PROSPECTS FOR USING LEARNING OBJECTS AND LEARNING DESIGN AS STAFF DEVELOPMENT TOOLS IN HIGHER EDUCATION

Authors: John Casey (UHI MI, Inverness, Scotland), Kevin Brosnan (University of Stirling, Scotland), Wolfgang Greller, Alpen-Adria University, Austria)

ABSTRACT

This paper examines the potential for using learning objects and Learning Design as vehicles for staff development in UK Higher Education (HE). To support this approach we propose using Ramsden's (1991) three theoretical models of teaching in HE to provide a conceptual framework to situate these technologies in. We observe that the introduction of these technologies into HE reveal and highlight underlying obstacles to their adoption by reifying existing pedagogic practice and values. We map these obstacles onto Ramsden's theoretical framework and propose in outline a staff development strategy to help remedy them. This implies a change both in the institutional and professional organisation of teaching activity in HE, we conclude by presenting in outline the kind of changes required which also provide us with an indicator of areas for further investigation.

KEYWORDS

Pedagogy, Learning Objects, Learning Design, Staff Development, Institutional Change

1. INTRODUCTION

Learning Objects and Learning Design (Koper & Tattersall, 2004) are entering the mainstream of the educational systems around the world and creating a 'buzz' of excitement about the possibilities of providing an efficient means of finding, sharing and reusing learning resources and designs. Yet, as is so often the case with the introduction of technology into an educational setting, this is bringing some of the underlying issues and features in our educational institutions to the surface (Neil & Cornford, 2000). We argue that this reification effect of technology in education far from being a problem can be a useful development aid for improving pedagogic practice. To support our analysis we will use Ramsden's (1991) three theories of teaching in higher education (HE).

The particular staff development need we are interested in is educational design for e-learning. The heart of the problem here in the UK is that teaching staff generally do not share and reuse learning resources and learning activities for their students, instead they concentrate on preparing 'their' content to deliver to 'their' students (Koper 2003). The teaching activity that is carried out is deeply embedded in an institutional context and therefore difficult to share and abstract. To deal with these problems effectively first we have to identify them, as Ramsden (1991) observes:

> *"Half the difficulty with doing it better is knowing what the real problem is"*
> Ramsden (1991) page 14

2. SYSTEMIC FACTORS

The arrival of learning objects, learning design and their related technologies from the industrial training and open learning sectors carry strong implicit organisational models that favour greater corporatism and a division of labour – an industrial model. This presents some problems, the opportunities for efficiency and quality gains are already well rehearsed elsewhere. The main problem for us is that the HE sector does not have the organisational structures that these technologies require. Instead higher education is characterised by a very high degree of informality and autonomy at all levels – which is not necessarily a bad thing. An excellent analysis of these systemic obstacles to using technology in higher education has been carried out by Newcastle University (Pollock & Cornford, 2000). The study found that the required administration processes often do not exist; a web version of the report can be found in the ARIADNE newsletter at:
http://www.ariadne.ac.uk/issue24/virtual-universities/

Teaching in higher education in the UK has traditionally been accorded a low status (Ramsden, 1991) yet for most institutions income derived from teaching is the major source of institutional wealth, with figures of 80% - 90% and above not being uncommon. So, for most universities teaching is the de-facto core business activity. As tightening financial constraints bring this reality to the surface and technologies such as Virtual Learning Environments (VLEs) are being deployed one of the emerging strategic gaps is a lack of pedagogic expertise.

There is a growing realisation that it is not very sensible to invest in learning technology and not change the way we work. It is a bit like a factory building a new production line and continuing to use handcraft production techniques – yet this is the situation that many of our institutions and teachers find themselves in. This is not surprising; tradition, dominant groups and vested interests can delay and obstruct the adoption and dissemination of new knowledge as the history of science shows (Kuhn, 1996).

Thus, learning objects, Learning Design and their implicit organisational and pedagogic models are colliding with the deeply entrenched pedagogic values and attitudes of the HE sector. Anyone who has worked in this area will recognise that it is a volatile environment that is still in the process of forming as the recent collapse of the government-funded UK e-University has shown (MacLeod, D. 2004). In this process orthodoxies from both traditions are being challenged in the new and emerging teaching practices and learning communities appearing at this interface. To move forward we need to address the so-called soft issues of professional and institutional cultures as well as some of the assumptions implicit in the technologies.

