Some Potential Benefits of Sharing Graphical and Dynamic Representations of Pedagogic Strategy for Learning Support

1.1 Introduction

This short project report represents some emerging conclusions and results from the Learning to Learn project (http://www.stir.ac.uk/departments/daice/l2l/). We have been investigating the feasibility of getting lecturers to articulate and share their pedagogic strategies for using learning objects that they are helping to design as part of the project.

For us 'learners' constitute:

- lecturers as novice instructional / educational designers
- students enrolled on courses (face to face and online) designed by the lecturers

One of the key activities of the project is to try to introduce and use a common vocabulary to describe pedagogic strategies in the use of learning resources by an existing community of practice – that of study skills tutors. The vocabulary is based on the concept of 'learning functions' as described in the work of Thomas Shuell (1992) who advocates building a descriptive cognitivist bridge between instructional design and constructivism. Initial results show that this is a useful support and communication tool for the tutors to share their pedagogic practice and designs – although a great deal depends on how the vocabulary is introduced to start with. This approach also looks like having the potential for providing a useful shared pedagogic analysis and design tool for use both between teachers and teachers and content media designers.

2. The Higher Education Teaching Context in the UK

In UK higher education, teaching activities and the learning content produced to support them are usually very contextualised and deeply embedded in institutional procedures. In this pedagogic environment lecturers feel most at ease developing content and delivering it to their students. Conceptualising learning activities for their students is not a particularly common activity (Koper, 2003), and sharing these conceptions with colleagues is even rarer. As Allison Littlejohn (2003) observes:

> "Designing for reuse means designing with multiple users in mind and this is a new experience for most teachers in all sectors of education."

The arrival of the IMS Learning Design and Learning Object specifications (http://www.imsglobal.org/specifications.cfm) are serving to highlight this aspect of the pedagogic culture of higher education in the UK and the shortage of instructional / educational design skills in the academic workforce to take advantage of these new technologies. This has been one of the major findings of our project and others in the JISC funded X4L programme. Finding ways to support busy lecturers in developing and sharing their pedagogic strategies has been a problem our project has focused on. In this context the use of graphics to represent pedagogic strategies is an attractive one for us.

3. Our approaches to creating and using graphical and dynamic representations of pedagogic strategy

We felt no need to add to the many different and sometimes conflicting theories of learning that already exist and Shuell's seems to offer a good balance of openness (to other theories), common sense, and detail. Shuell's work is particularly useful as it seeks to merge the rigorous approach of the Instructional Design tradition (teaching aims, learning objectives, performance criteria etc.) with the more learner-centred positions taken by cognitive and constructivist approaches. This makes it particularly suitable for the pedagogic culture of the UK.

What Shuell's model gives us is a convenient vocabulary to describe the cognitive processes involved in learning that can be shared and act as a 'scaffold' to support descriptions and discussions about teaching and about the design and use of learning resources.

There are many models and theories of learning and instructional design from which we could choose, Laurillard's Conversational Model (Laurillard, 1994) and Merrill's Component Display Theory (Merrill,1988) spring to mind. It would be a very interesting experiment to 'mix and match' different models and their graphical expressions for different purposes within the same course. For our project we have chosen the model developed by Shuell (1992) and mapped it onto the very old, simple and intuitive teaching model that might be summarised as: 'Prepare – Teach – Review'.

Shuell argues that every successful learning episode involves certain learning functions and that a learning function may be activated by the teacher, the learner or by a resource acting as an instructional agent.

Below is a list of these learning functions, with a short description:

- **Define Learning Expectations**
  the learner has some idea of what he or she is trying to accomplish

- **Motivation**
  willingness to persist and contribute effort to the task in which he or she is engaged

- **Prior Knowledge Activation**
  ensure that both cognitive and affective prerequisites (including the needs, goals, and everyday experiences of the learner) are available for use by the learner

- **Attention**
  important for the leamer to pay attention to important features of the instructional task and to ignore features that are irrelevant

- **Encoding**
  the process by which information is prepared so that it can be manipulated in short-term or working memory

- **Comparison**
  in order to acquire a body of knowledge involves understanding rather than rote memorization, the learner must compare facts and concepts in a search for similarities and differences that permit the formation of those higher-order relationships that comprise understanding

