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JIME Special Issue on Reusing Online Resources

Commentary and Debate on:

Reusing Online Resources: A Sustainable Approach to eLearning

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Allison Littlejohn & Simon Buckingham Shum
Special Issue Editors

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Welcome to this Special Issue of the Journal of Interactive Media in Education, which is 'reusing' the Reusing Online Resources book as the point of departure for online discussion. It is interesting to consider how much activity has grown since JIME's Special Issue on *Educational Authoring Tools and the Educational Object Economy* in 1998 [www-jime.open.ac.uk/98.html#eoe]. There is clearly a broader consensus on standards emerging, but what progress has there been on the fundamental ideas and infrastructure? This book and special issue are therefore a timely milestone to reflect. You will find expert contributions, grounded in technical and pedagogical experience, critiquing and refining the assumptions behind the idea of reusable learning resources.

The issue is organised as follows:

- the book's opening chapter by the editor, introducing seven key issues for reusable resources;
- invited introductions to the book's four sections - theory, design, resource and stategy perspectives - by leading educational technologists;
- an invited commentary on each chapter written for this Special Issue to open critical discussion...
- ...which can continue in the discussion area for each chapter, where authors, commentators and the wider community are invited to post their own views on the book and commentaries. [www-jime.open.ac.uk/Reviews/get/reuse.html]

We hope that you find this a valuable companion to the book, and welcome your participation in advancing the debate in this field, one which is seeing much activity, but also provoking strong reactions.

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Issues in Reusing Online Resources: Chapter 1

Allison Littlejohn

This is an era marked by rapid developments in three different educational arenas -- access, lifelong learning and e-learning. In both developed and developing countries there is a growing demand for access to education. For example, in the United States the number of undergraduate students is expected to rise by 1 million by 2005; in the UK the government has set a target that half of all school leavers will enter higher education by 2010 (DfES, 2001); while in China the expectation is 5 million extra students over the next three years (MOE, 2001). Alongside this growing demand for access, increased numbers of adults are returning to colleges and universities for additional education and training (CIHE, 2002). Lifelong learning has come of age, brought about by changes in attitudes to learning and in employment patterns, where jobs and careers are recast many times during a lifespan. Permeating and supporting these first two developments, in access and lifelong learning, are developments in information and communication technologies (ICT). New technologies are beginning to transform how higher education is organized and delivered both on campus and at a distance. E-learning affords new opportunities to increase flexibility in time and location of study, in forms of communication (for example, asynchronous discussions) and types of interaction (for example between teacher and student), in how programmes are constructed (for example modules drawn from different universities) and in access to, and availability of information and resources through the World Wide Web.

Although e-learning has the potential to provide the kinds of flexibility required by wider access and lifelong learning there are some major obstacles. On the one hand, wider access and lifelong learning require vast increases in specially designed course materials to satisfy the greater range of demands for learning. On the other hand, creating the digital resources necessary for online course delivery requires considerable investment, a factor that makes resource development only viable for courses with large student numbers or sizeable budgets. In order to address this difficulty, numerous national and international initiatives have been funded to investigate ways in which digital learning resources might be developed, shared and reused by teachers and learners around the world (so as to benefit from economies of scale). Behind these initiatives lies a vision of a future in which reusable resources (or 'learning objects' as they are called) could comprise a new currency of exchange within a learning economy. Learning objects, produced by publishers, teachers, support staff and students themselves, would be stored in digital repositories, where they could be easily accessed, recombined and reused within online courses. In an ideal world, these resources would be designed so that they could be adapted to fit different educational models, subject disciplines and levels of study.

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However, despite this vision, the idea of reusing electronic resources is more complex than the object economy scenario, outlined above, may suggest. The next section identifies seven issues associated with the reuse and sharing of resources. These sections focus on educational design, the need for standards, and on the culture and organization that would be necessary in institutions (and across institutions) if reuse were to become a reality.

Seven issues in the reuse and sharing of resources

1 How can digital resources be used to support learning?

In the vision of a learning object economy, resources are often conceptualized as blocks of content that could be interlinked so as to produce a course. Analogous with Lego bricks, these blocks can be recombined with other blocks and reused in a different course. However, this encourages a simplistic view of learning resources and a rather narrow model of the educational process. The assumption is that teaching involves only the transmission of blocks of content to students and that learning merely involves the uncomplicated acquisition of information and resources (Wiley, 2000).

Current models of education, by contrast, place constructive activity at the heart of any teaching and learning exchange. Learners do not just acquire information but more importantly, they also construct their own knowledge through interactions with tutors, other students and with learning materials (Palinscar, 1998). From this new perspective, learning resources act as triggers for both internal (inner mental) and external dialogue (with tutors and peers). Hence a key issue is how digital learning resources or objects could be used to support the different kinds of online activities and interaction patterns that teachers use in their courses.

One way to deal with this issue is to view student learning activities and interaction patterns as resources themselves, as templates (for example a framework for discussion or a learning task) that teachers could access and use to create an online course. Teachers would also require access to electronic tools, hardware and software, that would allow these 'activity structures' to be implemented across a range of different educational environments

2 How can resources be reused within a range of educational models?

Content and learning activities on their own, however, do not constitute a course.

They would have to be combined in different ways to create courses based upon different educational models (Koper, 2001). Course design might be conceived as a middle layer that integrates the course content and learning activities (for example, teacher-student exchanges) within the framework of an educational model. However, there are an infinite number of educational models, so we need a way of dealing with this complexity. Fortunately, researchers are currently developing authoring tools that will enable teachers to model and implement their own education design in an online environment. These environments could then be populated with content and process resources. Some environments may be authored to allow interaction with a teacher or peers. Others may be of an adaptive type, whereby activities and resources are presented to students 'on the fly' (ADL, 2001).

3 Why is standardization necessary?

The idea that different kinds of resources are reusable in many contexts implies some degree of standardization both of the descriptions of the resources and of the tools and environments these resources inhabit. Without standardization it would be exceedingly difficult for teachers to find electronic resources to fit their needs, to share these resources with others or to implement them in different electronic learning environments. Standardization exists at, at least two levels. First, anyone producing resources for a digital repository has to provide a description of that resource in terms of standard metadata (for example resource author, ability level). Standards here ensure interoperability of resources across different electronic environments and platforms. For example, the same set of resources could be migrated from one electronic learning environment to another. A number of organizations are currently developing international standards for metadata (IEEE, 2002). Secondly, in order for users to be able to locate resources in, and retrieve them from, a digital repository there must be a classification system or taxonomy. Without an agreed classification system and terminology it will be difficult to find what you are looking for in a repository.

The process of defining metadata is problematic: it is time-consuming for resource authors to carry out and there are problems in describing large resources with metadata. While teachers and students, as users, need not be aware of these metadata issues they do need to understand how resources are classified and the taxonomic terms that are used. Given that each discipline has its own language and discourse structure, and that resources will be shared transnationally (ie across cultures) this is a major challenge for developers of digital repositories.

4 Is there an optimum size for reusable resources?

Another issue in reusability is resource size. In general, the smaller or more granular a resource, the greater the possibility of it being reused in another educational context: for example, an individual image is likely to be more readily reused than an entire course (Downes, 2000). However, larger resources usually have greater educational value: it may be less time-consuming for a teacher to reuse a larger resource, such as a learning activity, rather than to construct a course from many small, basic components. Therefore, in terms of resource size, there is often a tension between increasing educational value and maximizing reusability.

5 Should resources retain contextual information?

There are other difficulties in ensuring educational resources are reusable in multiple situations. For example, for maximum reuse, resources should be context free: they should not contain information specific to a particular subject discipline, course or class (Naeve, 1999). However, this contradicts the way that teachers normally modify and adapt resources to fit specific teaching situations, disciplines, abilities of students and so on. One way of tackling this problem is for resource creators and users to detach context information from resources, rather than having contextual information as an integral part of a resource. In this way, the context information itself can become a reusable resource that could be made available to new users. However, separating context from resources is an unusual task for a teacher to perform.

6 How are educational institutions likely to change?

A learning object economy implies quite significant changes in what teachers will do in future and in how they spend their time. They are likely to spend less time creating learning resources, but more time developing activities for students, re-contextualizing resources and describing new resources with metadata (LTS, 2002). However, the need to find, create and share resources will require changes in the roles of other staff in the educational institution, not just teachers. For example, educational developers and learning technologists may have stronger roles in course design; technical support staff will be required to manage electronic learning environments and content management systems; audio visual staff will be needed to develop templates and complex technical resources; librarians will be required to manage digital resources; copyright officers will be needed to advise on copyright and intellectual property right issues. This implies that there will have to be much greater

collaboration across staff concerned with learning than exists at present. Ensuring this collaboration will be a major challenge to the ways in which educational institutions operate. In addition, all staff in institutions will require support to enable them to play their role in the reuse of resources within a learning object economy. Students will also need support in developing skills to benefit from reusable learning resources.

7 Is global sharing of resources a possibility?

The vision of a learning object economy implies the existence of distributed, digital repositories serving communities of users across multiple institutions, educational sectors and nations. Harnessing this potential would require major strategic reorganization not just within and across institutions but also across different educational sectors, for a number of reasons. First, at a cross-institutional level, obvious conflicts exist between institutional competition for students and the collaboration implied by a learning object economy. Secondly, to get maximum value out of the development of reusable resources they should be shared across disciplinary communities, but this kind of cross-disciplinary sharing is not a strong feature in education. Disciplines differ in their languages, in their methods of enquiry and in their social and cultural organization (Becher, 1989). Thirdly, at a transnational level, cultural and language differences add a further complexity to the idea of resource sharing. However, on a more positive note, globalization coupled with new technology is resulting in the emergence of real and virtual communities in which previous barriers to collaboration are being broken down. Hence, a learning object economy might not seem so far-fetched 10 years from now.

Discussion of these issues within this book

Trying to grapple with these seven issues is what led me to plan this book. Each of the issues is explored in more detail in relevant chapters in the book. The book is divided into four parts dealing with theory, design, resource and strategy. Each part draws on current research and the practical experience of scholars within school, continuing and higher education as well as the commercial sector. In the first part, underpinning theoretical concepts are introduced within a context of case studies and futuristic visions of sharing and reuse of resources. The second part explores educational design perspectives, including issues of accessibility and scalability. The third part examines resource perspectives, which are presented against the backdrop of emerging software tools and standards. The final part examines strategic issues within the wider educational context of schools, further and higher education and

online communities, and further explores some of the barriers outlined in the first part.

Ideas drawn from a variety of disciplines, including education, information science, computing and librarianship, are brought together in this collection on the reuse of online resources. While preparing their chapters each author had online access to the texts of other authors, so that ideas could be cross-fertilized and cross-referenced. This book offers the reader valuable insights into a rapidly developing and intriguing field of research and practice in reusing educational resources. It is hoped the book will make a useful contribution to the ongoing debate in the sharing and reuse of resources for e-learning.

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Vision and Theoretical Perspectives: Introduction to Part 1

Terry Mayes

The most enduring learning experiences are those that change *attitudes*. When I was invited to write an introduction to this part of the book I hesitated for a moment. Let me explain why. While long advocating the reuse of learning dialogues as a learning resource, I have nevertheless thought of myself as a sceptic on the topic of learning *objects*. My attitude had been rooted in the belief that it is fundamentally misguided to think of learning as having anything much to do with content. As a good constructivist I knew that many had been tempted away from the path of true pedagogy by the seductive vision of automated instruction. For many years the discipline of artificial intelligence offered the prospect of computer-generated courses, with the software capable of understanding enough about both the subject matter and the individual learner to be able to conduct an automated tutorial. Subject matter would be automatically selected from a knowledge base and offered to the learner in a way that filled in the identified gaps in the learner's knowledge. It had seemed to me that the idea of learning objects that could be automatically combined into a course, tailored for an individual learner, was a re-emergence of that flawed vision. Admittedly the idea was more modest in its goals than that of building full-blown intelligent tutoring systems (ITS).

Nevertheless, this idea still represented a version of instructivism, and as such, I thought, was pedagogically misguided, and even lacked the positive emphasis on feedback to the learner found in ITS. Even worse, I reasoned, learning objects are associated with the idea that small 'bites' of learning can be accessed when required, and somehow aggregated in the learner into useful knowledge. This idea also seems pedagogically unsound: it meets only the requirements of what Rumelhart and Norman (1978) called *accretion*, not the much more educationally important stage of *structuring*. The key is for the learner to build a schema for understanding into which the chunks of information -- the learning objects if you like -- can be slotted. That is, the subject matter in learning objects must be interpreted, assimilated into what is already understood, and thus given meaning by the framework of understanding already in place. It is the structuring of the framework into which the chunks of information can be slotted that represents the main educational challenge. Learning objects as I thought of them would not achieve this structuring. So, I reasoned, reusable learning objects are useful subject matter resources, but they must not be confused with pedagogically important concepts like learning tasks, feedback, reflection or self-assessment.

Well, I think I was wrong. Reading the five chapters in this part of the book has made me realize that, as is often the case with attitudes towards topics that are not

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often revisited, my view of learning objects was based on a simplified and rather crude version, based on assumptions not held at all by the writers in this part. Indeed, the concept that had originally provoked my antipathy towards learning objects is described in this part, not as a true learning object but rather, as a *knowledge* object by Rob Koper, as a *content* or *information* object by Dan Rehak and Robin Mason, and as an *asset* by Charles Duncan. Having established that learning objects can be tools or tests or even organizing resources, these three chapters all address the issue of how we can make these objects truly reusable in the support of a wide range of learning approaches, including the task-based methods of constructivist pedagogy (and thus the methods that would encourage structuring).

Of course the perspectives of these chapters differ. Charles Duncan approaches the issue by focusing on the problem of their *granularization*: the size of a learning object that might be abstracted from its pedagogical context and reused effectively. Rob Koper looks closely at the assumptions underlying reuse: is it really possible to abstract pedagogy? Dan Rehak and Robin Mason consider how we can make learning objects work in practice. Metadata provide the key for finding learning objects and then using them effectively, but the most important need is for communities of practice to develop their own values for the pedagogical attributes, and for the quality of a learning object to be revealed through 'recommender' systems (such as those found at amazon.com) and review databases. This highlights a theme running through all the contributions to this part: to be useful, learning objects will require the mediation of human (teacher) judgement, even though these judgements can operate in a very distributed way. The intense interest raised by MIT's decision to make its courseware freely available on the Web, described in detail in the final chapter in this part, that by Katie Livingston Vale and Philip Long, is now well known. This hugely welcome development will go a long way towards encouraging course developers to seek their pedagogical resources from a wider community: This is perhaps the first step in the development of a pedagogically-based learning object economy. On a institutional scale, but also widely influential, is the Open Knowledge Initiative, a collaboration between MIT and a number of other institutions, aimed at the development of a modular, open-source learning management system (LMS), designed through a rigorous methodology of consultation with university teachers and a detailed analysis of the tasks involved in campus-based learning, teaching and assessment. Both these projects are building a foundation on which a learning object economy can emerge. What more it will take for such an economy to develop is the focus of Lorna Campbell's fascinating chapter. Once all the technical, and even the pedagogical, issues are out of the way, we will still be faced with cultural, social and organizational factors that will determine the extent to which learning objects are actually reused.

By broadening my own understanding of the concept of learning objects, the contributors to this part have raised my awareness of the complex issues surrounding reusable resources. I have realized that the issues of how to create, select and mark up appropriately-sized learning objects of pedagogical value were those we have attempted to address in our work on vicarious learning through dialogue (Mayes *et al*, 2001). As I read these discussions, I also came to see that my rather PC (pedagogically correct) assumption that learning objects were just units for repackaging content had prevented me from relating this work to the deeper issues of pedagogy. Once liberated from that assumption, I could now connect this work to a constructivist rationale for a learning object economy. The contributors to this part have succeeded in changing my attitude towards an important area of development.