3. USING RAMSDEN'S THEORETICAL MODELS TO DESCRIBE HE TEACHING AND ASSESS THE USES OF LEARNING OBJECTS AND LEARNING DESIGN

Ramsden outlines three theories of teaching in HE that co-exist and build on each other in a hierarchical manner. They nicely represent the stages a university teacher progresses through as their pedagogic expertise improves and they also provide a useful way of analysing the proposed and actual uses of technology to support teaching. The three stages see teaching as concerned with (labels in brackets are ours):

- Delivering content (primitive)
- Organising and supervising student activity (simple)
- Teaching as adapting to circumstances and context in order to make student learning possible (sophisticated)

As noted in the introduction, technology in higher education often acts as a strong force to reveal hitherto hidden factors and demystify existing processes; this section looks at some of these kinds of issues.

Universities in the UK tend to be quite traditional in the way they organise their teaching activities. Lectures still tend to be the main focus of undergraduate teaching despite there being little educational justification for their existence other than being a medieval solution to the logistics of delivering information to large groups of students (Laurillard, 1994). In UK higher education teaching (outside distance learning providers) there is little tradition of sharing pedagogic resources or strategies and to try to do so is often met with confusion and hostility. One of the major reasons for this is that teaching in higher education is essentially delivered by groups of individuals who see themselves primarily as subject specialists and not teachers. This situation is compounded by the fact that many institutions do not see teaching as a core function either.

3.1 Theory 1: Teaching as telling or transmission

A number of researchers have observed that the transmission model of teaching is widespread (Shuell, 1992. Laurillard, 1994. Koper, 2003. Ramsden, 1991.); it is based on a deficit – accrual notion of learning that sees the main task of the teacher to supply information. There is little dialogue with students; the teaching is monologic – the onus being on the student to align their expressions of knowledge with the academic norm in the area. As Shuell points out this is such a widespread view of teaching that it is taken for granted, here the concentration is on content, on the subject matter. This pedagogic model might have been partially defensible when students and teachers were drawn from the same narrow social and academic backgrounds in traditional university settings. However this is failing under the sheer weight of extra students and the diversity of their social and academic backgrounds as well as the demand for flexible study modes. The teaching as transmission model is still widespread and tenacious, as Ramsden observes:

"There are some more modern versions of this theory too: the belief that the fundamental problems in university instruction inhere in the amount of information to be transmitted, and that these problems can be solved by technical fixes designed to transmit more of it faster…"

Ramsden (1991) page111

Here we can see much of the rationale for the proposed uses of multimedia, computer based learning and the Internet that have been espoused since the 1980's. More recently, the interest surrounding learning objects and digital repositories shows the strength of interest and concern in content creation and its transmission.

The 'teaching as telling' scenario is consistent with the 'subject specialist' model of amateur teaching that has historically dominated HE in the UK. The associated scholarly culture that 'trickles down' onto the student experience is often one of isolated, individualistic and competitive activity (Crook, 1994). The experience of students in this kind of environment is often unsatisfactory. Typically a student on a course will pass through the hands of different lecturers all teaching from their own notes, not working as a team from the same 'script'. This has the effect of fragmenting the learning experience and subject matter, it also places a higher load on the student than is necessary and presents obvious barriers to 'non-traditional' students.

In this pedagogic world-view it is possible to see why some teachers like to stick with creating and transmitting content. It is partly because they created their own content as part of the process of their own learning and relearning of their subject in order to teach it to their students. Thus their teaching strategy is

often to get their students to learn from what they did – this is not a very sound approach, but it is common and intuitive and helps account for lecturers deep attachment to their own 'stuff'.

3.1.1 Learning Objects

The arrival of learning objects and learning design into this scene is having some unexpected effects. One of the traditional learning object orthodoxies is that they should be free from internal contextual content to make reuse easier, this makes a lot of sense for a specialist educational workforce as in computer based training and instructional design. But this presents severe problems for 'general practitioner' teachers and lecturers who are increasingly clear about their need for meaningful contextual information about the resource to enable them to assess it and reuse it. A particularly popular request is for some kind of review process that allows users of the resource to record their usage and evaluation of it for others to examine (Rehak & Mason, 2003, Casey 2004). It is also increasingly being recognised that the production of this kind of usage information (sometimes called secondary metadata) can be important for professional and institutional strategic development purposes as Robyn, & Dalziel (2003) propose:

"These requirements make clear the need for new conceptions of learning object meta-data, and new ways of using repositories—not just for search and retrieval, but as a living, growing body of shared practice."