- **Hypothesis Generation**

the active, constructive nature of meaningful learning requires the learner to generate various hypotheses as he or she seeks a more adequate understanding of the material being learned

- **Repetition**
  it takes time, and multiple exposures, to find meaningful ways of relating the various parts of a complex body of knowledge

- **Feedback**
  for the learner to determine if he or she is on the right track, feedback must be received on the accuracy and/or appropriateness of what was done — either overtly or covertly

- **Monitoring**
  an effective learner keeps track of the progress being made toward achieving the instructional goal

- **Evaluation**
  simply receiving appropriate feedback is not sufficient; the learner must interpret and evaluate the feedback and determine how it can best be used in the learning process

- **Combination, Integration, Synthesis (CIS)**
  As information is acquired, the more-or-less isolated pieces must be combined in ways that permit the learner to integrate and synthesize information from several sources. Meaningful learning, as already noted, involves a complex network of interrelated concepts, facts, and procedures.

3.1 Shuell's functions mapped onto the Prepare – Teach – Review Model

Preparation Activities

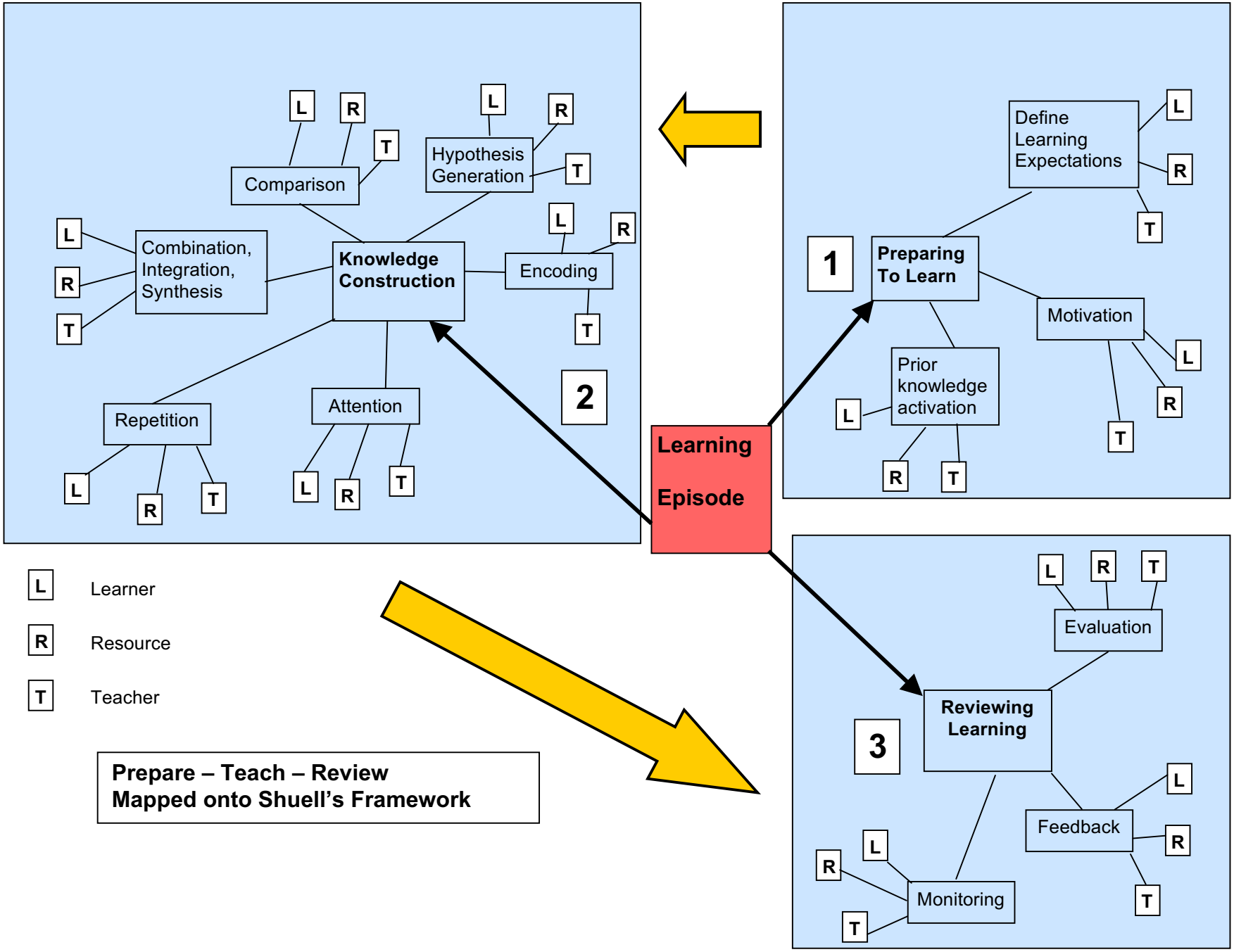
- Motivation
- Defining Learning Expectations
- Prior Knowledge Activation