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Granularisation: Chapter 2

by Charles Duncan
Commentary by David Nicol

Conceptions of Learning Objects: Social and Educational Issues

Introduction

This chapter by Duncan is the first in the book after Littlejohn's introduction. It provides a useful overview of the issues surrounding granularisation and lays the ground for the rest of the book. The granular size of learning object is a fundamental consideration if the goal is to facilitate the sharing and reuse of learning resources within a learning object economy. The chapter begins with a discussion of what a learning object is and why the conditions in education are now favourable towards the idea of a learning object economy. It then discusses the aggregation and disaggregation of learning objects including the role of metadata in supporting search and aggregation. The chapter mainly focuses on learning objects in terms of information or subject content. It also touches on the idea that, to achieve effective learning, learning objects would need to be combined with other components, especially activities involving people; and it alludes to the fact that 'the highest level of aggregation' would inter-relate learning objects with a learning design or pedagogical strategy. The chapter also discusses interoperability. All digital learning systems must be able to input and exchange each others' learning objects if these objects are to be shared across educational communities. Duncan concludes that the creation of stand-alone learning objects might appear to reduce the coherence of online courses but that this is not dissimilar to the traditional courses where coherence is supplied by the teacher who aggregates and integrates course components.

This review starts by commenting on the way learning objects are conceptualised by Duncan and others. It then moves on to draw out some of the pedagogical or educational issues that arise from that conceptualisation.

Granularisation and learning objects

The issue that the author first addresses is the meaning of the term granularisation. According to Duncan, granularisation 'refers to the *size* of learning objects [and]...it is a necessary condition for learning objects to be shared and reused'. This might be slightly confusing to newcomers to this area in the way that the text initially appears to equate granularisation with size. The literature on learning object granularity is more about the learning object being

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discrete and based upon a single concept or learning objective rather than on its file size or some other size consideration (see, Hamel & Ryan-Jones, 2002). A range of definitions are given for a learning object with the key idea being that it is a digital resource that can stand on its own and be reused to support learning. However, it is important to note that the term learning object could, to some researchers, include both process objects as well as content objects. For example, learning activities can be turned into process templates that could be reused with different content.

Granularisation and aggregation and disaggregation

Like many other writers in this area (Quinn & Hobbs, 2000: Liber & Olivier, Chapter 12), Duncan's basic assumption is that the smaller and more discrete the learning object the more reusable it is in new educational contexts. In these contexts, learning objects would be accessed and aggregated by users with other learning objects to form more complex units of learning. Small learning objects are assumed to offer flexibility in that the same material can be used in a variety of different contexts. From an educational perspective a number of issues are raised by these conceptions of granularisation and aggregation. Firstly, there is the question of how far it is useful to separate learning resources into separate or more discrete parts. Should the teacher break down the lecture into a series of powerpoint slides and notes or should the whole powerpoint file be uploaded to the resource library? It seems unlikely that teachers contributing resources to an object repository would share similar conceptions of granularity. Yet if the grain size of resources differs depending on the teacher contributing them then this might reduce the overall flexibility of reuse claimed for the learning object economy. A related issue centres on the idea of stand-alone learning objects. For most teachers, the wider pedagogical context of learning resources is critical to educational design and this context is, in part, provided by the inter-relationship that exists across learning resources. By ensuring that all learning objects in the electronic environment are stand-alone (i.e. without cross-referencing) and discrete these contextual relationships are stripped out. Hence some important information that might help new users repurpose resources is lost. One solution proposed to resolve this problem is to ensure that learning objects in digital repositories have descriptive information associated with them that allows new users to understand how they were used previously. Such information would help new users locate learning objects make the best use of them in their own context. This is where educational metadata becomes important.

Metadata

Duncan discusses the role of metadata in relation to the aggregation of learning objects. Metadata is descriptive information about the stored digital resources. As well as helping users search for, find and evaluate learning objects stored in digital repositories it also helps teachers make decisions about, and describe learning objects at different levels of aggregation. Metadata for assets and information objects (Duncan's terminology) includes information about file format, size, delivery, authorship, etc. This not only aids reusability but also supports technical interoperability (e.g. if the file format is appropriately labelled in the metadata it is more easily used across electronic learning platforms). Learning objects would normally include additional metadata fields for information such as resource type, interactivity type and level, context, level of difficulty, description etc. This 'educational' metadata defines an object as a learning object ? a resource that has an educational use.

There are some problems in relation to how educational information is represented in metadata fields. In particular, the usefulness of this educational metadata is highly dependent on who was involved in its creation. While librarians might provide descriptive metadata including subject classifications, teachers would have to create educational metadata both when they submit their learning object to the shared economy and when they re-purpose learning resources. However, people use educational terms in different ways and especially if they come from different disciplines (Becher, 1989). Hence there might be a wide variability in the meanings attributed to educational metadata descriptions, a factor that would hamper a users search for appropriate learning objects. Moreover, these differences in meanings are likely to impede the transfer of use of learning objects particularly across disciplinary communities. One solution to this problem is to construct metadata vocabularies and taxonomies that would allow identification of learning objects from a range of different perspectives (see Koper, Chapter 5). Nonetheless, even with controlled vocabularies and taxonomies teachers may not have the requisite expertise to fill in the metadata fields for their learning objects (see, Currier, 2001)

The Learning Object Economy

The hope expressed in Duncan's paper is that when sufficient learning resources are available then an educational economy would develop with learning objects as currency. This would both bring economies of scale to learning communities through shared object libraries and possibly better online educational courses. One

key assumption underlying this idea is that teachers would be willing to share their educational resources. As noted above they would also have to be willing to design their learning resources as small modular chunks of learning and to create metadata information to describe these resources. There is already some evidence that teachers might be unwilling todo this for a variety of reasons (Campbell, Littlejohn & Duncan, 2001). Firstly, it may require that teachers change the way they design learning in their own courses in order to be able to benefit from the learning object economy and they may be unwilling to do this. For example, teachers would have to ensure that when they design a course that it could be broken down into small modular units of learning (i.e. learning objects) and this may be counter to the way they would normally design. Secondly, some teachers may prefer to utilise resources that have an intact context rather than those that have been disaggregated and decontextualised. This implies that learning objects in the economy would have to be of variable size and tagged with appropriate metadata. Thirdly, there is a strong assumption that teachers would be willing to tag their own resources with educational metadata but this tagging is time consuming, difficult and expensive (see Currier & Barton, 2003).

A fourth issue is that currently there is not a strong history of sharing resources in education in the way implied by a learning object economy or any reward structure within and across institutions for doing so. Indeed, it is more likely that this kind of educational sharing might take place in small disciplinary or professional communities rather than across a whole educational sector. Such communities would benefit from a common understanding of educational metadata terminology and vocabularies and if core metadata fields were retained this would still support some sharing and exchange by other communities (with different vocabularies). Fifthly, for mass use of learning objects in the way suggested by Duncan there would need to be an information literate population of educators and, importantly, students who have the information management and evaluation skills necessary to search, find and aggregate learning objects to fit their purposes.

Another issue is who would manage these collections of learning objects. Duncan relates this to interoperability and proposes that as long as all producers or vendors of learning objects agree on the same file formats then learning objects could be exchanged within a learning object marketplace. This is only part of the problem. The management and quality assurance learning resources, whether digital or paper based is a complex task that has until now been carried out by professional librarians. If digital repositories proliferate in the way that is envisaged by a learning object economy then many more people in the educational community will have to acquire

the some of the skills that are currently the preserve of the professional librarian.

Concepts of education and the teacher's role

Duncan discusses the aggregation of simple learning objects to create more complex learning objects or units embodying more structure and extended learning objectives (e.g. learning objects aggregated to form a module). He also notes that at the higher level of aggregation learning objects would necessarily have to be integrated with other components in order to create effective learning. These components comprise processes such as activities, dialogue and a learning design (pedagogy). However, while most readers might accept the idea that educational resources might be stored in a repository and be searched for and reused, many will be concerned about the view that courses are constructed by aggregating learning objects together. This idea seems to fit a specific conceptualisation of learning and of course design. It appears to propose that learning is about acquiring packets of information and that course design is only a matter of assembling units of content and packaging this together with a learning design template. This is more consistent with a transmission view of learning rather than a social constructivist view in which students construct their own interpretations of subject content in dialogue with others (see, Palincsar, 1998). In the latter view interaction and dialogue around ideas are primary and learning objects as subject content might only be important insofar as they provide some input to that dialogue (see also, Mayes introduction to this section of the book).

Duncan to some extent bypasses the issue raised in the last paragraph by arguing that it is the teacher who provides the glue that binds a course together and that 'granularisation enables good teachers to do what they have always done: create stimulating courses for students'. However, not all in the e-learning field of study take the same view. Recently, researchers into learning object reuse have attempted to address the pedagogy issue by proposing that learning design should be key driver in online course design (see Tattersall & Koper, 2003). These researchers have been piloting learning design templates which specify the roles of teachers, students and the activities they are engaged in within a typical learning scenarios (e.g. problem-based learning, collaborative learning). The idea is that these design templates would be reusable in different contexts and with different types of content. However this raises further difficulties for some commentators. For example, can a learning design template really capture the essence of a pedagogical approach and can pedagogical knowledge really be formalised in this way (see, Earle, 2002).

A final issue concerns students as users and generators of learning objects. If the

learning object economy is to become a reality then students would not just be 'consumers' of the learning objects submitted to repositories by teachers but would also be involved in the creation and storage of their own learning objects and of the evaluation of the learning objects of others (Nicol & MacLeod, 2003). This will require considerable changes in the way students search for and use information and resources. These changes are already evident in universities given that the web has made information and resources much more accessible to everyone. However there is a growing need to recognise that information literacy including the use of new tools such as data repositories and metadata software may need to become an essential part of undergraduate education. Students will use their own repositories for learning objects, they will have to learn how to classify and provide ratings of resources using controlled metadata categories as well as open descriptions just as they are now learning to use email and web-based search engines like GOOGLE.

Conclusion

Those new to learning objects, aggregation, metadata and the idea of a learning object economy will benefit greatly from reading Duncan's chapter in this new book. It presents an overview of some fundamentals in an accessible language. This review has highlighted some areas of concern. However, the picture presented is merely a snapshot at a particular moment in time. Researchers in e-learning have already begun to tackle, and make headway with, some of the more tractable problems.

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Keeping the Learning in Learning objects: Chapter 3

by Dan Rehak and Robin Mason
Commentary by Symeon Retalis

Recognising the fact that learning objects are still a new concept, D. Rehak and R. Mason have tackled the significant issue of how to make learning objects work in practice in a very interesting and thorough manner. They clearly state that the topic of learning objects is rather new and in an experimental phase. There is an agreement about the attributes of a learning object (reusability, accessibility, interoperability-portability, duration) within the learning technology community. However, stakeholders see the usefulness of learning objects from different optical angles: on the one hand, the training sector tends to be engaged in reuse and just-in-time/on-demand content aggregation in order to augment their market share; on the other hand universities and the learning sector in general, consider the reuse and repurposing of learning material as a big opportunity to save resources as well as to offer new (more enhanced) learning experiences.

The authors analyse the concept of learning objects in five stages which are common for new concepts in any domain. Along the presentation of these stages (confusions, stakeholders, precedents, investigations of how to apply and exploit, acceptance), they pinpoint several crucial issues that need to be tackled in order that the learning process will take benefit of the notion of learning objects. These issues are:

1 The lack of consensus about the definition and description of learning objects as well as their granularity

Perceptions about the nature and size of learning objects differs. Elaborating on this issue, one could easily find out that the main learning objects repositories do not conform to the LOM standards. For example, while IntraLibrary (http://www.intrallect.com/) and Merlot (http://www.merlot.org/) are IMS-compliant, Belle/Careo (http://careo.netera.ca/) is using the CanCore protocol which is a simplification and interpretation of the 86 elements of the IMS Learning Resource Metadata Information Model. Moreover, Colis (edna) (http://www.edna.edu.au/go/browse/0/) depends on the EdNA Metadata Standard which is based on Dublin Core Metadata Element Set. Other R&D groups have proposed quite different sets of meta-data (in the best case, some of them are extended versions of the IMS standard) in order to describe web-based multimedia teaching materials in a specific domain. For example Heal (http://www.healcentral.org/) has developed a standard metadata specification for sharing medical education multimedia based on the IMS standard. Other ideas

come around like the ones proposed in [Simon and Quemada 2002] of the UNIVERSAL project (http://www.educanext.org): "LOM does not propose learning resource types, which would be required for categorizing educational activities. At the Universal Brokering Platform, the following educational activity types are introduced: case study, course, course unit, exam, exercise, experiment, group work, lecture, presentation, project." Furthermore, despite the fact that sites like Math Goodies, which is a free math help site featuring interactive lessons, homework help, worksheets, etc., do not use LOM description they are very popular. Users prefer resources like lesson plans which do not entirely fit into a LO category. All the aforementioned ideas do show that LOM standards are not descriptive enough and mature enough to *keep learning in LOM*, so various extended versions exist and a LO taxonomy might be needed. Another reason for this plethora of LOM standards (apart from their possible insufficiency) is the lack of user training? Recently the SCHEMAS project has provided a forum for metadata schema designers involved in projects under the IST Programme and national initiatives in Europe. The project has supported development of good-practice guidelines for the use of standards in local implementations. In the same line, the European Schoolnet's European Treasury Browser (ETB), which uses the EUN Dublin Core Metadata that has 15 elements and some sub-elements, has a usable and quite convincing short tutorial for teachers and potential content providers.

2 The lack of clarity on how to reuse learning objects. Learning objects cannot work like Lego

On the one hand, we could affirm that instructional design methods, which could effectively support the process of aggregating course content, do not exist. In fact, there are some ideas like the one presented at [Douglas 2001] that proposes such a component based instructional development process and argues that we should adopt/adapt object-oriented software design methods. On the other hand, authoring tools and Learning Content Management Systems (or even Learning Management Systems) are not advanced enough to create content "on-the-fly" from learning objects. Very few commercial products of this type exist. One prominent example of such a tool could be the Designer's Edge [http://www.allencomm.com/products/authoring_design/designer/]. It is quite surprising the unavailability of usable tools since research efforts have started since the European Union DELTA programme (e.g. DIScourse project, (http://www.itd.ge.cnr.it/sarti/papers/mispelkampsarti.html). Of course efforts have been being made (e.g. EuropeMMM is a research project part funded by the Information Engineering Programme of the EU). One explanation might be that the reusability of LOs is still a tacit knowledge.

3 The diversity in the provision mechanisms of learning object

Learning objects pre-existed on the Internet in the form of illustrations, book chapters, articles, etc., but it was more difficult to trace them. Nowadays, quite a lot of pools or better repositories (or even LO brokers) have emerged whose quantity and quality of content differs. Still, these repositories do not contain a lot of material, they are not interoperable and their functionality is not standard (e.g. some might not support annotation or customized search). Efforts have started to be made. For example, the European Schoolnet, proposed a tool kit for connecting existing database driven educational repositories to the ETB network [http://mmm.uni-c.dk/etb/]. Nevertheless, the content providers, especially the instructors, are reluctant in uploading their LOs to repositories for many reasons. First because it needs a lot of time to fill in all the LOM fields. Automation in form filling is needed in order to avoid quite cumbersome and impractical practices that exist nowadays. Fortunately, vocabularies have appeared which will be used for homogenising the description of some fields of a resource and making the online form completing process easier and faster. Secondly, the added value for posting a LO is not clear for an educator. She/he rarely gets credits when preparing good quality online resources. Of course recognition can be achieved when offering a high quality resource via a repository that could become popular. Online rating (annotation) systems have been integrated into most LO repositories, but their utilization is limited. We might need to develop mechanisms/tools like ResearchIndex (CiteSeer) [http://citeseer.nj.nec.com/cs]. Furthermore, copyright issues continue to hinder the setting up of repositories, but there have been positive developments in the licensing of digital resources (e.g. CEN/ISSS Learning Technologies Workshop Educational Copyright License Conditions [http://www.cenorm.be/isss/Workshop/LT/Digit-rights/ECDL.htm].

4 The insufficient description of the "behavior" of learning objects

Despite the fact that there are many attributes in learning object metadata description, they do not fully capture the "behavior" of a learning object. A learning object is created with specific learning objectives in mind, holds specific behavior and interoperates with other surrounding learning objects. Isolating a learning object and reusing it, means that either this learning object can remain intact since it might fit well to the new learning context, or this learning object needs changes. In the latter and most usual case, not only do technological problems arise but also instructional. A learning object does not only have its own characteristics and learning value but its relationship with other learning objects offers additional learning experiences.