3.2 Theory 2: Teaching as organising student activity

As Ramsden observes the transmission model of teaching in HE (although still widespread) has in public discourse tended to be supplanted by concern about managing and directing student activity.

"Teaching is seen as a supervision process involving the articulation of techniques designed to ensure that students learn...Activity in students is seen as the panacea. It is assumed that there is a finite set of rules which may be infallibly applied to enable them to understand: these all imply that the students must learn energetically."

Ramsden (1991) page 113

Although often this discourse acts as a 'cover' for the continuation of the transmission model it is at least a step in the right direction. Here the concentration is on what the student does, not on what the teacher does – or delivers. Here we can see much of the existing rationale for the use of VLEs (virtual learning environments) as being management, direction, supervision as well as the ubiquitous delivery of content. We can also discern the basis for the use of 'interactive' media and computer programmes. Currently a popular mantra amongst UK e-learning designers (who are usually media designers with little educational knowledge – the role of instructional designer being almost completely absent in the UK) is that learning *must* be active to be effective, showing us the sharpness of Ramsden's earlier criticism. Often this is little more than a justification for using some interactive aspect of the media being sold. A more sensible and efficient approach can be seen in the distance learning community where the academic subject specialist is just one in a team of professionals (Laurillard, 1994) and is often dispensed with after they have contributed their subject knowledge while the educational and media specialists finish the job.

3.2.1 Learning Design

Currently, a lot of excitement has been generated in the world of educational technology by the arrival of 'Learning Design' a technical specification for representing in both human and machine readable terms the pedagogic strategy that can be employed to teach a particular course. The particular risk with Learning Design is that its proponents will fall into the trap outlined by Ramsden concerning the over-emphasis on

activity and an implicit positivist conviction that all we need to do is find the 'right way' to teach a particular course and encode it to make it a 'run-time' success. It is easy to get over-enthused by the possibility of the technology and lose connection with the reality of teaching and learning at the ground level. Despite this caveat, Learning Design does have a great potential for 'capturing' and sharing pedagogic strategies with obvious applications to staff development as well as uses for institutional knowledge management.

At present the Learning Design language itself looks far too abstract for general teaching staff to be able to use and is likely to be restricted at least initially to those with the educational design skills that can work at the required level of pedagogic abstraction. Yet this situation is not as negative as it might seem. A seminar of the JISC X4L programme in January 2004 building on earlier discussions in the e-learning community suggested that what was needed were a number of initiatives and support tools to help teachers bridge the gap between traditional embedded pedagogy and the more abstract representations required by Learning Design (Beetham 2004). One of the conclusions of the X4L seminar was:

"That many teachers do not possess a vocabulary for articulating and sharing their pedagogic strategies and designs with others, particularly beyond their cognate discipline areas"

Currently there is a lot of work going on that intends to address this issue by looking at ways to support teachers to articulate their designs and activities in ways that can then be further developed into formal learning designs. Tools and methods are being proposed to take care of the these 'middle' representation such as mind maps, concept maps, the Semi-Structured Learning Design Statement from the ACETS, project at Edinburgh university (http://www.acets.ac.uk/) and the Dialog Plus (http://www.dialogplus.org/) design toolkit from Southampton university. The UNFOLD European project (http://www.unfold-project.net:8085/UNFOLD) is also doing valuable work in this area and serves as a focus and forum for this kind of development as well as more sophisticated explorations of the Learning Design concept and specifications. All this work is valuable but we need to also recognize the rougher and more tentative conceptions of pedagogy that practitioners really use, we would call these 'primitives' and 'artefacts'. Together these approaches give us a useful notion of a Learning Design continuum as shown below:

Primitives/Artefacts………………….Semi-Structured……………………Formal

Figure 1. A Proposed Learning Design Continuum

As we shall see this nicely complements our proposed framework for staff development using these technologies. From a staff development point of view the good thing about this continuum is the support it provides to help in beginning to articulate teaching strategies.

Paralleling these developments there is a growing realisation that content in the form of learning objects and pedagogic designs in the form of Learning Designs are less likely to be useful (or even used) without some sort of contextual information about how they are intended to be used and how the actual use of them has worked out in the past. This may be obvious to teachers but not for some technical developers who are often far removed from the realities of teaching. This vital contextual information has been referred to as 'secondary metadata' and 'secondary resources' see Casey (2004) and Robyn & Dalziel (2003) for an interesting discussion of the implications of this.