Teaching /Knowledge Construction Activities

- Attention
- Encoding
- Comparison
- Repetition
- Hypothesis Generation
- Combination, Integration, Synthesis

Review Activities

- Feedback
- Monitoring
- Evaluation


Define Learning Expectations
L
R
T
1
Preparing To Learn
Motivation
Prior knowledge activation
Learning Episode
2
Knowledge Construction
Comparison
Hypothesis Generation
Encoding
Combination, Integration, Synthesis
Repetition
Attention
3
Reviewing Learning
Evaluation
Feedback
Monitoring
L Learner
R Resource
T Teacher
Prepare – Teach – Review
Mapped onto Shuell's Framework

3.2 Some Suggestions for Different Graphical Descriptions of Shuell's Model

3.2.1 This and other pedagogic models and strategies could be applied and 'viewed' from different perspectives such as:

- **Linear Timeline**
- **StoryBoard (Branching structure)**
- **Concept Map**

The graphical representation of Shuell's Model shown in Fig. 1 seems particularly suitable as a case for the application of concept mapping software such as CmapTools (http://cmap.ihmc.us/Index.html) produced by the Institute of Human and Machine Cognition based at the University of West Florida.

3.2.2 Different Graphical Views of the Granularity of Shuell's Model

Pedagogic models and strategies could be applied and 'viewed' from different levels of granularity such as:

- **Lesson**
- **Module**
- **Semester**
- **Complete Course**

This would provide the conceptual and logical basis of a 'zoom' function for Pedagogic Strategy (although different models might be suitable for different levels of granularity).

4. Some Potential Benefits of This Approach:

- It can complement and simplify a textual description of pedagogy – which can be semantically dense and time consuming to produce

- As an aid to developing course design skills Littlejohn (2003) suggests using storyboards and other graphical techniques, she also makes the point that such storyboards are useful tools to support reuse – allowing lecturers to easily identify where activities and content resources can be changed or substituted.

- Perhaps most importantly storyboards and other graphical tools provide ways of capturing a lecturer's conception of the processes and activities in a course, that they might find otherwise difficult and time consuming to articulate. Using graphical representations of pedagogic strategies in this way could be very valuable to allow a multi-disciplinary course development team access to the information. This appears to be a typical use of 'boundary objects' to transfer and negotiate meaning within and between communities of practice as advocated by Wenger (1998).

- This use of graphical representations of pedagogic strategy seems to have a particularly good fit with the ideas surrounding the use of design patterns for educational design and the need for richer design tools as advocated by Bartolucci et al (2003).

- Depending on the type of pedagogic model chosen it could be possible to 'zoom' the graphical view of the course to different levels of granularity – something that is particularly attractive for course design activities and as an aid in visualising the use of learning objects.

- For the student experience we can envisage different views of the course using the pedagogic strategy as the basis for generating the view combined with system tracking information. Such views of the course might include individual location on a timeline, or cohort positions mapped onto learning outcomes achieved, or a representation of the subject knowledge domain produced by a lecturer.

5. Conclusions

Based on our project work experience we have come to these tentative conclusions:

- graphical representations of pedagogic strategies are potentially valuable staff development tools and may help support groups involved in course design
- graphical representations could provide a useful bridge to the more abstract activity of generating Learning Designs
- sharing graphical representations of pedagogic strategies with students is potentially a valuable learning support aid and may encourage the development of meta-learning skills
- adding dynamic components to such graphical representations could add to the richness of learning support available
- useful dynamic graphical representations of the pedagogic strategy in terms of time, student progress and cohort activity etc could be generated with the aid of web services
- a fundamental question to consider is what risks may be associated with sharing a conception of pedagogy with students

References

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