I would remind the reader of the wholistic theory of Aristotle who said that "the whole is larger than the sum of its constituent parts".

The metadata descriptions seem not to be enough for representing the "behavioural" description of learning objects nor the learning objectives. The authors suggest that we need better descriptive models such as CLEO or educational modeling languages such as EML. Not only that. We also need better design models for the authoring/aggregation of learning content. We need to adapt formal design models and methods from the field of hypermedia engineering (e.g. OOHDM, RMM, etc.). Such models will show which learning object consist a learning application and how these learning objects are interrelated. Of course these models as well as their formal notation (and bindings) should be compatible with the existing (or the ones that might arise) learning technology standards like the Content Packaging, Learning Design etc. One approach akin to a modeling notation in education is concept mapping [Gaines and Shaw 1996] which might be proven valuable if combined by the unified modeling language (UML) (probably extended using its extension mechanisms).

Finally, taking for granted the increased interest in learning objects, the authors invite the learning object R&D community to try finding answers to the big question of whether it is feasible and acceptable to aim at automatic course creation. The positive answer depends on progress in conceptual, learning, social and technological issues.

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Combining re-Usable Learning Resources to Pedagogical Purposeful Units of Learning: Chapter 5

by Rob Koper
Commentary by Dai Griffiths and Rocio Garcia

Summary

The first part of this review discusses the issues raised in general terms, focusing on a contradiction in educational practice identified by the author.. It is proposed that this is disguised by the pervasive "conduit" metaphor for communication, and in the face to face context partially resolved by the interventions of teachers. The specific approach described by the author is then discussed in the light of these comments. In particular the distinction between resources and Learning Objects is discussed. The need for a three level hierarchy of resources, Learning Objects and Units of Learning is identified as an issue for debate.

This stimulating and authoritative chapter raises a number of major issues related to eLearning, Learning Objects, and reuse of resources. In order to place this debate in its context I would like to start by making some general remarks on the nature of the problem, and the metaphors which we use when trying to make sense of it.

Why should reuse be a problem?

Reuse is the norm in face to face, non electronically mediated education, at all three of the levels identified by Koper. Individuals reuse their own activity sheets and lesson plans, schools and education authorities reuse resources and textbooks in various schools with differing profiles and needs, and texts, poems, resources and learning activities are used for a wide variety of purposes in different contexts. With the advent of the web government agencies such as the UK Teacher Resource Exchange have provided an environment where these exchanges can take place online, and hundreds of reusable resources are made available[1]. Commercial publishers such as Nelson Thornes also provide access to reusable resources[2]. When we move from face

1 See http://tre.ngfl.gov.uk/

2 See http://www.nelsonthornes.com/primary/html/index.htm and http://www.lastminutelesson.co.uk/

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by networks (hereafter referred to as eLearning) we find that the issue of reuse becomes problematic, and the authors of the chapters in this book are wrestling with the problems raised.

A contradiction in traditional educational practice

Why should the move from face to face to eLearning involve these problems? I believe that the answer is to be found in contradictions within traditional educational practice. Koper indicates where this contradiction is to be found, stating that:

> *Cognitive research has shown that knowledge cannot be transferred, but is (re-)built within a cognitive framework (schema, mental model) in the long term memory by each individual (Mayer, 1992, p.431; Winn & Snyder, 1996).*[3]

while later in the chapter he also notes

> *Vermunt and Verloop (1999) have identified that the majority of teachers employ an implicit design idea based on 'knowledge transmission'.*

This contradiction is invisible to many teachers, learners, and also to technologists involved in implementing eLearning systems, who seem to treat this cognitive research as belonging to a quite different domain from their own practice.

What makes it possible for a practice to be maintained which is in direct contradiction to what we would expect from the facts of human biology and cognition? There are two parts to this answer.

The power of the "conduit" metaphor

The first part of the answer lies in the way in which we think about communication is formed by a complex metaphorical structure. As Lakoff has explained:

3 The idea that knowledge can be transmitted is also biologically unfounded, as shown by Maturana and Varela. The most accessible statement of their approach is to be found in The Tree of Knowledge. They also provide a valuable alternative description of communication and language.

> *A more subtle case of how a metaphorical concept can hide an aspect of our experience can be seen in what Michael Reddy has called the "conduit metaphor". Reddy observes that our language about language is structured roughly by the following complex metaphor:*
>
> *IDEAS (or MEANINGS) ARE OBJECTS,*
>
> *LINGUISTIC EXPRESSIONS ARE CONTAINERS,*
>
> *COMMUNICATION IS SENDING.*
>
> *The speaker puts ideas (objects) into words (containers) and sends them (along a conduit) to a hearer who takes the idea/objects out of the word/containers. Reddy documents this with more than a hundred types of expressions in English, which he estimates account for at least 70% of the expressions which use for talking about language.*[4]

This metaphor is very pervasive, and within our culture we often have difficulty thinking outside it. It has also proved to be an effective facilitator of communication in many situations, and in particular has been the foundation of what has become an entrenched education system. When the learning process is seen to be sub-optimal or breaks down the appropriateness of this metaphor is not usually questioned. The teachers and learners involved typically respond to the difficulty in two ways. Firstly, the problem is typically situated in the way in which ideas have been put into objects (e.g., "it's a bad text book"), or problems in the conduit (e.g. noisy classroom), or situated the hearer (e.g. lack of attention, laziness, stupidity).

The analogy of encapsulation

The widespread conduit metaphor for communication is reinforced by a particular metaphor built in to much of the discussion of eLearning. As Koper describes in his introduction, *Over the last decade scholars in the field of learning technology have introduced the concept of the reuse of resources in education, analogous to software reuse and object oriented approaches*. In object oriented programming the objects are

4 Lakoff, G. and M. Johnson (1980). Metaphors we live by, Chicago and London, University of Chicago Press, page 10.

encapsulated, that is they operate independently of the environment in which they are situated, and they respond in predictable and prescribed ways to the inputs which they receive. Thus this analogy, which is in perfect accord with the conduit metaphor, runs contrary to much of what we know about how human beings construct meanings from language, texts, images, etc. on the basis of their previous-experience, which varies from individual to individual.

The invisible support offered by teachers to learners

The second way in which the contradiction between classroom practice and cognitive science is resolved is through a wide variety of interventions made by teachers to help overcome breakdowns in the learning process, often within the most traditional classroom settings. These lead learners to reach an understanding not by opening a conduit, but rather by supporting learners in their own construction of knowledge. These strategies involve impromptu questions, problems setting, referring to the learners own experience, etc. They may or may not be part of a conscious constructivist pedagogy, and many of these interventions are invisible because they may never be recorded in a lesson plan or report.

When the role of the teacher is reduced, as it often is in electronically mediated education, the strategies available to teachers to overcome breakdowns in the learning process, are radically reduced or entirely removed. That is why the problems created by the contradiction between the dominant metaphor for communication, and the nature of human cognition as established by cognitive science are so much more acute in eLearning than in face to face education. From this perspective it seems that the debate on how to describe learning resources in eLearning systems may produce more or less effective systems, but it cannot resolve the underlying difficulties caused by applying the conduit metaphor to the learning process.

So far I have made some general comments on the nature of the problem we are dealing with, and the metaphors we use in understanding and describing it. I have highlighted the contradiction between cognitive science and educational practice identified by Koper in this chapter, and proposed that these metaphors mask the contradiction. I have also suggested that the practice of the teacher in face to face teaching resolves many of the problems which the contradiction creates. I have then observed that when the teacher's role is reduced or removed, these problems are exacerbated, and are the cause of many of the difficulties experienced in implementing eLearning and reuse of resources. I will now move on to consider some perspectives on the specific solutions proposed in this chapter, in the light of the

above considerations.

The need for metadata describing learning activities

As Koper has observed[5], most educational metadata does nothing to describe and define the learning process. The result has been that learning was, by default, conceived of as lying in the content itself. The decisive contribution made by Koper in meeting this need has been his work as lead architect of the Open University of the Netherlands Educational Modelling Language (OUNL EML). OUNL EML has now been adapted by IMS as its new Learning Design specification, and represents the best available alternative to the conduit metaphor in eLearning. Learning no longer has to be situated in the resources used, and can be viewed as being constructed in interactions and activities carried out by the learner.

EML sets out to be pedagogically neutral, and Koper wants eLearning to support as wide a range of pedagogies as possible.

> *In our view, a modern e-learning environment, including the underlying learning technology specifications and standards, should support pedagogies coming from both ends of the spectrum. Not by being ignorant of the pedagogy, not by being prescriptive in any of the hundreds of different pedagogical models around (for example Koper, 2001), but to allow the pedagogical model to be explicit.*

This is surely the correct approach. In the first place it is pragmatically wise to let a thousand schools of pedagogy contend, rather than to attempt to resolve these conflicts and in the process alienate a large numbers of potential users. Secondly there are times when even the most enthusiastic constructivist recognises that reading specified texts, and rote learning, are appropriate, and when practice drills are necessary. Nevertheless, if *knowledge cannot be transferred*, as Koper suggests, then we need to avoid situating the knowledge in the text being memorised, or in the material being practiced. If we do not make this clear then we will reduce the capability of EML to provide an alternative to the conduit metaphor. In this respect the concept of the Learning Object sometimes plays an ambivalent role.

5 See Chapter 12, Learning Content Interoperability Standards, Bill Olivier and Oleg Liber

The role of Learning Objects

In this book Learning Objects are defined in a number of different ways, and the roles which they play in the author's frameworks also differs. Koper defines a learning object as *any digital, reproducible and addressable resource used to perform learning activities or learning support activities, made available for others to use*. He goes on to clarify that when a learning object is aggregated to a learning activity, then the aggregate is no longer a learning object, but it is now a 'unit of learning'. This is, as he points out, a more restricted definition than that used by The IEEE LTSC (2000), or by Wiley.

There are, however other approaches, and Rehak and Mason, in Chapter 3 of this book maintain that A common definition is something like, *"A small chunk of learning which serves a learning objective". This view says that the Learning Object itself must have a learning objective -- not just be part of a learning opportunity*. They later suggest that among the aspects of learning objects which need to be described are

- What it can be used for
- How learners will interact with it
- How it fits into the larger learning experience

It seems that Rehak and Mason's Learning Objects are closer to Koper's Units of Learning than they are to his view Learning Objects.

In Chapter 7 Laurillard and MacAndrew develop a very different analysis in their Conversational Framework for learning, in which the role of the academic is to provide *Digital document/resource with internal structure defined; a set of analytical tasks*; the structure for the discussion around those tasks. In this description Learning Objects do not seem to be distinguished from resources.
Thus the issue of what constitutes a learning object is very much open to debate.

The need for a three tier hierarchy: resources, learning objects, units of learning

In his definition of Learning Objects and Units of Learning, Koper establishes a three level hierarchy. At the bottom level are resources, such as files and documents. At the next level up these are transformed into Learning Objects. At the top level Learning Objects are combined with learning activities to create Units of Learning. Given the lack of agreement on what constitutes a Learning Object, it is perhaps worth considering whether we need them at all. Perhaps all we need is the top and bottom

levels of the hierarchy: resources and Units of Learning. This is the approach taken by Apple in their teacher resource exchange using their well established Unit of Practice methodology[6].

To illustrate the issue, consider a poem on a web page. This fulfils the first part of Koper's definition by being digital, reproducible and addressable, and made available for others to use. If I want to know if it is a learning object, how can I find out? According to the definition I need to establish if it is used to perform learning activities or learning support activities. How can establish that? I need to look at the history of interactions in which the object has taken part. I cannot tell by looking at the file itself. If we need to look at the learning activities carried out with a Learning Object in order to distinguish it from a resource, then the distinction between a Learning Object and a Unit of Learning becomes blurred.

This is obviously a complex technical issue on which there are many perspectives, but my own view is that there may be advantages to flattening the hierarchy to two levels, and removing Learning Objects. Resources could be large (e.g. a book) or small (e.g. a paragraph), and Units of Learning could be nested.

What would the result of this flattened hierarchy be for reuse of educational resources? It would it is true mean abandoning the hope for encapsulated chunks of knowledge or learning, independent of pedagogy and context. The issue to be debated, however, is if this is a realistic ambition. Reusability in eLearning would become parallel to that in face to face learning, that is to say, we reuse resources (books, texts, illustrations, maps...), and we reuse Units of Learning (activities, lesson plans, modules, courses...).

Abstraction of learning resources

Related to the issue of depth of hierarchy is the question of abstraction. *In this chapter Koper says that In an ideal world of reusable learning objects, all objects could be used by a teacher for a course, irrespective of the pedagogy or 'learning design*. If a learning object is constituted by its use, however, it can be argued that to this extent

6 In this methodology teachers take resources (in this case technological resources), follow a procedure for describing activities to be carried out with them, and so create Units of Practice which can be shared online. There are at present over 1300 units available online to help teachers integrate technology into theirclassroom activities. See http://ali.apple.com/ali/uops.php

it partakes of the pedagogy within which it has been used. If, on the other hand, one were to remove the criteria for use from the definitionof a learning object, one is left with something which looks very like a resource. Koper also seeks abstraction of context, although in this case he refers to learning resources rather than learning objects. A similar question arises of whether a resource can be understood other than in the communicative context within which it was created and is used.

Learning Objects and the conduit metaphor

Perhaps these difficulties do not flow from this particular formulation of learning objects, but rather they are inherent in the use of a three tier hierarchy. It may be that the concept of Learning Object is familiar and comfortable because it maps neatly to Reddy's conduit metaphor, adopted by Lakoff, which I referred in the earlier part of these comments. Thus, adapting the original metaphor, we could propose:

- Resources are objects
- Learning Objects are containers,
- Teaching is sending.

I do not suggest that this is Koper's meaning, indeed he makes it clear that it is not. Nevertheless, this metaphor mapping may explain some of the attractions of the three level approach, especially for what Koper describes as the "older instructional design approaches" which espouse the conduit view of education. It may also be part of the reason it sometimes generates resistance among some constructivists.

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Models for Open Learning: Chapter 6

by Katie Livingston-Vale and Philip Long
Commentary by Ramesh C. Sharma

Summary

The Chapter, "Models of Open Learning" details two important projects of MIT focused on how can the re-usable internet based educational materials be assembled, delivered and accessed. This chapter explains the Open Knowledge Initiative (OKI) and the Open CourseWare (OCW) project. The Massachusetts Institute of Technology has been advocating open source software and the authors through this chapter tries to identify the pedagogical requirements to make MIT course materials openly available on the Net for non-commercial purposes. They have discussed various strategies for the development of pedagogical models of open learning towards sharing and reusing learning materials.

Open Source Initiative

Recently the 'Open Source Initiative' (OSI) has gained momentum and many people have found OSI a radical and revolutionary concept. The fast gaining popularity of OSI among millions of internet users has posed a threat to the survival of 'propriety software'. Many people (as individuals and as institution) have welcomed OSI, making its scope, reach and potential very effective. Rather, not only this, there is a fairly good business going around on the front of selling OSI solutions. Governments around the world are opting for OSI products. Educational institutions are also considering and using OSI products in response to the rapidly changing needs of learners, institutions and society at large.

Open Knowledge Initiative

The Open Knowledge initiative was launched by the joint deliberations of MIT and Stanford university towards development of their own Learning Management Systems [LMS] (viz. Stellar at MIT and CourseWork at Stanford) which had to be modular and open sourced. After the initiative received tremendous response from the academics, many other colleges and universities joined and a formal OKI Advisory Board was constituted. The OCW project was initiated to make MIT electronic course material free of cost to the users for non-commercial purposes. Here MIT wanted to develop an electronic publishing model for offering educational material over the Net, (not to launch a credit bearing distance learning programme) and thus Stellar (a LMS software) was developed. One of the advantages of Stellar is

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its customization as per needs of the departments or faculty. Stellar served the purpose of a reference architecture framework with the help of which the educational material could be developed, integrated or modified. It had a greater scalability, sustainability, security features, pedagogically more flexibility and open ? being easy for integration with existing other campus systems. To achieve these above stated features, the researchers at MIT conducted conferences, structured interviews and collated responses from a large number of faculty, instructor and educational support personnel. First LMS summit was held in April 2001 and the next one in August 2002. The first summit was designed to identify various principles of teaching and learning pertaining to constructivism; collaboration and community; reusability; individualized/adaptive learning; usability and faculty development; assessment and evaluation; and system design. The second summit was organised with the objective to pragmatically search for potential areas of teaching where OKI services can be utilized and in which areas further development is possible.