One interesting development related to this is the emergence of and growing interest in educational design 'patterns' (Bartolucci, S., et al. 2003) for courses that can be shared and reused. An intriguing aspect to the use of patterns is that it might also present an elegant solution to some of the dilemmas described by Stephen Downes (2003) between context and reuse. In this way, patterns might usefully correspond to what the community has called intermediate levels of description. In this vision it would make sense for learning designs to be associated with their 'pattern' to help teachers adapt the design. This could help reduce the cognitive load of deciding how and what to reuse by future users. This is certainly an area that would benefit from further research. This approach has striking parallels with the techniques employed by the Toshiba

software factory where programmers were asked to file such 'high level' generalisations with their code (van Vliet, 1993).

What this points towards is a realisation by the technical and developer community that there is much more to teaching than delivering the 'right' content and organising the 'right' student activities. This is uncomfortable for some as it implies that there is going to be things they are not going to be able to capture or represent even with the wonders of XML and the techniques of the semantic web. It's about time, many of us have been labouring under the dubious illusions touted by some proponents that it is possible to capture everything we need to know about teaching and represent it in machine-readable form.

Still, the myth that there is some 'magic bullet' type of solution persists in the developer community and we hear phrases such as 'with enough computing power' and with the right 'AI' (Artificial Intelligence) techniques' that we can crack the problem. To be blunt they should know better – they had their own AI bubble back in the 1980's, a kind of dress rehearsal of the dotcom bubble at the end of the 1990's. AI works best in well-defined problem spaces. Using learning objects and learning designs to support a teaching and learning community is very far from being a well-defined problem space. Those who have recovered from their AI hangover now advocate using technology to support human intelligence in dealing with these kind of problems which is well fitted for dealing with complexity and multiple meanings – and resolving them. The future of e-learning will consist of humans, assisted by technical agents; operating and maintaining networked e-learning systems.

3.3 Theory 3 Teaching as making learning possible

This leads us nicely to consideration of the third level in Ramsden's hierarchy of theories of teaching. He sees teaching as an activity that includes delivering content and organising activities but is also fundamentally concerned with learning about teaching itself and applying the lessons learnt to new students and situations. In this view teaching is a constantly evolving, reflective, and reflexive process in which there is no steady state of masterly expertise that one may attain and encode. As in any other craft, mastery brings an awareness of what one does not know as much as what one does know, and this is a prime requirement for the attainment and retention of that mastery.

Ramsden describes this as the development of an awareness of the seemingly contradictory development towards an increasingly relativistic and problematic understanding of the relations between teaching and learning:

"It is as if the development itself denotes an acceptance of the restless tension of opposites in education"
Ramsden (1991) page 117

This 3-level view of teaching certainly does not lend itself to being reduced to a simplified mechanistic process that can easily be entirely encoded in a Learning Design – which suggest limits to the application of Learning Design. It does however provide us with a potentially powerful way to analyse and evaluate proposals for utilising technology to support our teaching activities. Or to put it another way if we intend to live by the slogan "education should lead the technology" it gives us a way of explaining the "why" and "how".

Teaching, of course, does consume content and information and it is very concerned with planning and directing student activity. But that is not the whole story – there is much more to effective teaching than using content and directing student activity. The vital component of effective teaching is what the teacher learns about their own teaching as they go along and applies it to their teaching, Ramsden makes the important point that this can occur at an individual, departmental and institutional level. In this view, good teaching it is concerned and involved with the students - their activities and their perceptions, the subject matter, and is reflective and reflexive about the experience of teaching and incorporates lessons learnt from

the experience of teaching into teaching practice. In this view teaching is a continuous *process* not a repetitive act of pumping the same content at students or finding some illusory magic formula for student activity. As Ramsden explains:

"Theory 3 is a compound view of instruction. In this conception, teaching, students, and the subject content to be learned are linked together by an overarching framework or system. Teaching is comprehended as a process of working cooperatively with learners to help them change their understanding. It is making learning possible. Teaching involves finding out about students' misunderstandings, intervening to change them, and creating a context of learning which encourages students to actively engage with the subject matter. Note that this theory is very much concerned with the content of what students have to learn in relation to how it should be taught... a teacher who uses this theory will recognise and focus especially on the key issues that seem to represent critical barriers to student learning. The content to be taught, and students' problems with learning it, direct the method he or she uses."

