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Pedagogical considerations in an e-learning framework

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We are developing a framework that supports network based education at the University of Veszprém. It handles learning objects that are discovered by service discovery and described by Learning Object Metadata (LOM). In this article I would like to present the framework and some of its pedagogical aspects.

E-learning has two main aspects:

- The technology that supports the framework of learning
- The pedagogical principles built into the framework

There exist many applications supporting elearning, they are referenced as Learning Management Systems (LMS). Although an LMS can be very rich in functions, if it lacks important pedagogical principles, it becomes useless.

We've developed a framework supporting network based education at the University of Veszprém and I'd like to present this framework in the paper, together with the pedagogical aspects.

To establish an e-learning application the first step is to develop the content [1]. In traditional education content is divided into smaller parts called lessons. E-learning has a similar concept, the learning object (LO). The official definition of this term comes from the Learning Technology Standards Committee (LTSC) of the Institute of Electrical and Electronics Engineers (IEEE). According to the LTSC, a LO is any entity, digital or nondigital, which can be used, reused or referenced during technology supported learning [2]. In other words, a LO is an entity that can be reused and composed with other objects.

To use an analogy you can think of a LO as an atom. We can build more complex structures from one LO just like a molecule builds up from several atoms. There are several rules how a molecule can be created, and different rules apply for LOs too. The most important is the "rule of dependencies", i.e. the LOs depend on each other. For example to begin working with "Distributed systems" LO we have to complete "Computer networks", while in turn "Information networks" must be accomplished to go to "Computer networks". Our framework can represent dependency rules by graphs so they can be easily understood. The graph depicting the example can be seen here:

The next step is to store the LOs created in the previous step. There is a certain amount of time when the LO must be revised and corrected, if needed.

We also need to describe the LOs. This is done by some kind of metadata. Without metadata we would have a lot of objects without any clue what do they contain. It's like we were in a library without any catalogs.

There exist several proposal for educational metadata, I chose the most significant of them, the Learning Object Metadata (LOM), developed by LTSC. It contains nine categories with more than 60 attributes.

After describing the learning objects we have to find them. The framework is distributed which means LOs can be scattered across the network. Traditionally users find a network object by typing its address or using a search engine. A new approach is service discovery. It is not exactly for finding some useful data, it was designed to manage network services in a distributed environment. I regarded the framework elements as network services. Using service discovery they can cooperate without any configuration.

Service discovery is performed by discovery protocols. The four main service discovery protocols are Jini, Salutation, SLP (Service Location Protocol) and UPnP (Universal Plug and Play Protocol). We decided to use SLP, mainly because it was developed by the Internet Engineering Task Force (IETF).

Content packaging is the way LOs are put together to form a specific course. This feature is not implemented yet in the framework.

Using a LO students can bump into problems they can't solve. Some kind of help should be provided for them, most likely communication with the instructor. Our framework contains both synchronous (chat) and asynchronous (forum) communication possibilities.

This is a difficult issue because some forms of assessment are not possible in electronic way. However we can use multiplechoice questions, matching questions and short answers. The most useful of them are multiplechoice questions, because they test students' higher-order thinking skills. It is possible to use this kind of questions in our framework, too.

To establish a working e-learning application we need not only pure technology but also pedagogical principles built into the framework. In this paper I examined these principles through a framework developed at our department. We can conclude that this framework supports many principles, although some extensions are still needed.

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