After the first LMS summit, a series of use case narratives was developed by staff at both MIT and Stanford, to define ways in which the created model could be used by the instructors and staff. To develop there use-case narratives, faculty interviews were conducted, recorded and subjected to qualitative analysis. From these interviews, the relevant teaching strategies were identified and on the basis of those use-case narratives were written. The interview schedule was focused on the items related to events happened during a week a course is taught, type of documents exchanged, kind of faculty-student and student-student interaction, how the course was prepared, how the group work was assessed, kinds of products developed in student groups, and various kinds of simulation or data visualizations tool in that course. The authors have expressed the limitation of not being clear on upto what extent such narratives could be utilized, nonetheless these have been found to act a blueprint for software developers or what shall be the functions of software and for researchers to understand the needs of the faculty correctly.

Stellar system and pedagogy

Initially the Stellar systems was conceived to act as a basic LMS for MIT's on-campus and distance learning courses for providing support for direct instruction and for constructivist or collaborative work. For direct instruction, a provision of instructor toolset allowed faculty to upload and organize content material and defining how the user will have access to that. Although stellar became a clearinghouse for assignments, recorded lectures, solutions and handouts, it was found that the faculty members from different disciplines used different vocabularies, and thus a feature of customization at the faculty level was added. But the same repetitive nature of

content or presentation, tempted the faculty to move away from direct instruction model, and thus to support other teaching models some tools were added to Stellar like providing access to shared file space, for personal or collaborative work, enabling a Java-based threaded discussions board for an asynchronous dialogue between faculty and students, and a FAQ.

Future plans for new models

The authors have indicated that the themes generated from interviews and use-case narratives, will be utilized to developing further models to support inductive thinking, peer review, role play, small-group learning, inquiry learning, constructivism and portfolio creation. Work is already in progress for development of an assignment management system, a suite of reusable "webjects", online quizzing toll and search facility etc.

Discussion

After reading this chapter I was feeling the need to know more about these two projects in terms of how exactly these two function and how the course material is processed. Not to appear to be too technical, but some details on technical specifications of Stellar software could have given the readers an idea on how this software works. Some brief on what the OKI and OCW website offers would have an added advantage for the readers.

Since the OKI project supports the LOM and Content Packaging Standards, it can be discussed how the educational institutions in other parts of the world especially developing ones, can adopt a learning object approach by having a ready made architecture supported by the relevant software for deploying learning objects. We may also discuss on the mechanisms for generating personalized sequences of learning objects, which are suited to the learners needs.

The two Learning Management Systems Summits came out with relevant issues and workable solutions. The various principles laid down and the pedagogical design suggested for online support of teaching and learning raise very pertinent points to be discussed. It was desired that the learners should be able to create ‘knowledge legacies’ as part of their learning. The learning styles and abilities of independent students will have its impact for such knowledge mapping processes. For the students to be able to comment on their own and on others’ artifacts of learning, there must be adequate critical and reasoning power in them.

Since Stellar provides facility for uploading and organizing course material of any media type through an instructor toolset, whereby the teachers can upload or organize text material, the issues related to the copyright need to be addressed. Who will have control over the content moderation?

The OKI and OCW shall promote and guide other institutions to work on similar lines for designing, developing and sharing their tools and instructional content, its operationabiltiy in the developing countries needs to be addressed carefully where there are many barriers to the use and adoption of ICT in education.

Concluding remarks

The authors have presented a detailed account of the significant work being done at MIT and Stanford for open source software development and on two key products of this category viz OKI and OCW. Such initiatives, although started off as a small and individualized effort, nevertheless, will form a base for other institutions in designing, developing and sharing their instructional content as well as tools with other institutions. Overall this chapter gives an interesting account of what is happening in the educational institutions towards open source software development and how the area of open learning can draw benefits from the models of open source movement.

Wiley, D. (2003). Introduction to Part 2 of Reusing Online Resources: Design Perspectives. *Journal of Interactive Media in Education,* 2003 (1) [www-jime.open.ac.uk/2003/1/]. Reprinted with permission from: *Reusing Online Resources*, (Ed.) Littlejohn. Kogan Page, London. ISBN 0749439491.

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Design Perspectives: Introduction to Part 2

David Wiley

In my dissertation on the design and sequencing of learning objects, I criticized Merrill's (1996) work on Instructional Transaction Theory (Wiley, 2000). The main critique of ITT centred on an inherent paradox: the theory requires that reusable educational resources come in extremely well-specified formats, meaning that an instructional approach supposedly centred on reusing educational resources actually required all existing online resources to be specifically tailored to ITT before being reusable. This requirement seemed to destroy the notion of reuse as I had envisioned it. Merrill wanted the building blocks to be cut, trimmed and outfitted with specifically sized knobs and notches so that they could fit together perfectly. I continue to believe that the alternative approach of using mortar to hold together blocks of a variety of shapes and sizes is in closer harmony with the idea of reusable educational resources.

This same theme recurs in this collection of chapters on design. Without some sense of context binding together reusable educational resources, a 'course' so designed becomes nothing more than a grab bag of apparently unrelated stuff. As Paul Saffo famously quipped, 'It's the context, stupid' (Saffo, 1994). The chapters in this part of the book explore a number of ways of wrapping educational contexts around existing online resources, allowing them to be reused exactly as they are -- without necessitating editing or other alteration a *priori*.

I was glad to see the pragmatic foci of these chapters, especially the commitment to meet current learning needs first, and to only design for reusability opportunistically. The design consideration that says 'someone might want to reuse this resource later' should never be allowed to get in the way of achieving local instructional goals. I was reminded of Eric Raymond's first rule of creating successful open source software (the end goal of which is, of course, broad sharing and reuse): 'Every good work of software starts by scratching a developer's personal itch' (Raymond, 2000). If the educational resources we create don't meet our own needs well, why would we think they would meet another's? We *must* start by reusing resources in a way that solves our own problems perfectly, and then generalize to hypothetical cases of reuse from there.

It's refreshing to see people continuing the struggle with the issue of grain size. In their chapter Laurillard and McAndrew state that 'what was needed (for pedagogically effective reuse) were either small, simple to use, software elements or relatively large well-described sections of courses'. Well, which is it? This question, of course, is loaded with the assumption that there is one 'correct' grain size for a given course, curriculum, or for the world. In another example of the pragmatism displayed by

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these chapters, the authors show a willingness to promote the use of larger grains when they makes sense, and smaller grains otherwise. The commitment to design the context wrappers described above also shows the pragmatism of admitting that sometimes good instruction is going to require the design and production of material that just isn't reusable across contexts.

Oliver and McLoughlin make the claim that online learning should be both scalable and sustainable. I would add to this list 'sociable'. The flip side of their observation that learner-to-learner communication can cut down on interactions with online tutors is that fostering learner-to-learner interaction can facilitate certain types of learning that would be extremely difficult to achieve through interactions with content. I am not alone in believing that the trend toward automated, adaptive, personalized, or intelligent systems, or in other words, the drive to remove expensive humans from the learning experience loop, is an insidious form of cultural or epistemological imperialism. We must be extremely careful that our learning environments based on reusable resources contain opportunities for meaningful discourse.

In addition to cataloguing several ways in which context can be wrapped around pre-existing resources, Thorpe, Kubiak and Thorpe state that metadata can only be created by the original resource design team. I would agree that there is no better place to create this metadata for the original use context. However, metadata that describe the variety of real world cases in which a given resource has been reused, what we have termed 'nonauthoritative metadata', can be extremely helpful in facilitating the efficient and effective reuse of existing resources (Recker and Wiley, 2001). Reusers should be given the opportunity to meaningfully contribute to the catalogue entries of the resources they reuse.

Finally, I greatly appreciated Treviranus and Brewer's chapter on accessibility issues. Their point that metadata should contain accessibility information may seem like a no-brainer until you begin to ask, 'So, who is doing this?' This simple suggestion provides implementers of learning objects systems an extremely high value system feature that should be very straightforward to implement? a very valuable contribution!

It warms my heart to see the dialogue around the reuse of digital educational resources continuing at this level. Here's to more research, conversation and, most of all, fun.

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A Comparison of Issues in Reuse of Resources in Schools and Colleges: Chapter 17

by Allison Littlejohn, Insung Jung and Liz Broumley
Commentary by Terry Anderson

This chapter forces us to confront an issue that has long haunted education technology focused reformers ? what if we build it and nobody comes? Will learning objects end up alongside programmed learning machines, educational television, and video conferencing as technologies that were cool in their day, but never had anywhere near the impact on formal education that was predicted by early proponents. Perhaps the best way to ensure valued and valuable use of any technology is to ensure that lessons learned from early implementations are recycled back into design of subsequent products. Fortunately, we are yet in early times in the development of objects and thus the potential for both incremental and substantive change to the way we design and use these latest techniques is great. As importantly, the design and construction processes related to educational objects use and adoption are much different than the monolithic models of earlier technologies. Educational objects promise a flexibility of design and implementation that allows for and even demands creative input from both professional designers and practicing teachers. Thus, articles such as this one by Littlejohn, Jung and Broumley that not only document issues and concerns of early adopters but further provide new design models and heuristics are especially valuable.

The article presents the results of two geographically and educational diverse case studies that focus on adoption and use of learning objects. The first reviews an interview-based study of 283 Korean K-12 teachers who had access to a national repository of objects. The second case study focuses on the experiences of tutors developing and delivering educational modules for a new distributed postsecondary network located in Northern Scotland. The article provides brief summaries of these studies and a link to the full Scottish study, but none to the Korean one. As in any good multiple case study the authors help us to compare and contrast the two cases through a table that builds on the four categories introduced by Campbell (Chapter 3 in the text) of cultural, educational interoperability and technological. The cultural variables that are found in both studies are familiar and in most cases similar ? both samples have issues related to familiarity and access to the technology, lack of time, and concerns about motivation and reward related to adoption of any new technology. Cultural differences, though, are significant. The Korean K12 teachers are teaching to a standardized national curriculum. In contrast, the Scottish tutors, like most higher education teachers, are individually developing and delivering their own localized curricula. Finally, the context of the Korean teachers includes a large scale federally sponsored and mandated repository of curriculum that has been established for years.

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The Scottish tutors are forced to create their own content and tag and store it for reusability. These tutors are motivated only by a sense that reuse is a good thing and may save them some time in subsequent revisions. Oddly, the authors don't look at the larger cultural dimensions related to teaching and learning between the two samples that anthropological scholars such as Geert Hofstede (1991; 1986) have identified. For example it would be interesting to determine if any Hofstede's five cultural dimensions ? of individualism, power, uncertainty avoidance, achievement or long term orientation ? are directly related to learning object creation or adoption.

Educational, interoperability and technological issues are remarkably similar despite the fact that Korean teachers are using educational objects in classroom situations, while their Scottish teachers are developing distance-learning content. Not surprisingly, higher education teachers focus on content development, while K-12 teachers leave content creation to texts and other commercial content objects and focus on acquiring and using objects that support learning activities.

What the two cases provide for us is a snap shot of object use in the real world. The short summary statistics and the expansion in the original articles help us focus on the adoption issues that are most likely credible and useful to teachers making real adoption and use decisions. The authors speculate that the standardized curriculum of the K12 context is likely to lead to more extensive and rapid adoption of objects since the larger economy of scale that determines the market for object production and use is likely to lead to higher quality products. However, this view sees learning objects as being static entities much like textbooks that demand large press runs to amortize production costs. I like to think of objects as being more malleable than this and gaining their economy of scale by their capacity to easily be contextualized or morphed to meet a variety of curricula needs. In this latter view, objects may in fact be more attractive in areas in which culture demands local accommodation and development of curricula.

As a good chapter should, the authors next take us from the data to the theoretical by presenting a model or framework for "module design and evaluation". The module combines Biggs' (1999) design that attempts to constructively align learning objectives, assessment tasks, and teaching methods and throws in Mayes' (2002) categorization of courseware at three levels: content, activities, and discussion. Unfortunately, the single example of the framework provided is focused on the "design of online courseware" itself. This confusing habit by which educational technology researchers provide examples from the study of educational technology itself does nothing to help the reader generalize to more diverse educational contexts. Surely educational technology researchers will eventually discover that there is a

world of education beyond the study of educational technology itself!

Notwithstanding this concern with the model's presentation is a deeper concern that the framework model lacks sufficient specificity to actually guide learning object use and integration. The framework helps us get our heads around the fact that learning objects can meet courseware needs that go beyond the familiar text model of content that leads to discussion activities. However, it is less effective in providing any guidelines as to how learning outcomes, assessment, teaching and evaluation should be aligned. It certainly provides a nice reminder to see these four factors sitting side by side in the model, but there is little guidance as to how learning objects fit into the framework. This is especially challenging when current confusion in the field between so called "knowledge objects" which are devoid of outcomes and assessment or learning activity are confounded with other conceptions of learning objects at generally larger levels of granularity where all of these activities are referred to as components of the learning objects. As the authors suggest, perhaps more formal description of these contextual components of a learning object provided through the IMS learning design specification or other versions of an educational modelling language will help solve this problem. So for now, the framework provided only tells developers to remember these important components of effective learning contexts but gives us little more than a tabular heuristic to guide the process. The framework is a model and models are often the first and necessary step in theory formation. They identify the important variables ? but further work is needed to expose the theoretical relationships between these variables.

To conclude there is much to be learned from the study of real applications of learning objects in authentic use and development applications. These chapter reviews two such studies and in the process helps to identify factors that will likely both exacerbate and promote re-usable learning object adoption. The framework provided is useful for reminding us that education is multi-faceted and multi-staged and that learning objects need to be integrated within culturally defined learning sequences. Thus, diverse needs often warp around instruction, support, assessment, and encouragement and each can be critical to effective use and integration.

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Pedagogical Designs for Scaleable and Sustainable Online Learning: Chapter 8

by Ron Oliver and Catherine McLoughlin
Commentary by Tom Carey and Kevin Harrigan

Oliver and McLoughlin provide an excellent summary of some of the design considerations needed to make developments in online learning 'scaleable and sustainable'. Many of the approaches they suggest could also be treated as requirements for any successful online learning deployment, so that the chapter brings together principles of the underlying pedagogies with a context for reaching critical mass.

In our own work we talk about our designs being *task-based* rather than *goal-based*. We have found this terminology is more quickly assimilated by our instructors, for several reasons:

- the term *goal-based* has a rich history in work by Roger Schank and others, but our instructors' immediate assumption was that it would refer to their own instructional goals and objectives, rather than to an explicit goal for learners to achieve.

- our learning designs are most often intended for blended environments in which the online resources are used before, during and after synchronous events such as scheduled class sessions. This allows us to position the tasks as playing a specific role in achieving the instructional goals, e.g. a Preparatory or Induction task in meant to relate a particular set of content to previous subject matter. [cf. Jane Vella's *Taking Learning to Task* for a description of how various tasks can be composed effectively into such blended designs];

- in the same way that *objectives* are matched with *assessments*, we match *tasks* with *feedback* on the task 'deliverables'. We distinguish assignments as tasks for which the feedback is recorded for grading purposes, leaving most task feedback as formative information to guide learners. Instructors can also receive feedback as formative information for classroom events -- this approach is outlined well in the book *Just-In-Time Teaching: Blending Active Learning With Web Technology* by Gregor M. Novak, Evelyn T. Patterson, Andrew D. Garvin, Wolfgang Christian.

We have begun to integrate the task-based design approach into online tools to support instructors as they create Web based courses. This infrastructure has been informed by the work described in this chapter from Edith Cowan University, as well as our participation in the

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MERLOT consortium and in developing metadata for learning objects. For example, our current prototype tools are designed to integrate access to the MERLOT learning object repository and to capture instructional metadata about the learning tasks and their roles in the learning process.

In the following paragraphs we are addressing the issue of separating instruction from the Learning Object itself as discussed in the section 'designing for reuse' in this chapter.