Ramsden (1991) page 114

4. A PROPOSED FRAMEWORK FOR STAFF DEVELOPMENT

We should not underestimate the problems we are up against here, as Ramsden points out:

"To do these things is never easy, especially if the departmental or institutional context is one where surface approaches are seen as a normal way of learning and where students' learning difficulties are not seen to be the teachers' problems"

Ramsden, (1991) page 151

Assuming change is really desired then Ramsden's three theories of learning provide a fairly clear and intuitive development framework model for individuals and groups to follow, each stage building on the previous one. Briefly, the prescription for change is as follows.

Technologies such as VLEs, learning objects and learning design all strongly imply working as a team to design, develop and deliver courses – the importance of this should not be underestimated. Working as a team, sharing learning resources and discussing approaches to teaching are currently comparatively rare in HE in the UK.

A good model for academics learning to teach along the lines advocated by Ramsden is that of the notion of 'cognitive apprenticeship' a development of ideas from the work of Lave (see http://tip.psychology.org/lave.html) by Brown, Collins & Duguid (1989) (see http://www.ilt.columbia.edu/publications/papers/JohnBrown.html). This approach proposes that people learn a 'craft' (practical or theoretical) in the context of a particular 'community of practice' (Wenger), and expertise is maintained and passed on through that community by people working together. This model often includes the notions of zones of proximal development from the influential Russian psychologist Vygotsky (http://tip.psychology.org/vygotsky.html) and 'instructional scaffolding' developed by Bruner see http://tip.psychology.org/bruner.html). It sounds more abstract than it is, zones of proximal development is the concept that expertise in a particular subject can be separated into a number of steps and that with support (scaffolding) the learner can move up the steps to achieve proficiency. Scaffolding denotes the idea that people need support (ideally from their peers and 'masters' in the craft, but potentially from many other sources) until they can develop their expertise at a level above where they currently are.

Ramsden's three theories of teaching provide us with a good description of the 'zones' that require to be mastered by academics, departments, faculties, and institutions as they mature as teachers. The diagram below shows their relations to learning objects and Learning Designs.
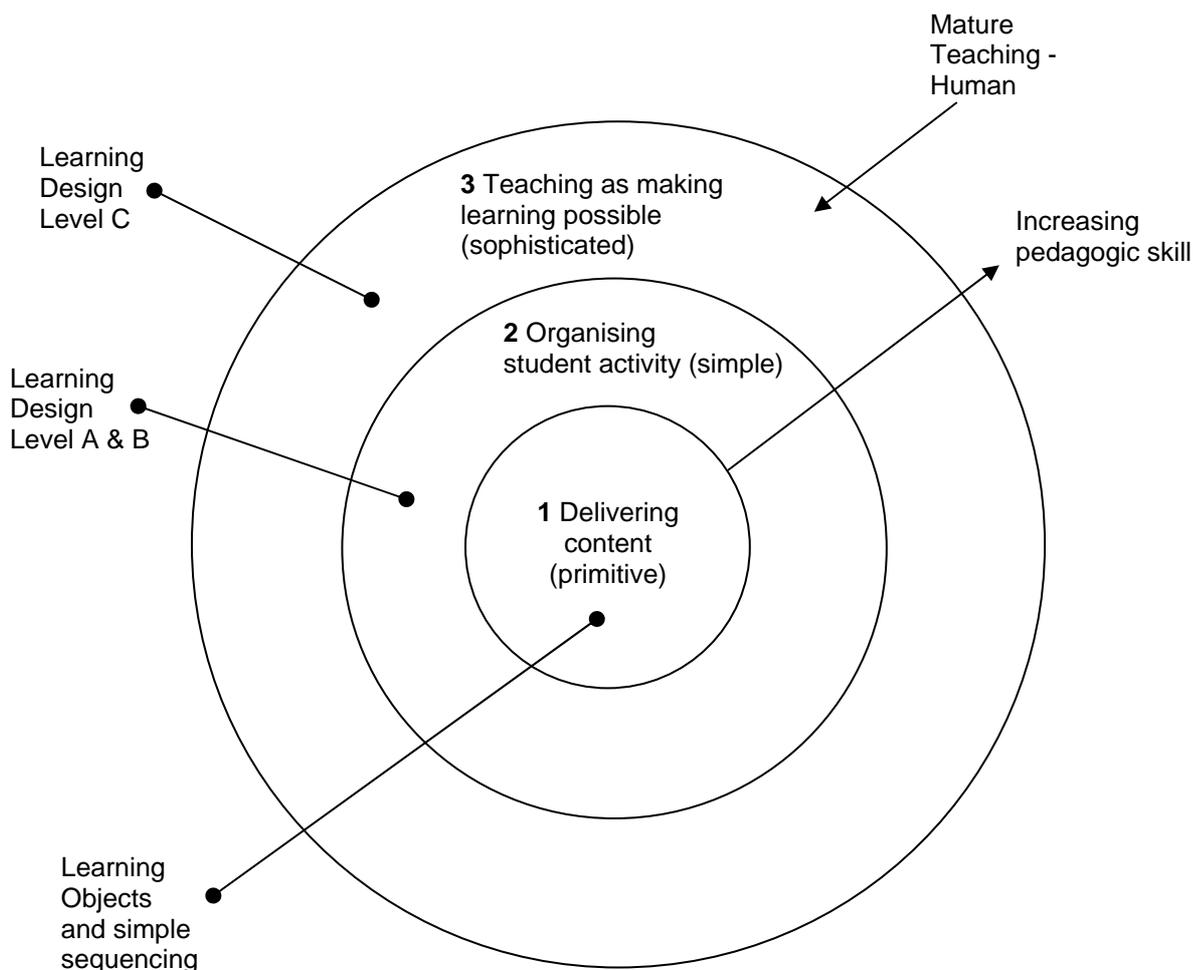
Figure 2. Ramsden's Models Mapped To The Technologies As Proximal Development Zones

