/>