We are introducing our university instructors to various online resources including our new Learning Object Repository called CLOE (cloe.on.ca) and MERLOT (www.merlot.org). Our experience is that the instructors feel strongly that they have been hired as an expert in the field and thus they must have ownership over their course. It must not be simply an aggregation of Learning Objects that were created by others. The typical scenario that we see is that the instructors tends to teach the same course year after year. Each year the learners experience difficulties with certain concepts which we call instructional challenges or instructional bottlenecks. The instructor is interested in finding techniques to overcome this bottleneck. Typically, when instructors are searching for Learning Objects from a repository they have already tried other techniques in the past without success. Our model is for the instructor to create a learning task and then use Learning Objects when appropriate to support the learning task.

In first working with instructors, we felt that they would want Learning Objects in repositories to be accompanied by the instructional context in which they were originally designed for and used in. We felt they would also want any other documents that were related such as sample assignments. In practice, what we have been finding that the instructors only want the Learning Object. They want to use the Learning Object as a means of overcoming the instructional challenge but they already have their learning task in which they want to use the chosen Learning Object. This strongly supports the idea put forth in this chapter that the instruction not be directly linked with the Learning Object itself.

Our work is almost exclusively with university instructors. We feel that this emphasis by the instructors of not wanting to simply aggregate Learning Objects to create courses would be higher at universities than at most other learning environments. For example, in may be common for a trainer in a organization to be required to do training in a subject in which that trainer has some knowledge but is not an expert. In this case, the trainer may create the course by aggregating Learning Objects that have been built by experts. This trainer may use all associated

material such as information about how the Learning Object was originally used and sample assignments. In this case, the separation of the instruction and the Learning Object itself may not be necessary but it would be quite acceptable as the trainer could still create a course by aggregating the Learning Objects and the associated instructional material. Thus, the notion put forth in this chapter of keeping instruction separate from the Learning Object works well whether or not the person reusing the Learning Object is interested in the instructional material or not.

We, like the authors of this chapter, are concerned with sustainability and the following two paragraphs address three initiatives that we have taken to address this issue of sustainability. Our initiatives are quite different from the sustainability issues raised in this chapter..

The first is Case Stories of reuse from the instructors perspective. Case Stories are meant to tell the story of the creation, use, acquisition, and reuse of a Learning Object (our first is available in the 'About' section of cloe.on.ca). We are creating these as we have found that many instructors have heard about Learning Objects but they are not sure why or how they should use them in their courses. The Case Stories are a means of allowing an instructor to see what others have done and thus learn from the experience of others. Feedback to date has been very positive. The idea here for sustainability is that there needs to be a critical mass of instructor using repositories in order for the repositories to continue to be in operation.
Our second initiative is that we are conducting six Learning Impact research studies which look at the use of a Learning Object from a learner's perspective (These will be posted at cloe.on.ca by August 2003). We are creating these discipline specific Learning Impact Studies as many decision makers are interested in knowing whether or not Learning Objects are useful in courses. We feel that creating these Learning Impact Studies is addressing sustainability of repositories as decision makers need to be shown the 'value propositon' of providing ongoing support for these repositories.

Our third initiative that we are involved with is the peer review of Learning Objects. Currently there is little incentive for instructors to contribute Learning Objects to repositories as it carries little weight in the instructor's Promotion and Tenure submission. Both in CLOE and MERLOT we have created a peer review process so that we open up the possibility that an instructor can get professional recognition for the creation and submission of a Learning Object. Currently we are working with mostly early adopters, whereas over time we need a more entrenched incentive for instructors to submit Learning Objects to repositories.

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Designing for Reuse and Versioning: Chapter 9

by Mary Thorpe, Chris Kubiak and Keir Thorpe
Commentary by Tom Carey and Kevin Harrigan

This chapter presents some elegant ideas about how an individual institution can manage its online content to promote repurposing and re-use. The cases illustrate the benefits and issues involved in making this work. Since the OU process and its instructional approach are already well-managed, the adaptation of the process to allow versioning can be accommodated naturally. The module size for re-use appears to be larger than many of the units on offer from learning object repositories. This is particularly evident in the section on *Teaching and structuring the learning process*, where the tactics suggested for linking together the chunks are suitable for bridging between self-contained units of study but are less appropriate for integrating smaller learning objects into a coherent unit on its own. A better approach for that purpose is the goal-based design in chapter 8. Even for the integration of larger modules, the terms in this section do not seem to convey the stated need for a cohere program of study -- labels such as *tagged on and bolted on* do not do justice to the thoughtful insight required.

For institutions with the scale of the UK Open University the focus on internal re-use is natural. However, for many institutions the greater need will be to develop and manage content which can be re-used by other institutions, as in the CANDLE project described in chapter 15.

Our situation is that we have 15 universities in our system. Each university is interested in both submitting and re-using Learning Objects in our repository, called CLOE (cloe.on.ca). To date the Learning Objects submitted and re-used have been of the granularity that they can be used by the learners in one sitting. Examples include a high quality three-dimensional animation of muscle contraction and a Learning Object that allows the learner to do hands-on experimentation with the Stroop Effect in Psychology.

Instructors appreciate the ability to incorporate these Learning Objects into a week of their course without doing any major course redesign. The fact that the Learning Objects in the repository tend to all have a different look-and-feel does not tend to be an issue for the instructor as they only want to incorporate one or two in their course and the learners clearly know that they are using a learning Object that was created by a different expert in the field. Given this, they seem to think that it is reasonable that each object has its own look-and-feel. Trainers who are creating a course by aggregating Learning Objects may find that the different look-and-feel to the Learning Objects is constantly an issue for the learners but with limited use

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of Learning Objects in a course our experience is that this seems to be a non-issue.

In most cases, our instructors create their own course. Usually someone has taught the course before and they inherit all associated material. They then modify the course as they wish. There is typically no 'team' involved in the course creation as was described in this chapter. Rather the course is created by one instructor with perhaps some assistance from others such as a central 'Teaching and Learning' centre. In this situation, it seems that Learning Objects that are of the appropriate granularity to address one instructional bottleneck are what fit easily into the model of course creation that has traditionally been used. The exact granularity of the re-used Learning Objects can and does vary but in our experience to date it is always been something that the learning would be expected to use use for roughly 1-3 hours.

An initiative that we are actively involved with in CLOE is the co-design and co-development of Learning Objects across multiple institutions. Essentially, our idea is that if the Learning Object was initially designed and used by two or more instructors that immediately upon completion of the Learning Object it would be used by the two or more instructors who were involved in creating it. There is an underlying assumption in this chapter that we should design for our own student first with a view towards how the Learning Object might be re-used. The idea behind this initiative of ours is that by targeting initial students in more than one institutional context we get a long way toward reusability with little additional effort [and with a much stronger community to support instructors].

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Developing and Reusing Accessible Content and Applications: Chapter 10

by Juta Treviranus and Judy Brewer
Commentary by Sharon Perry and Simon Ball

Preamble

As the implementation of online learning systems continues to grow, so does the need for content that can be used in those systems. If that content were broken down into its component parts (learning objects), tagged with the appropriate metadata and stored in a searchable repository, a wealth of reusable educational resources would become available.

By ensuring that these learning objects are also fully accessible, they can be used by anyone, anywhere, regardless of physical, environmental or technological limitations. Such modularised, accessible learning objects can then be mixed and matched to construct learning experiences appropriate to each learner's needs. This personalisation of learning could be equated in many senses to one-to-one teaching and will require more than just changes in the supporting infrastructure ? it will also require a dramatic change in pedagogical thinking.

Jutta Treviranus and Judy Brewer's chapter introduces the concept of reusable learning objects and describes some of the considerations that need to be made to ensure that accessibility is incorporated right at the very beginning of the design process.

Accessibility Guidelines and Specifications

Guidelines and specifications are available in many areas of online learning ? most of which now either include or will include accessibility elements. If these guidelines and specifications are implemented, they will help to ensure that learning objects are accessible and therefore available to all learners, irrespective of learning style, environment or technology requirements.

The authors emphasise throughout the importance of using standards (or at least guidelines and specifications) to ensure that content is accessible. There are subtle differences between guidelines, specifications and standards. Guidelines are only recommendations towards good practice, while specifications can be considered as guidelines that are "works-in-progress" toward becoming standards, where conformance is optional but recommended. Standards can be regarded as a set of rules to which conformance is mandatory. The number of standards

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available for online learning is very small whilst the number of fledgling specifications and guidelines is growing, most of which include accessibility elements. Implementation of these guidelines and specifications is necessary to ensurethat everyone has an equal opportunity to access online learning content, and usability and interoperability are greatly increased if everyone adheres to the same set(s) of standards.

The authors describe a small selection from the wide range of needs exhibited by disabled students. This serves to highlight the point that any guidelines, specifications and standards pertaining to accessibility must be sufficiently flexible and generic in nature so as to encompass all potentially disadvantaged students, while retaining enough technical provision to render them achievable in a wide range of circumstances.

Some of the relevant guidelines and specifications currently available are described in this chapter. In particular, they include the World Wide Web Consortium (W3C) Web Accessibility Initiative (WAI) guidelines with a very brief mention of other guidelines and specifications (such as IMS and Dublin Core). The W3C/WAI guidelines described are:

- Web Content Accessibility Guidelines (WCAG) - for web based content, and which are also applicable to any electronically based learning materials
- Authoring Tool Accessibility Guidelines (ATAG) - for support in the creation of accessible software and also to enable software developers to design products, which aid the end-users to create a more accessible end-product
- User Agent Accessibility Guidelines (UAAG) - for browsers and multimedia applications, and to increase interoperability with assistive technologies, as well as rendering navigation and customisation more accessible by including features, which allow disabled students to select their own preferences
- XML Accessibility Guidelines (XAG) - for making XML-based applications accessible.

Although the authors have briefly touched upon other guidelines and specifications, they are not covered in as much detail as those relating to the W3C. Further expansion of these guidelines and specifications would provide a useful balance. For example, the IMS Global Learning Consortium, which develops specifications for

learning technology, is working on adding accessibility elements to many of its established specifications. It has already published "Guidelines for Developing Accessible Learning Applications" and is currently adding extensions to specifications, such as the Learner Information Package (LIP) Specification, which will allow learners to specify assistive technology preferences. The Dublin Core Metadata group is also working on including accessibility elements. Tips on XML and Accessibility can be found in Franklin (2001).

Learning Object Repository Functionality

The authors identify three levels of learning object repository functionality, which relate to the amount of modularisation of a learning object. They are, in order of increasing modularity:

- Sharable learning objects - like a library book, they can be taken out (retrieved) from the library (repository) but cannot be repurposed (most common)

- Repurposing of content - the content is either structured or broken down into small enough modules to allow component exchange

- Personalisation of the instructional method and/or content - learning content is constructed independently from presentation and control functions (virtually unexplored).

By splitting learning objects into sufficiently small modules (and modularising the content, structure, presentation, functionality and control method), they can be joined with other modules to create personalised learning objects. For example, a learning object containing an audio module can be adapted for use by a deaf learner by exchanging the audio module for a text transcript. Therefore, personalisation of learning objects allows learners with different requirements to learn what they need, in the style, format and speed, which they prefer.

The learner should not necessarily be aware of such personalisation, however. This should be done as far as possible in the background as a result of implementing such specifications as the IMS LIP for student preference and by using well-constructed metadata. The only part of the process the learner should see is the selection of preferences, such as a screen reader, amount of graphical content, text transcripts and so on at the start of their interaction with a learning environment. Content should

be marked up with the appropriate metadata to describe the degree of accessibility and its suitability for use with various technologies, such as screen readers, for example. A number of organisations are undertaking work in this area, with a view to producing fully customisable and flexible materials.

The Barrier-free and TILE Projects

An overview of the Barrier-free Project is given in the chapter, providing an example of the way in which learning objects can be made accessible. The project involved the development of authoring tools, a player/browser, a learning object repository, and XML-based learner preference specifications. These tools were then used to digitise video content and to mark up video captions for navigation and linking to other learning materials, such as web content. Events occurring visually in the video were also described so that visually impaired people could use the video as a learning object. Video content is particularly difficult to make accessible, as it requires a great deal of time and resources.

A further phase of this project, The Inclusive Learning Exchange (TILE), will extend this personalisation to other types of media, including animation and simulation, which will then be structured in a learning design framework.

Accessibility Strategies for Learning Objects

Learning objects should be accessible, regardless of their modularisation, but it is essential that strategies are designed and adopted first. These strategies should include timescales and planning for making existing content accessible as well as policies to ensure that any new content is made accessible from the very beginning. As Foley and Regan state: "Accessibility must be seen as an integral aspect of the design process, not an add-on or separate activity".

The authors list a number of considerations, which need to be addressed in an accessibility strategy for online learning content. One item not included in the list was the issue of legislation. Accessibility strategies should include reference to any relevant legislation as non-conformance to such legislation can have serious legal implications. Federal (includes educational establishments) websites in the United States, for example, must comply with Section 508 legislation. Although such legislation has not yet been passed in Britain, the Special Educational Needs and Disability Act (SENDA) makes it unlawful for providers of education and educational services to discriminate against disabled people. This implies that all

teaching and learning activities, including online learning content must be made accessible to all learners, or at the very least that equivalent alternatives should be made available where appropriate. For a more detailed discussion of the issues surrounding electronic learning materials and legislation in the UK, see Sloan (2002).

As accessibility issues need to be considered at the design stage, the section covering "Planning for Accessibility" could perhaps have been expanded further. For example, further information on the individual issues that need to be taken into consideration and pointers to examples of planning strategies/policies would have been useful.

Conclusions

Jutta Treviranus and Judy Brewer have produced a useful introduction to the issues involved in making learning objects accessible, although it is a theoretical rather than practical account, which emphasises the process rather than the methodology. It is a difficult area to tackle because although guidelines/specifications and technologies are continuously being developed, the idea of personalised learning objects is still very much in its infancy.

In summary, prefabricated learning objects are becoming more widespread with the consequence that repositories are being developed to store them. Content authoring and the supporting infrastructure tools are also being further enhanced simultaneously with the development of myriad guidelines and specifications to ensure that the whole architecture is accessible. However, there is still some way to go before this vision of accessible personalised learning objects becomes a reality and a major shift in teaching methods and pedagogies will be required.

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Sloan, M. (2002), E-Learning and Legislation, Retrieved 17/03/03: http://www.techdis.ac.uk/resources/msloan02.html

Resources

Dublin Core Metadata Initiative (DCMI) Accessibility Special Interest Group - http://dublincore.org/groups/access/

IMS Guidelines for Developing Accessible Learning Applications - http://www.imsproject.org/accessibility/index.cfm

IMS Learner Information Package Specification - http://www.imsproject.org/profiles/index.cfm

Stiles, M. (2003). Introduction to Part 3 of Reusing Online Resources: Resource Perspectives. *Journal of Interactive Media in Education*, 2003 (1) [www-jime.open.ac.uk/2003/1/]. Reprinted with permission from: *Reusing Online Resources*, (Ed.) Littlejohn. Kogan Page, London. ISBN 0749439491.

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Resource Perspectives: Introduction to Part 3

Mark Stiles

In my own work on VLE development, pedagogy and standards I have 'banged on' at length about how 'it's all about people and how they learn and not about just giving people resources', or if you prefer, the thing that matters is the design of the experience we intend our learners to have. In the sections on 'vision' and 'design' this emphasis has been reassuringly present (alongside some practical issues such 'why and how reuse resources?'). Asked to review the contributions in this part of the book, I was interested to see if the same healthy view would be maintained or if we would slip back into 'delivery' mode.

In Chapter 11, 'Digital libraries and repositories', Charles Duncan and Cuna Ekmekcioglu have kept the 'learning' emphasis but also recognize the many barriers and cultural issues to be overcome. The effective reuse of content depends on educators being able to find items of content, ascertain their quality and availability and then repurpose these things to contribute to enabling their learners to meet the goals the educator wishes to set them. Many of these issues are the traditional preserve of the library and the librarian and this chapter explores the issues around cataloguing, distribution of resources versus centralization, and the diversity of artefacts that form 'resources'. The thorny issues of quality and intellectual property are raised and these inevitably bring us to the need for cooperation, communication and cultural change involving all of the ever-changing roles that this 'new world' implies.