The most important building block in our proposed model of development for academics is for them to work in teams that do not just include academics but also media designers, learning technologists and educational design specialists such as instructional designers. This division of labour is necessary for efficiency (Laurillard, 1994) but from our point of view this is where the real usefulness of technologies such as learning objects and Learning Designs becomes clear. They become what Wenger calls 'boundary objects'. This simple idea has some important ramifications about the uses of these technologies

- They act as a form of collective memory for a particular community that can be accessed and reused by that community in the future
- They support the construction of, and sharing of enough meaning between different groups (subject academics, tutors, administrators, instructional designers, media designers etc.) to allow them to understand their place in the educational system they are working in.
- To achieve the first two objectives the necessary contextual data needs to be collected

Working as a team to design, develop and deliver courses, sharing their learning materials and conceptions about the teaching and learning are the basis for potentially powerful staff and institutional development processes. The ability of learning objects and Learning Designs to support this process can be exploited. Properly conceived and planned this process may also play a role in building and strengthening scholarly communities.

5. CONCLUSION

Learning Objects and Learning Design have been eagerly welcomed and adopted by the e-learning community in the UK and this has brought to the surface some of the issues discussed in this paper. Rather than presenting an impassable obstacle this reification of existing pedagogic practice, attitudes and values is useful and identifies areas to be addressed through staff development, although we do not underestimate the task at hand.

As a result of these developments it is now increasingly obvious that the human infrastructure needs to be developed to effectively use these new tools (and the more recent ones such as VLEs etc). This is likely to pose some significant challenges in the form of institutional and professional change. As Mayes (1995) reminds us:

"education is a social and political system, and the checks and balances that keep the system working may not be shifted by any technology"

Along the way, we in may indeed find that learning objects and learning design do help in transforming teaching in higher education – it just might not happen the way we thought it would.

5.1 An Outline of the Organisational and Professional Changes Required to Utilise a Re-skilled Workforce

Alongside the staff development framework there needs to be a change to the institutional and professional organisation of teaching that can actually utilise a re-skilled teaching workforce along the lines we have been discussing. As Carol Twigg (2005) has observed much of the development of e-learning in HE to date has been 'bolted-on' to existing structures and practice, to move forward she contends that the process of teaching has to be re-engineered around the technology. In this context staff development without parallel institutional/organisational change makes little sense as there will be nowhere to use and develop the skills that we are advocating; it would be a classic misuse of training and be counter-productive. To be clear, the underlying causes of the obstacles to the adoption of learning objects and Learning Design are professional culture and institutional organisation. As Mayes observes there has to be the will to change to accommodate the technology, staff development alone cannot make this happen. The kind of changes we envisage are relatively simple but raise some profound questions for traditional HE institutions and academic staff about their roles and relationships, these are also the areas that we see as fertile for further work:

