Pedagogical Convergence of E-learning Technologies

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ABSTRACT
One of the problems of designing and evaluating e-learning materials is the absence of a single unified model that establishes a rigorous and consistent relationship between pedagogy and technology. Such a model would facilitate the most effective use of both of these in the design process. It might also clarify the issue of which of these is driving modern educational development.

This paper describes and tests a proposal for a model based on a set of components that can be aggregated in various ways to reconstitute any of the mainstream pedagogical theories. The aim is that they should be acceptable to both the practitioners and the theorists. They should also have a clearly defined relationship with all forms of e-technology, including content-based and process-based formats, so they define a framework for the convergence of pedagogy and technology in e-learning.

In this paper, the model is proposed and some illustrations are provided for a range of technologies. It is found to be a viable and natural way to inform the design process.

Keywords: Pedagogy, E-learning, Technology, Objects

1. INTRODUCTION
In recent projects to design pedagogically informed learning objects it has become clear that there are no universal design criteria that might inform the process. In fact, when asked to evaluate existing objects both tutors and students tended to prioritise usability, motivating features and subject context rather than pedagogy. In addition, they were uncertain about the relative merits and even the comparability of these objects with traditional and other e-learning options in terms of pedagogical principles. So it was decided to examine the possibility of developing a model that might formalise the relationship between pedagogy and technology.

2. PEDAGOGY
Pedagogy can be regarded as a strategy for the implementation of learning methods. These are generally defined in terms of broad learning perspectives such as associative, constructivist and situative [1]) with many variations on this theme. So the terminology is quite abstracted and, to the practitioner, somewhat elusive. This has led to the development of many suggestions for authoring systems that facilitate the design process [2]. However, none of these seems to be sufficiently user-friendly and technology-aware for the present purpose.

So the aim was to restructure the theory in terms of a more familiar and easily applicable taxonomy to obtain a pedagogy that can be related in some way to the technologies.

3. TECHNOLOGY
In some respects, technology is a more accessible field of study since many tutors are web aware. However, it too presents some difficulties since it is already a disparate field of study and is evolving quite rapidly. It covers many formats including learning objects [3], learning designs [4], blogs [5], video conferencing, virtual reality and even some offline technologies. It would be useful to find some commonality between these and a convergence with pedagogical theory.

4. OBJECTS
The aim has been to identify a set of pedagogical components that can be aggregated in various ways to represent any of the learning perspectives. So an analysis of these theories was carried out and this yielded a set of components that can be described as Information, Experience, Consolidation, Discussion and Assessment.

These components are objects. In effect, they are learning objects without any associated learning activities. This highlights a well known ambiguity in the definition of learning objects that would describe them as content objects [6]. They can be used in various ways by external learning activities in full learning objects, learning designs and other e-learning systems. Here they will be described simply as objects.

5. INHERITANCE
To make the model work it has to be noted that these are not real objects. They are types of object. They have to be implemented with a specific technology to become usable. This is the key relationship and it is the point at which the convergence between pedagogy and technology takes place. So Information, for example, defines a type that can be realised as a book, a diagram, a podcast or a web search. This real object inherits the general properties of the Information type and adds its own special and usually technology-dependent features.

Also, an object may inherit from more than one type – and usually does. So an online conference may be designed partly for Discussion and partly for Information or Experience. These are simple rules but they can lead to a wide range of quite complex structures.
6. RESULTS

The results of this study take the form of a number of trial implementations to assess the viability and acceptability of the approach. Some of these are outlined below.

**Associative e-tutorial**

This tutorial is implemented as a learning object. It follows the classic behaviourist style of providing an Experience object in the form of an equation solving exercise followed by Assessment, which is formative and includes feedback. These are embedded in a learning activity that trains the user in a standard method of solving equations. It does not provide any Information since that is given elsewhere in the course material and, although some Consolidation of conceptual knowledge may be involved, it is not targeted explicitly. Finally, it is intended for individual learning so it has no related Discussion.

**Constructive e-tutorial**

This is a tutorial implemented as a learning design that uses a set of objects in the form of interactive simulations of successively more advanced JavaScript programs that the learner has to develop. The learning activity defines an individual learning process. The package offers an authentic Experience object in the form of a real software development exercise, and also implements Consolidation that explains difficult programming concepts. There is no Information since that is provided elsewhere in the course, and there is no Discussion, since the tutorial is designed for individual study. In this example there is also no Assessment although the Consolidation does involve immediate feedback that could be expanded into a more formal Assessment. So this is a cognitive-constructivist tutorial.

**Situative e-tutorial**

This version is implemented as a blog since this is a suitable technology with which to encourage collaboration. It first of all shows a video clip of a web search procedure, which is a vicarious Experience, then asks the students to carry out their own searches, which involve further, real Experience. This should return Information which is the subject of a Discussion aimed at generating a consensus outcome for Assessment. So this tutorial creates an authentic, situated learning environment.

7. CONCLUSION

The main conclusion is that the approach seems to work. It employs a terminology that is easily understood by practitioners and it can reconstruct any of the main pedagogical perspectives, even if the designer is unaware of these. It provides a unified terminology and a systematic framework for the comparative evaluation of e-learning materials.

In addition, it is a more accurate way of describing these and traditional learning events than the original terminology. For example, it avoids the usual debates about what exactly constitutes a “tutorial” by defining a specific pedagogical process.

Since the model can be applied to any technology it can be said to promote the pedagogical convergence of e-learning technologies.

8. REFERENCES