These issues highlighted by Charles and Cuna neatly lead into Oleg Liber and Bill Olivier's chapter on 'Learning technology interoperability standards'. Oleg, Bill and I, along with many others, share the view that learning is not merely about content but about what people *do* to learn. In this chapter, the current state of specifications and models is discussed in a way that explains their relationship to each other, and their importance in (hooray!) an educational, rather than technical, context. The vital importance of the development of a specification that enables the learning process itself to be described and defined is covered 'straight from the horse's mouth', as Bill Olivier is probably the major contributor to the development of the IMS Learning Design specification. I have argued myself that specifications were needed that supported an holistic approach to both pedagogy and mode of delivery, especially in the context of a world populated by 'e-learning systems' that focus in the main on content delivery, and here Oleg and Bill show us the way forward.

The first chapter in this part raised the issues of diversity of resources and Grainne Connole, Jill Evans and Ellen Sims expand on this in 'Use and reuse of digital images in teaching and learning'. While a picture may well be worth a thousand ords, how such a burst of information

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is best used when building a learning experience is quite a another matter and also, as the chapter points out, the word 'image' covers a lot of ground! 'Small' things like an image are highly contextual in the meaning they convey and their selection and reuse poses a range of problems that are only beginning to be explored. Grainne, Jill and Ellen review the current state of research and highlight issues such as the description of such resources in terms of both what they are and how they might be useful. This is *hard* -- a resource that is useful, for example, in Media Studies, might be useful in Engineering in a completely different context. Furthermore, the pedagogic implications will vary with context -- the chapter highlights the importance of what an 'image' communicates in the context of recognition of the social nature of learning. (Another 'hooray' from me for this!) Of course the spectre of IPR and copyright raises its head again.

So far the authors have looked at resources and reuse in context of enabling learning. In 'Assessing question banks', Joanna Bull and James Daziel move on to considering how we will know learning has been successful. Like many practitioners, I am somewhat sceptical of the ability of computer-aided assessment (CAA) to assess the full range of outcomes I desire to identify, largely due to the focus on the use of multiple-choice questions. This chapter recognizes such concerns and discusses the extended range that CAA now encompasses. Assessment is probably *the* major area of stress for teaching staff in the era of widening participation and mass further and higher education. Joanna and James address the vital issues of achieving efficiency gains while maintaining quality. The issues of copyright appear *again* and are addressed alongside the need for specifications and the requirements expected of systems delivering CAA. While I am still unconvinced of how some things (such as synthesis) can be assessed by computer, I will certainly look at extending my activities in this area!

This part of the book concludes with a look at the international dimension. In 'Sharing and reuse of learning resources across a transnational network', Joachim Wetterling and Betty Collis give us a fascinating look at a European project. I have become very aware of the pedagogic and cultural differences in education when viewed across national boundaries, and have recently commented on the problems raised. In this chapter the authors discuss the issues of reuse in this problematic context, concentrating on pedagogy, collaboration and the re-engineering of courses. Yet again I'm delighted that this has been done in the context of what people *do* with content. The project described is as yet at an early stage, but is focused on issues of standards, and I look forward to the contribution it will undoubtedly make.

So much for the 'resource' perspective -- but how will we make all this happen across the sectors and in our institutions? Gilly Salmon introduces this in the next part of this book.

Walker, E. (2003). Commentary on Duncan and Ekmekioglu, Digital Libraries and Repositories, Chap 11 of: *Reusing Online Resources*, (Ed.) Littlejohn. *Journal of Interactive Media in Education*, 2003 (1) [www-jime.open.ac.uk/2003/1/].

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Digital Libraries and Repositories: Chapter 11

by Duncan and Cuna Ekmekioglu

Commentary by Ed Walker

Summary Comments

Duncan and Ekmekcioglu begin their chapter with the ritual observation that learning resources (i.e., library assets) are becoming ever easier to reproduce and distribute. So they are, and many commenters have been content to attribute the source of change to the death of place or the digitization of knowledge assets. These authors fortunately do not submit to being mesmerized by the epiphenomena of e-change. After making only brief comments about better infrastructure for databases and inter-repository communication and the persistent value of custodianship, cataloguing and retrievability, they conclude succinctly that there will always be big, little, and personal repositories of mixed types of assets, as well as a need to federate them.

They then move on to the more valuable and provocative discussion of how users of libraries and librarians themselves are better enabling their time honored symbiosis by exploiting computer and networking technology. Like other kinds of e-commerce or e-government, the mutual services that comprise the dialogs between librarians and their "customers" can now be performed quickly and cheaply at a distance. As a result, this performance can now involve more intricate, more frequent, and more direct interaction between provider and user. Some parts of it can even be automated, and some roles can be shared or transferred from provider to user and vice-versa.

The resulting changes are more in the delivery of service than in the nature of the service, and in the style of user-provider interaction than in the intent or substance of that interaction. Following this theme, Duncan and Ekmekcioglu rightly organize the body of their chapter around the roles of librarians and users, the interface that library systems provide to other systems, and the integration of those roles and interfaces.

Decomposing and Recombining Roles

Disintermediation and customization are marching through education and training as inexorably as they have through other systems for exchanging value. The lines between user and librarian and between library systems and the systems with which they interact are being redrawn. Learners and teachers expect, as consumers, that access to learning resources will be as personal, immediate, and unimpeded as access to a book or CD on Amazon. Authors expect

that their work will be made globally and persistently available; yet they still expect to make ad hoc revisions. These expectations can only be met if some of the responsibility for indexing and maintaining assets migrate to users and their systems.

No less do librarians expect to be solely back office custodians and archivists. Duncan and Ekmekcioglu point out that librarians expect to take proactive "responsibility in user education, knowledge management, organisation of networked information resources, electronic publishing and curriculum development." If such expectations are to be met, then such activities as searching, alerting, etc. will be based on collaborative behaviours by users, librarians, and software agents.

User Needs: The MERLOT Project

The Multi-media Resources for Learning and On-line Teaching (MERLOT) project provides a perspective on technical and sociological issues involved with the dynamic growth and use of learning object repositories used for teaching and learning.

MERLOT (www.merlot.org) is designed primarily by and for the faculty and students of higher education. Its system infrastructure provides links to online learning materials and environments for adding annotations to those materials such as peer reviews and assignments. MERLOT is an open community, and community members help MERLOT grow by contributing or evolving materials and adding assignments and comments.

These materials may be added by the people who created them or by any member of MERLOT. Peer reviews of material are contributed by qualified faculty members in the relevant discipline(s). Peer review editorial boards in 14 fields ranging from biology and business to mathematics, teacher education, and world languages are responsible for developing evaluation standards and conducting peer reviews of materials for that discipline. Editorial board members also monitor and contribute to the MERLOT collection in their discipline.

MERLOT begins to address part of the problem of collecting resources created by individual teachers or authors from local storage and rating their quality to make them both available to and usable by other teachers and to learners. How will the assets created by this process be made persistent, maintained over time, and distributed reliably?

Functional Requirements: The COLIS Project

The Collaborative Online Learning and Information Services (COLIS) project has focused on specifying the functions that an integrated learning-library system environment would entail. www.colis.mq.edu.au The services that the COLIS participants have identified include:

- Authoring tools which enable all types of contributors to create, edit, annotate, etc.
- Learning/teaching interfaces for a variety types of interaction
- Facilities for importing and exporting content (assets)
- Robust authentication and authorization of users
- System interfaces that support automatic and manual interaction with a variety of learning management, asset management, and administrative systems
- Facilities for search and discovery by both expert and amateur users
- Asset management functions and interfaces
- A rights management and version control capability
- Application profiles which support deployment, maintenance and use in a variety of domains
- Interfaces to networked distribution and delivery systems

Enabling Interoperability: Work by IMS and Other Consortia

The COLIS list of necessary functions is complex, and ensuring that individual functions can interoperate with one another to provide the integrated environment necessary to realize the MERLOT agenda is truly daunting. Work on specifications which will support the overall framework is being conducting by a number of organizations.

The work of IMS brings together end-users, consumers, vendors, and policy setters and focuses on the aspects of interoperability required to deliver interoperability in such functions as finding resources and retrieving them, putting objects into repositories, and supporting interactions between repositories. This work has delivered a first basic specification. A special interest group is now formulating projects to provide solutions to immediate interoperability issues. Joint work that involves participants from IMS, the Center for Networked Information, the Digital Library Foundation and the Online Computer Library Center is addressing the deeper issues

on which innovative redistribution of function depends.

In addition work on such standards as MARC and Dublin Core continues, and the learning technology community has developed and released such standards as the Learning Object Metadata of the IEEE, and the IMS Content Packaging specification.

Discussion Starters

Some key tasks have not yet been addressed. Even if they are designed to be interoperable and meet the requirements of many sectors of use, individual, general purpose standards must be integrated and profiled to support the various interactions characteristic of particular systems in specific application domains. This task involves producing a "complete solution", rather than a collection of parts, and it will require participation from many communities. How will the collective effort be organized and led? Will projects like the COLIS project be expanded, or will new projects need to be organized? Will consumers or vendors take the lead to organize this joint activity?

New capabilities and new roles are being enabled. Many components of an integrated learning and library environment are subject to external forces. At least temporarily, the genie of change will behave unpredictably. Technical evolution and information science and pedagogy will proceed in parallel with development activities. Organizational environments are likely to be out of synchronization with the state of the art. How will the design of library and other systems and the development of staff and organizations build in capacity for flexibility or change in response to these trends and constraints?

The broad need to fix individual responsibility for assembled functionality that enables many kinds of users to create, maintain, distribute, and use learning resources reliably, is such an overarching issue that it is worth speculating what model of "charging" or metric of accountability and credit will eventually emerge from the process of re-implementing and redistributing these services among provider, user, and system behaviors. The authors offer us an intriguing peek at the way through the many thickets of this issue when they refer to the "quality control" that is implictly associated with the cost (or perceived value) of a service.

They observe that a 'free' service is a (lower) boundary condition,

> *"There is a perceived value ... when some form of "quality control" is implied. ... where no charge is made ..., there is often a question mark over the quality of material."*

How will this question mark be removed? Is it possible that some sort of "certificates of quality" will emerge as a standard of value to complement traditional " right to use" as a monetary or non-monetary metric of value added?

Many states between the intrinsic worthlessness of chaotic openness or the isolating proprietariness exist.

Walker, E. (2003). Commentary on Liber and Olivier, Learning Technology Interoperability Standards, Chap 12 of: *Reusing Online Resources*, (Ed.) Littlejohn. *Journal of Interactive Media in Education*, 2003 (1) [www-jime.open.ac.uk/2003/1/].

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Learning Technology Interoperability Standards: Chapter 12

Oleg Liber and Bill Olivier
Commentary by Ed Walker

Summary Comments

Bill Olivier and Oleg Liber have done a service to the field of on-line learning by beginning this chapter with an succinct summary of the benefits of interoperable media and software for education and training, as well as a concise differentiation of specifications, reference models, and standards. At the time this chapter was written, most work on specifications and standards concentrated on data exchange. The data consisted of items of content, learner characteristics, or administrative information. To be sure, such data is exchanged in learning interactions. But while they are necessary, data specifications by themselves are by no means sufficient to characterize the technical requirements of the interactions.

The distinction the authors draw between de jure and de facto standards foreshadows their central critical observation; which in simple terms, is to speculate whether the notes and scales of standards are powerful enough to represent the music of learning. As they put it,

> *"In our opinion, the key question now facing eLearning standards development is how they can ensure support for the broadest range of pedagogic approaches."*

Indeed, work on a second generation of specifications that deals with the behavior, as well as the structure, of learning resources, had begun at the time the chapter was written. Olivier and Liber quote Professor Rob Koper's rationale for the now completed work on specifying learning activities in the IMS Learning Design specification.

> *"So far IMS has specifications to describe learning (Meta-data), package learning (Content Packaging), to support enrolments on courses and get results back (Enterprise), to test learning (Question and Test) and to support the exchange of information about learners (Learner Information), but there is nothing to describe and define the learning process itself. That is what EML brings to IMS Learning Design."*

Certainly much work remains to be done to refine and extend specifications for the means which underlie effective learning interactions. The notes and scales we have do not yet constitute a fully developed and enduring system for notating learning. However, primitive as they are, using them

have begun to reveal that use cases (examples) and profiles (applied standards) which differentiate pedagogies on the basis of their technical requirements -- as opposed to merely on the features of one pedagogical technique or another -- are difficult to find and understand.

Are the specifications inadequate because they instantiate out-moded or inadequate pedagogy or because more modern or more adequate pedagogical approaches have yet to be expressed in terms from which specifications can be developed? In fact, both the means for delivering learning interactions and the goals of those interactions are immature. The answer to the either-or question is, not surprisingly, "yes".

Maturing Means

The status of the specifications reviewed has changed since Olivier and Liber's summary of the state of the art was made. New specifications that were yet to be started at the time of their review have been added. Existing specifications have been revised in response to user feedback and technical innovation. Many of the specifications which Olivier and Liber mention have experienced widespread adoption and use.

One duly accredited international standard has been approved, the Learning Objects Metadata standard of the IEEE/LTSC. A content management standard based on the AICC CMI is about to emerge from the IEEE balloting process. Similar progress is being made in the ISO SC36 Working Groups.

Work also continues in IMS, CEN/ISSS, SIF, and other specification development organizations. In IMS, new work on the selection and ordering of instructional content has grown from the Learning Design and Simple Sequencing specifications and from the assessment oriented Question and Test specification. A specification defining Competencies, or educational objectives, has been released, and accessibility extensions to the learner information package and meta-data are under development. The Enterprise specification is being extended and is now complemented by a Digital Repositories Interoperability specification. The DRI specification is serving as the basis for a growing collaborative effort between the learning technologists and the digital library community to address the interactionbetween learning environments and distributed repositories.

The MIT Open Knowledge Initiative project has just released specifications for Application Programming Interfaces (APIs) that are aimed at providing interoperability between learning environments and implementations of system services. This

work is the result of a multi-institutional project funded by the Mellon Foundation, and its results already are being applied in developments at several universities worldwide.

CANCORE and SINGCORE specify meta-data for the education and training communities in Canada and Singapore, respectively. The Schools Interoperability Framework Consortium is in the process of profiling the IMS Question and Test specification for assessment applications in the K-12 or schools community, and the SIF Framework and Zone Integration Server are serving as the basis for data aggregation and exchange in several communities worldwide. In the UK, the Office of the e-Envoy is developing an e-Government Interoperability Framework which includes a suite of specifications for education and training.

The surest sign that adoption is progressing is rising demand for tests of compliance and for maintenance and evolution of the specifications and standards. Both kinds of demand have appeared and are being met. The ADL Co-Laboratory has developed and deployed test suites for SCORM. SIF has developed tests for the SIF Zone Integration Server. IMS has initiated an International Conformance Program in order to facilitate the development of application profiles, test suites, and a program of certification which can be adapted for use world-wide.

It seems clear that the specifications which have been developed so far are achieving the scale of adoption and momentum from use that is required to carry them beyond their origins in computer based training and their initial focus on data alone. Specification development shows signs of becoming a sustained and continuous process.

Maturing Goals?

Work to define the behaviours which constitute learning activity -- both in the microcosm and in the aggregate -- also has continued. The Learning Design specification stimulated by Koper's EML has been released, as has a Simple Sequencing specification arising from the instructional design requirements of the SCORM community. On-going work on the selection and ordering of assessment related content has progressed in the community using the IMS Question and Test Specification.

Is this progress good news or bad? Or does it merely heighten the concern that Olivier and Liber express that

> *"... eLearning standards will constrain Internet supported learning by freezing a sub-set of existing practices, or whether specifications can be provided that can support the development of new, enhanced, but yet to be developed approaches to learning which the Internet makes possible"?*

Whether they are enabled by the internet or not, supporting different pedagogical approaches will depend in the first place on understanding their technical requirements. Could it be that the key challenge or risk for the future of on-line learning is not the provenance of the specifications or their representational power, but the development of computationally relevant descriptions of pedagogical distinctions?

Summary

The Simple Sequencing , Question and Test, and Learning Design specifications have established a basic capability for characterizing learning interactions. Is that capability sufficient to support the theoretical constructs of scholars of learning? That question can now be examined empirically.

So the field has arrived at a crux. Both the means and the ends of learning technology are immature, but they do exist. Almost certainly the specifications are inadequate. But are they sufficiently mature to create a virtuous cycle of improvement between those with a practical orientation and those with a theoretical point of view?