- Teaching is recognised as the primary business activity for most HE institutions and treated accordingly
- Courses are designed, developed and delivered by multidisciplinary teams – rather than individuals
- Course content/syllabus is not changed (apart from maintenance) for between 3-7 years
- All course materials are created and shared before the course begins – i.e. no teaching from your own notes
- The staff who teach and tutor on a course are probably not the staff who designed and developed the course
- Staff teaching and tutoring on a course are likely to be on different employment contracts to traditional lecturers who are primarily subject specialists
- All course content and teaching and learning materials are digitised and shared in a central institutional repository in learning object format
- Novice academic teachers (and support staff) are allocated a 'master' and team to develop their skills in a clear institutional staff development framework
- Learning objects have enough contextual information in them for the members of the team to make sense of them and reuse them – pedagogically, technically and administratively

- Learning Design is used to represent the pedagogic strategy associated with a learning object and this is used for staff development purposes and as an aid to reflective practice, with a user-friendly graphical interface.
- Learning Designs and learning objects are mapped to particular curriculum teaching aims and learning outcomes in an easy to understand graphical format to facilitate search and reuse

These activities and objectives are the type of context that needs to exist to make our staff development framework meaningful. Currently, little of this activity currently exists in HE outside distance learning providers. As this context develops in HE then our proposed staff development framework becomes more relevant.

REFERENCES

Bartolucci, S. et al 2003. E-LEN project: Working towards an e-learning design pattern language. *In Learning Technology,* October 2003. http://lttf.ieee.org/learn_tech/issues.html

Beetham, H. 2004. *Review of developing e-learning models for the JISC practitioner communities version 2.1.* , JISC, London http://www.jisc.ac.uk/elearning_pedagogy.html

Casey, J. 2004. If Content is King, Context is God! Secondary Usage Metadata & Resources in Supporting Web Services for Learning Communities. *In Learning Technology,* January 2004. http://lttf.ieee.org/learn_tech/issues.html

Crook, C. (1994) Collaborative interactions around and through computers. Chapter 8 in Crook, C. , *Computers and the collaborative experience of learning.* London: Routledge pp189-216.

Downes, S. (2003) Design, standards and re-usability. http://www.downes.ca/cgi-bin/website/view.cgi?dbs=Article&key=1059622263&format=full

Koper, R. 2003. Combining reusable learning resources and services with pedagogical purposeful units of learning. *In Reusing Online Resources: a sustainable approach to e-learning.* Ed. Littlejohn, A. Kogan Page, London.

Koper, R. & Tattersall, C. Eds, 2004 *Learning Design*, Springer, Berlin.

Kuhn, T. 1996 *The Structure of Scientific Revolutions*, University of Chicago Press.

Laurillard, D. 1994 *Rethinking University Teaching*, Routledge, London.

MacLeod, D. 2004. The online revolution, mark II, *The Guardian*. Manchester. http://education.guardian.co.uk/elearning/story/0,10577,1190470,00.html

Mayes J.T. (1995) 'Learning Technology and Groundhog Day'. In W. Strang, V. et al (Eds) *Hypermedia at work: Practice and Theory in Higher Education*, University of Kent Press, Canterbury.

Pollock, N. & Cornford, J. 2000. Theory and Practice of the Virtual University: report on UK universities use of new technologies. *In ARIADNE issue 24*. http://www.ariadne.ac.uk/issue24/virtual-universities/

Ramsden, P. 1991. *Learning to Teach in Higher Education*, Routledge, London

Rehak, D. & Mason, R. 2003. Keeping the learning in learning objects. *In Reusing Online Resources: a sustainable approach to e-learning*. Ed. Littlejohn, A. Kogan Page, London.

Philip, R., Dalziel J, (2003) "Implications of COLIS for course development: The need for secondary usage meta-data" http://www.melcoe.mq.edu.au/res.htm

Shuell, T. (1992) Designing Instructional Computing Systems for meaningful Learning. P. Winne & M. Jones (eds) *In Adaptive Learning Environments: Foundations and Frontiers, Springer Verlag, New York.*

Twigg, C (2005) Keynote Summary: Improving Learning and Reducing Costs - New Models for Online Learning in the ALT-C 2005 conference, ALT-C, UK. http://www.alt.ac.uk/altc2005/keynotes.html#carol

van Vliet, H. 1993. Chapter 16: Software Reusability in *Software Engineering*, Chichester: John Wiley & Sons

Wenger, E. 1998 *Communities of Practice*, Cambridge University Press, Cambridge.