Vreeland, T. (2003). Commentary on Conole, Evans and Sims, Use and Reuse of Digital Images in Teaching and Learning, Chap 13 of: *Reusing Online Resources*, (Ed.) Littlejohn. *Journal of Interactive Media in Education*, 2003 (1) [www-jime.open.ac.uk/2003/1/].

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Use and Reuse of Digital Images in Teaching and Learning: Chapter 13

by Grainne Canole, Jill Evans and Ellen Sims
Commentary by Tom Vreeland

Summary

Conole, Evans and Simms, the authors of Chapter 13, *Use and Reuse of Digital Images in Teaching and Learning*, have provided a coherent and well structured description of the issues involved in use of digital imagery in education. The authors have done a good job of describing the aspects of granularity and context and how they relate to utilization of images in education.

Main Review

The authors of Chapter 13, *Use and Reuse of Digital Images in Teaching and Learning*, begin with a very useful image mapping exercise, which describes a selection of image types. Then they group these examples into a table of image categories. I would add two additional image classes to the table, which are very important in building image libraries in support of learning. From the Image mapping exercise they are: the 3D Model and the virtual reality model. These two examples are important because they typify the computer image primitive markup, which generates an image (as in a 3D modeling system or a computer graphic metafile) and the rendered or generated virtual reality image. As the semantic web evolves, with its goals of machine and human readability and machine understanding of web documents using XML, these two synthetic image types will take on ever more importance.

Some of the biggest challenges in image reuse have to do with classification, cataloging, and discovery. In the chapter, two important JISC image capture and cataloging projects are mentioned. I would like to add mention of the ongoing work at Columbia University on WebSEEK, and VisualSEEK, Berkeley Blobworld, Stanford VISION, and Penn State's SIMPLIcity.

Of these projects, the Content Based Image Retrieval (CBIR) projects are interesting for educators because they seek to provide richer and deeper semantic classification schemes. Image classification is usually done in one of three ways:

Objective cataloging - indexes and retrieves images by primitive features such as color, texture, shape or the spatial location of image elements. It uses features, which are both objective, and

directly derivable from the images themselves, without the need to refer to any external knowledge base.

Logical cataloging - indexes and retrieves images by derived features, involving logical inference about the objects depicted in the image.

Abstract cataloging ? indexes and retrieves images by abstract qualities, involving high-level reasoning about the meaning and purpose of the objects or scenes depicted.

In addition to the hundreds of thousands of images cataloged in the research systems, both commercial and non-commercial search engines now provide search strategies and access to hundreds of thousands of additional images. Most of these search engines use objective keyword indexes as their main form of retrieval. The following specialized cataloging schemes for images are well known: The Getty Archive, the RPI Art and Architecture Thesaurus (AAT), the Vienna classification for trademark images [World Intellectual Property Organization, 1998], and the Library of Congress Photo Classification Scheme.

In the section on images and pedagogy describing the importance of images in education, references to Howard Gardner's Multiple Intelligences, recent cognitive and neuroscience research, findings in left-brain right-brain studies, gender differences in perception, learning styles and visual literacy could add an important dimension. From the I Ching to 20th century Semiotics, the role played by images in culture and education has been central. As part of art studies, visual literacy, visual grammars, and visual syntax are important subjects for future study.

A short review of image technologies and formats would be useful in understanding the implications of proprietary and open image formats for use and reuse of images. It is also important to point out that there are two new image formats, which have particular significance because they contain features, which are optimized for the Internet and put them in a class by themselves.

The Portable Network Graphics (PNG) format was designed to replace the GIF with a royalty-free format. PNG controls its own brightness using gamma correction. In a cross-platform environment GIFs and JPEGs don't always look the same on every platform. With PNG, you don't have to worry about that because it is self-correcting. Another important thing about PNG is that it uses alpha channels for improved anti-aliasing and control of transparent areas within an image. Like GIF, PNG uses lossless compression.

W3C Scalable Vector Graphics (SVG) is a new graphical presentation language based on XML. SVG is a language for describing two-dimensional graphics in XML. SVG drawings can be dynamic and interactive. By leveraging SVG together with other web technologies, powerful interfaces can be built that work consistently across all sorts of browsers and present high quality, scalable imagery.

Other visual coding and XML markup schemes like MathML will replace static images currently used in learning systems with dynamic markup and data driven imagery.

The authors have done a good job of describing the aspects of granularity and context and how they relate to utilization of images in education. There is one other distinction, which should be made when considering the use and reuse of digital images. Hypertext creates an extended dimension for linking to, from, and into text documents, which transcends their reusability as standalone documents. The SVG image format and other commonly used hyperlink image maps transcend the reusability of individual images. When regions of an image are clickable, the image forever transcends being objective, passive or neutral. Its structure is active and its parts have meaning.. Full implementation of W3C XLINK, XPATH, and XPOINTER capabilities promise to create altogether new ways of perceiving, understanding, manipulating and using images on the Web.

In the section on Intellectual Property (IP) rights and images it would be worth mentioning the emerging technologies available for watermarking and embedding rights information into existing image formats.

Vreeland, T. (2003). Commentary on Bull and Dalziel, Assessing Question Banks, Chap 14 of: *Reusing Online Resources*, (Ed.) Littlejohn. *Journal of Interactive Media in Education*, 2003 (1) [www-jime.open.ac.uk/2003/1/].

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Assessing Question Banks: Chapter 14

by Joanna Bull and James Dalziel
Commentary by Tom Vreeland

Summary

In Chapter 14, Joanna Bull and James Daziel provide a comprehensive treatment of the issues surrounding the use of Question Banks and Computer Assisted Assessment, and provide a number of excellent examples of implementations. In their review of the technologies employed in Computer Assisted Assessment the authors include Computer Adaptive Testing and data generation. The authors reveal significant issues involving the impact of Intellectual Property rights and computer assisted assessment and make important suggestions for strategies to overcome these obstacles.

Main Review

In Chapter 14, Joanna Bull and James Daziel provide a comprehensive treatment of the issues surrounding the use of Question Banks and Computer Assisted Assessment, and provide a number of excellent examples of implementations.

It is worth noting that, although computer based assessment systems have been in use for thirty or forty years, their growth and utilization has been limited by closed proprietary architectures and a lack of interoperability. One of the reasons that the IMS Question and Test Interoperability Specifications are so important, is because they provide an XML model for open interoperability. We are on the threshold of explosive utilization of assessment tools in primary and secondary education and the growing integration of assessment tools in educational environments portends the transformation of the current multi-billion dollar assessment market.

In their review of the technologies employed in Computer Assisted Assessment the authors include Computer Adaptive Testing and data generation. One of the most significant new technologies being implemented in assessment is the use of Bayesian models of text classification for scoring open response items and student essays. The developers of these naïve Bayesian systems, which use a multivariate Bernoulli model, or a multinomial model, claim performance that matches or improves upon the performance of human scorers. Some of the highest profile uses of Latent Semantic Analysis and this technology are Pearson in the US Military and schools, and the Educational Testing Service (ETS) and their e-rater testing tools. The technology is widely used in scoring essays in their Graduate Record Exam (GRE).

Although the chapter is titled "Assessing Question Banks", it would be helpful if the author's taxonomy were broader than just the traditional multiple-choice questions that are useful for assessment of learning expectations in the cognitive domain. It would be particularly helpful if the taxonomy included checklists, rubrics, portfolio assessments and other "authentic" assessments. The importance of these assessments is that they make it possible to evaluate higher order thinking skills in the cognitive domain, and other learning standards in the psychomotor and affective domains.

In reading the chapter it was not always clear to me what the authors were saying with regard to validity, item analysis, difficulty, etc. One distinction, which should be made before talking about assessment metrics is the distinction between criterion referenced test items and norm-referenced test items, their differences and uses. Greater clarity on the item analysis issues could be achieved by describing the distinctive measures and item analysis methodologies used in criterion-referenced, and separately, those used in norm referenced testing.

Other elements I think deserve mention are parametized testing and pattern based assessments. These assessments rely upon an assessment algorithm or pattern for evaluation of a particular skill or knowledge. The pattern makes it possible to generate hundreds or thousands of unique items with little effort. This is one of the most important computer-based question types, is widely used in primary and secondary schools and in higher education, but is not supported by the IMS QTI specification.

In addition to the author's formative and summative categories of assessments it is useful to have a third category for pre-tests and the new genre of online assessments being used by teachers and professors just before or during a class period as part of the methodology called Just-in-time teaching.

As more and more summative high stakes testing occurs in primary and secondary schools, higher education, and business education the issues of subgroup bias and demonstrating validity across populations become more visible. The American Association for the Advancement of Science, Achieve.org, and the CEO Forum have all reported fundamental and significant problems with statewide school assessment systems in the United States. One of the most significant challenges they identified in assessments and in computer assisted assessments is the problem of alignment and correlation of assessment items with the learning standards they purport to measure.

The IMS Question and Test Interoperability (QTI) specifications provide the details necessary to openly exchange of items and assessments, to build item banks, and to

manage and administer items. The QTI Information model describes items, sections, and assessments as the Information Objects in assessment systems. Sections may contain items or a group of items that share a common element, as in the case of a reading passage and the set of items that test comprehension of the passage. Assessments may contain items or sections. These structural concepts of assessments are important to consider in planning potential reuse of test items.

The principal value of computer adaptive tests is their ability to "walk" the network of knowledge, skills and abilities being measured including: prerequisites, and both sequential and parallel paths. Well designed computer adaptive tests can reveal gaps in student understanding, skills, and abilities so that targeted remediation is possible. In some cases the actual number of items on which a student is tested can be greater than in a conventional test, and the diagnostic information on students is significantly greater.

Another important technical issue related to the quality and design of multiple-choice assessments is the way in which distractors (answer choices other than the correct answer(s).) are used to help identify patterns of student misconceptions.

The authors reveal important issues involving the impact of Intellectual Property rights and computer assisted assessment and make important suggestions for strategies to overcome these obstacles.

Sharma, R. (2003). Commentary on Wetterling and Collis, Sharing and Re-Use of Learning Resources Across a Trans-National Network, Chap 15 of: *Reusing Online Resources*, (Ed.) Littlejohn. *Journal of Interactive Media in Education,* 2003 (1) [www-jime.open.ac.uk/2003/1/].

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Sharing and Re-Use of Learning Resources Across a Trans-National Network: Chapter 15

by Wetterling and Collis
Commentary by Ramesh C Sharma

Summary

The main concern of this chapter is to discuss the sharing and re-use of various types of learning resources. The authors describe the CANDLE project where an academic community from 12 universities and colleges from seven countries collaborated in order to identify various issues on re-use of learning resources. Another focus of this chapter is to examine the pedagogical methodology, re-engineering the course material and different technological support tools engaged in the process.

Learning Object (LO) Technology

Advances in internet and web technologies have given a new shape to the e-learning mechanisms. Of late, learning objects have been the center of attention of academics all over the world and designated as 'atomic' units of knowledge (Li-ping and Rui-min, 2003). The learning objects are also called 'Knowledge Objects' (Li and Close, 2000) and 'Sharable Content Objects' [www.adlnet.org]. In educational settings learning objects can be of different kinds, e.g., from being files having static description of content (like HTML, PDF or Powerpoint presentation format) or in sophisticated interactive format (like HTML pages loaded with JavaScript or Java applet etc). Audio files, video clips or Flash animations also constitute learning objects. The chief idea behind the development of LO technology was its feature of re-usability. A LO comprises a chunk of content material, which can be re-used or shared in different learning situations. Such use or re-use of content from one system to another, makes LO standardized so that these can be adopted across different computer platforms and learning systems without modification. The IEEE 1484.12.1-2002 Draft Standard for Learning Object Metadata (LOM) which was approved in July 2002, is the first accredited standard for learning object technology (ltsc.ieee.org).

Downes (2001) reported significant cost implications for re-use of learning objects and cited a study (Bates, 2000) where the cost for developing an on-line course and the time were significantly reduced by assembling the course out of pre-existing components or learning objects. The authors of this chapter have laid greater stress on the need for interoperability and re-use of course materials, as it not only leads to greater efficiency, but also an improvement in the

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uality of learning. To examine the issues on implementing an exchange of learning resources, the CANDLE project was conceived in 1999 by the EUNICE network. There was a felt need to have an information brokerage system to support exchange of course materials across an international network of institutions selected from Germany, the Netherlands, France, England, Norway, Spain and Italy. They also wanted to develop a set of re-usable resources and to evaluate the re-usability of such resources within those countries. One more objective of the CANDLE project was to come out with a methodology by which the instructors could improve the re-usability of their own learning resources.

The authors have highlighted main issues pertaining to pedagogy, collaboration and re-engineering associated with CANDLE project. Through pedagogical issues, an understanding was made on how the sharing and re-use of learning content was integrated into the teaching and learning process. Factors related to collaboration were concerned on how course writers, learners and instructors joined together in material exchange; while how this material was re-structured and re-styled for improving quality and re-usability was analysed under re-engineering.

Activity theory was the base for the pedagogical model of the CANDLE project, adopted to benchmark relationships between learning materials, agents who will use those materials and the activities to be undertaken through that material. Effective collaboration was achieved by defining common parameters by EUNICE network like a common organizational structure, common tools developed through CANDLE and common goals (e.g. improving the quality of learning materials and enhanced level of exchange of materials by instructors and learners).

Re-engineering depicted restructuring the course material into learning objects of different granularity and then integrating them with other learning resources, student activities and merging it in the overall course structure. The course content was disintegrated into smaller components like modules. A module comprised of c-atoms and particles (further fragments of course material), was the lowest level of granularity.

The authors have reported some difficulties faced by them during CANDLE project. One was related to granularisation and pertained to selecting an appropriate standard for resource metadata. They preferred to adopt version 6.1 of LOM with some adoption (reason being following Activity Theory Model for pedagogy), out of Instructional Management System or Learning Object Metadata (LOM) by IEEE. Another difficulty experienced by them was in the selection of metadata fields for Activity Theory Model. This was due to the reason that such fields were not compre-

hensively covered in original LOM for this theory. Here they opted for closed fields, being easy to tag. To overcome the difficulty in supporting the users in tagging learning resources with metadata, a 'tagging tool' was integrated into the course authoring toolset.

To accomplish the goals of CANDLE project, an open and distributed architecture was followed to support collaborative courseware lifecycle management, information brokering and content delivery. Adequate attention was paid to develop Course Authoring Tools so that they can assist in creation of a course structure, adding or updating extra learning objects, tagging such learning objects with metadata and uploading or storing courses/resources in the information broker system.

Evaluation of CANDLE project

The authors plan to assess the effectiveness of this project by analyzing the experiences gained by instructors and learners in re-using learning resources. Such an assessment shall be focused, based on the features of re-usability of course materials (and to see that how it improves the effectiveness and efficiency of learning materials), accessibility to these re-usable resources, collaboration between different agents involved in implementing the project, cost-effectiveness as a result of increased re-usability and collaboration, and to see improvement in the quality of teaching supported by ICT. Three evaluation trials have been planned. One trail has been scheduled at the University College London and Suffolk College, of United Kingdom. The former is engaged in developing and delivering a course targeted for the corporate sector, while the latter has medium sized enterprises as its target clients. The next trial has been planned for the University of Karlsruhe to evaluate courses with their own students, while the third trial on similar lines will be undertaken at the Norwegian University of Technology, University of Twente and Universidad Polytechnica de Catalunya, Spain. These three trials shall be completed in two stages. First, the existing courses and course components will be granularised (through CREEM methodology) and then in the second stage, the resources developed shall be shared and re-used.

The authors point out some hindrances in resource sharing due to diversity of courses across institutions. These courses have a broad spectrum of topics, different subject vocabularies, instructional strategies, credit systems and expertise level of instructors and students. The authors hope to overcome such hindrances through the use of relevant metadata fields. Cultural issues also seem to affect the successful implementation of the project instead of technological design or development. Non-

sharing of their course material by instructors to others, and the resistance in using the materials developed by other instructors were observed. A greater degree of flexibility in sharing and re-use strategy is considered to overcome this resistance.

Discussion

There are a number of issues to raise for further discussion:

- There are various stakeholders in the CANDLE Project: further details on the analysis of the needs of such stakeholders (as done by employing Scenariobased Needs Assessment Method, SUNA) could be provided to clarify the context for the CANDLE project. In the light of knowing how the project has developed, how effective do the authors feel SUNA was in highlighting what turned out to be the most important requirements? For instance, would they recommend it to others embarking on similar projects?

- This project also draws on re-engineering course materials through several layers of granularisation (by the Courseware REEngineering Methodology: CREEM). I was interested in knowing more details on CREEM. Given their experience, can the authors characterise the circumstances where this methodology can be adopted -- or point to existing sources?

- The authors highlight the importance of flexibility and active student engagement in the pedagogical model for this project. What are the authors' reflections on how well the individual differences of the learners were met by the elements in this project based on Activity Theory?

- There are tools which allow standardized metadata searches for learning resources, where the instructor can indicate which types of learning resources will be suitable for a course or instructional situation. The Open Knowledge Initiative (OKI) project [www.oki.mit.edu] designed and developed by Massachusetts Institute of Technology provides an architectural model to facilitate sharing of learning content between educational institutions. As the authors discuss how such learning resources can be created and packaged so that they maybe re-used in a reliable mode, it is important to identify how the metadata can help *learners* to facilitate the reuse of learning materials on the Web. What are the mechanisms to allow learners to identify standardized information on various modules or atoms or particles? How will the employment of metadata extend help to course authors, instructors and

students in managing and exchanging relevant information? There is a need for further research into seeking how the adaptability of metadata fields will resolve the problems arising in resource sharing for a variety of courses, instructional strategies and student and instructor's expertise.

Conclusions

Overall the CANDLE project is an important milestone towards sharing and re-using of learning resources. The project has a large magnitude, covering many educational institutions across several nations of Europe. It should help in establishing a trans-national learning object economy by providing a set of exemplar courses and resources, designing and developing an information broker system and devising a methodology on sharing and re-using of learning materials. I personally feel the project is very important for developing counties where e-learning is gaining importance and many private and governmental ventures have taken off. Online learning in the South Asian region is gaining momentum and new LMS software is being developed and adopted to make e-learning more effective. The traditional, and open and distance universities in this part of world, are making initiatives towards resource sharing. The setting up of www.cmcvarsity.com by CMC, www.netvarsity.com by NIIT, zeelearn.com by Zee Learning, zeeeducation.com/online by Zee TV's online training, learnatsatyam.com, virtual campus initiative of ignou.ac.in, tamil virtual university, and www.gurukulonline.co.in by Gururkulonline Learning Solutions etc are some of the prominent examples indicating the preparedness by the Indian universities and IT industries to meet the growing demand, and in that context we look forward to hear more on the successful outcome of this project.

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Strategic Perspectives: Introduction to Part 4

Gilly Salmon

The visions on every page in this book tap into our espoused missions to work more successfully together, within and across every sector of education, in the service of learning. I'm excited and challenged by the notion of a new economy in educational provision, as the vehicle for successful collaboration and with learning objects as the currency (step aside the Euro!)

Well, at first glance it seems that understanding and implementing the new technologies are our major challenges, but if you've read so far in this book, you'll know they're merely the tip of a huge great iceberg! Instead we see that digitalized learning resources *could be* a way for harnessing technology in the service of our educational objectives. But if technology is to become our servant, who or what is our master? I'll hold on the answer to that for a moment and invite you to a take a reflective look at this final part of the book. By the way, leave aside the thorny issues of standards for the technology for the moment and enjoy the feel of real paper in your hands.

In the Open University Business School, I have responsibility for chairing a large modular, distance and online Professional Certificate in Management. The Certificate in Management was one of the first in the Open University to move towards short online courses. From this experience I know that granularity, flexibility and choice for learners come at a high price for the institution. The students get on really well with the process, but the staff, while committed to the programme's success, are bending under its demands. Allison Littlejohn's chapter, 'An incremental approach to staff development in the reuse of learning resources' in this part, details many of the issues we face. She also offers a focus for staff development efforts, underpinned by building confidence and motivation.

So, how can we reduce costs, increase student numbers, work harder and smarter and yet provide learners with highly customized and personalized learning, without becoming another e-casualty? If those are the questions, reusability, in all its glory, looks like an answer to me. We would be crazy to turn aside from the opportunity. As my daughter would say, 'It's just so what we want!' Why, oh why, can we not 'just do it'? Perhaps because everyone who works in today's demanding educational environments knows that our organizations function and change through the millions of thoughts and actions of individual people. It's reach-out not RAM that's the issue!

From my research, I know there a number of key issues that distinguish changing teaching and learning practice. Many of these are special to educational provision and occurred

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even before we began to see the importance of our championship of knowledge economies. First, we are professionals and have strong tendencies towards independence and autonomy. We're used to taking responsibility for ourselves and view imposed 'solutions' with much suspicion. However Rachel Harris and Carol Higgison's e-workshop chapter, 'Reuse of resources within communities of practice' provides a wonderful example of how staff can be engaged in exploring new ways of working in the comfort of liked-minded others. Their approach leads to gradual apprenticeship into workable ways of thinking and doing for new entrants as well as the critically important activity of sharing and development for those of us who've been on the scene a little longer. In particular they demonstrate the importance of common frameworks to provide the building blocks of necessary changes in practice.

Second, we are fully immersed in our own disciplines. Through perhaps many years of studying and teaching, the traditions of the 'way we do things' are embedded deep into our practice. Disciplines strongly influence our professional identities and what information and knowledge we consider important, even what's acceptable. We give up our content and method-led approaches most reluctantly since they feel like a blow to the centre of our hearts! You might like to read the comparative chapter by Littlejohn, Jung and Broumley with these ideas in mind. They conclude that 'guidance and support' is the way forward.

How do we progress and use digital opportunities happily and successfully? There simply is not just one way. Carmel McNaught's chapter, 'Identifying the complexity of factors in the sharing and reuse of resources' offers us a series of models. No, not of instructional design, but of organizational change. We're invited to explore polarity theory, scholarship principles, integrated, parallel and distributed approaches to the use of IT and the ever-present see-saw between teaching and research pressures. She again mentions the importance of disciplines in teaching.

So who's in charge of this train to the future? Your view of the speed of the train may be that it is an express or a slow, regional stopping train, depending on your tolerance and position on the innovative-to-reluctant users scale. This part of the book suggests that new forms of communities of practice in teaching provide us with the engine of the train.

Oliver, M. (2003). Rethinking the Reuse of Electronic Resources: Contexts, Power and Information Literacy. Joint commentary on McNaught, Identifying the Complexity of Factors in the Sharing and Reuse of Resources (Chap 16) and Littlejohn, An Incremental Approach to Staff Development in the Reuse of Learning Resources (Chap 18) of: *Reusing Online Resources*, (Ed.) Littlejohn.
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Identifying the Complexity of Factors in the Sharing and Reuse of Resources: Chapter 16

by Carmel McNaught
Commentary by Martin Oliver

Rethinking the Reuse of Electronic Resources: Contexts, Power and Information Literacy

Summary

This paper is a response to Chapter 16 by McNaught (2003) and Chapter 18 by Littlejohn (2003a), from 'Reusing Online Resources: a sustainable approach to e-learning' (Littlejohn, 2003b). These two chapters are briefly summarised, and the points that each makes are examined and challenged. Following on from this, the proposals within these two chapters are re-framed in terms of issues of information literacy and the exercise of power. This analysis suggests that, whilst these chapters may make an important contribution to understanding the process of reuse, they neglect issues relating to scholarship, wisdom and personal development; they also hide the ways in which reuse may serve to strengthen the position of learning technologists whilst marginalising academics.

Introduction

This paper is intended to raise issues and questions in relation to two chapters from the book, *Reusing Online Resources: a sustainable approach to e-learning* (Littlejohn, 2003b). These chapters examine the complex contextual factors that influence reuse and the ways in which staff development can be used to encourage such practices (McNaught, 2003; Littlejohn, 2003a). Rather than discuss issues in the order they arise in the texts, the discussion within this paper has been structured around the following two themes:

- Reframing reuse as information literacy, and
- Questioning the play of power around reuse.

First, however, the two chapters will be briefly summarised. Rather than simply précis either chapter, these summaries will draw out a select number of points for consideration and challenge. Since such a process may appear to distort the authors' arguments, it is important to emphasise at the outset that the purpose of this paper is not to dismiss or devalue this work.

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However, it is necessary to challenge the position of the authors as *authorities*, so as to show that their chapters are examples of *petits récits* (Lyotard, 1979) — local, personal understandings, rather than definitive accounts. By doing so, it is then possible to offer up other little stories that can stand alongside these offerings, valourising them by using them to generate new perspectives, new insights (*ibid*).

A summary of the chapters being discussed

Identifying the complexity of factors in the sharing and reuse of resources

McNaught's central argument (2003) is that the changes facing reusability in education are largely educational and cultural. She argues, moreover, that the increased calls for the sharing and reuse of learning resources, if not handled in a collegial way, may prevent teachers from engaging in this process. However, in spite of recognising the complexity of the change process, McNaught begins by assuming the goodness of reuse, explaining that her "chapter is concerned with how to reduce the barriers and improve the drivers". Within the chapter, there is no attempt to explore why these forces are acting on academics. This position serves to frame the academic — the resistor — as recalcitrant, as wrong. Whilst recognising that "there are still many academics and teachers who have not yet comfortably adopted technology in their teaching" she goes on to speak of "the adoption issue", which serves to present this situation as a problem to be solved.

In order to develop an understanding of the process of adoption, McNaught reports on a survey of technology adoption. Within this, the majority of people identified as early adopters of technology appeared to be isolated; these individuals asserted that the majority of staff in their institution would only use technology when it became mainstream. On the surface, this appears to tell an important story about managing change, and McNaught concludes that "it is imperative that academic teachers come to see the potential benefits that reuse offers" as a way of changing this situation. However, although such inferences may at first appear to be warranted by this study, it is important to consider three points which call these conclusions into question. Firstly, academic life involves a constant struggle to build a professional identity (Taylor, 1999); it is only to be expected that those who wish to distinguish themselves from their colleagues will portray their own practice as innovative and their colleagues as less creative. Such identity creation through questionnaire response is a well recognised problem in social psychology (Potter & Wetherell, 1987). Secondly, Rogers' model of adoption is largely uninformative in this case. It is tautological that the majority of individuals in a population will only use

technology once it is in the mainstream. It is also a necessary fact of a model that describes a population chronologically that the first quartile of users will adopt the technology earlier than their colleagues. Unfortunately, information about the pace of adoption, the spread of adoption through the population (which is unlikely to be uniform) and so on is disregarded in this model. Thirdly, within the context of the model used for this survey, there is no attempt to explore what is meant by 'technology' (cf. Kuutti, 1996). This lack of analysis renders invisible the familiar technologies (language, chalk and blackboard, overhead projectors) that have become commonplace. The effect of this is to distort the picture by ignoring that we are *all* technology users — what is important (but unexamined in this study) are the ways in which we use technology and the ends to which it is put.

Fortunately, McNaught does not rely on Rogers' model for the heart of her argument, instead discussing polarity theory as a way of analysing this situation. This theory proposes that situations can be described in terms of dilemmas — problems to which there can be no solution, only a constant state of tension. It also advocates that these poles should be considered together, holistically. This approach seems ideally suited to the analysis of such a rich, complex situation. From this perspective, McNaught asserts that there are several dilemmas that should be considered, and discusses each in turn:

- Scholarship *versus* cost effectiveness;
- Integrated support *versus* piecemeal support;
- Maintaining a comfort zone *versus* pushing the boundaries;
- Rewarding teaching innovation *versus* efforts on research outputs;
- Collaboration *versus* individualism;
- Rewarding first attempts *versus* standards of best practice; and
- Iterative educational design *versus* traditional models.

Before discussing any of these, it is important to recognise that there are no claims about the exhaustiveness or power of this model. McNaught acknowledges that these are, simply, "the set of dimensions I chose". This model is not necessarily any less powerful for being a personal account, but it must be recognised that, within the context of this paper, the choice of dilemmas rests on personal experience rather than any explicit theory or body of literature.

The first of these dilemmas is used to generate a series of questions, inviting reflection and engagement. This approach does not continue, however. Whilst it is asserted that polarity theory is about states of tension, several of the discussions slip

into solutions. For example, discussing integrated versus piecemeal support, McNaught sidesteps the dilemma by asserting that "clearly articulated functions and effective coordination between units is the answer" — in other words, integrated support is needed (although this is not necessarily the same as centralised support). Similarly, in discussing the complexity of learning, McNaught sidesteps the 'instructivist/constructivist' divide by asserting that what is important is "deciding whether the learning needs are short-term and explicit, or whether a more holistic focus has been taken." Rather than align with either of these two positions (which are primarily about the status of knowledge, rather than about the pragmatics of learning) it is asserted that models of reuse and customisation are value neutral. This ignores the fact that academics must develop an understanding of what reuse means ? and that McNaught's own model must take a position over whether we can instruct academics about what reuse is or whether we must help them construct their own meanings. The existence of answers in this section (some of which are value judgements, others of which sideline the dilemma) calls into question whether these are, indeed, the right poles to include in this model.

McNaught concludes by arguing — wisely — that "it is not useful to allow sectors of the organisation to work without reference to each other", and goes on to describe how these different sectors might be aligned. However, such a conclusion does not need this elaborate model to justify it; indeed, the power of the model is largely left unexplored, without even a 'before and after' pair of illustrations to demonstrate its application. Whether flawed or not, further use of this model would clearly be of value, and it was disappointing that its potential as a way of analysing specific cases was not developed within the chapter.

An incremental approach to staff development in the use of learning resources

Littlejohn (2003) opens her chapter with an exciting and empowering assertion: "the key to effective reuse of resources lies not in the technology, but in the creativity and imagination of teachers". Wisely, she frames her discussion in relation to the established history of reuse involving things like paper-based resources. However, in spite of this holistic start, her view of teaching appears fragmented. One of the benefits of reuse, it is argued, might be that "tutors could spend more time devising teaching strategies and interacting with students, rather than focusing on content generation". This might seem alien to academics, for whom devising teaching strategies, interacting with students and generating content are all part of a seamless whole (Oliver, 2002). In a study of academics' descriptions of their practice (*ibid*), a

strong message was that creation of courses involves a complex interplay between one's personal sense of the discipline, departmental politics, perceived student interest, existing curriculum structures, the need to differentiate this course from that offered by other institutions and the various texts, papers and resources that could be called upon. Moreover, the curriculum itself was described in a rich, multi-layered way: the syllabus and 'content' (materials) were visible parts of it, but attitudes and beliefs, departmental 'style' (the 'hidden' curriculum) and ongoing interactions with students (the 'lived' curriculum) all formed essential parts of this whole. Disaggregating this into components, each treated separately, oversimplifies this emotive art into a rational production process — convenient for automation, but hardly the same.

Questioning the simple process of curriculum development described in Littlejohn's study is important, because it allows us to reframe the problem being examined. As presented, the fundamental issue is one of acquiring and using content. In marked contrast, the curriculum design study described above shows that acquiring and using content are relatively minor components of much more significant projects. Searching, acquiring, interpreting, shaping and sharing are all parts of an holistic process of personal development for the academic involved; they are also a way of ordering, shaping and developing the discipline (cf. Wenger, 1998, who discusses the way in which personal trajectories through a community of practice shape the development of that individual's professional identity whilst also influencing the practices of the community in a process that requires mutual negotiation). This suggests that Littlejohn's model of development is limited as a result of its view of curriculum design as a technical process. The alternative is to view it as an act of scholarship (Boyer, 1990).

The case for specialised training is made, in part, in relation to an "inconsistency in approach" of academics. It is argued that tutors feel comfortable searching libraries and so forth for materials for traditional courses, but tend to develop (rather than reuse) materials for online courses represents. There is an alternative explanation to inconsistency. Introducing new tools into an established activity causes problems, which may lead to patterns of work changing and with them, each individuals' sense of professional identity (Kuutti, 1996; Wenger, 1998). In the study in question, for example, academics were given criteria for evaluating resources; these were not derived by them from personal experience. In other words, reifications of other peoples' practice was imposed upon this community, who then had to learn to adapt their own practices to accommodate this new approach (cf. Wenger, 1998). Moreover, this vocabulary is fixed, which stands in marked contrast to the ongoing

tinkering, development and updating inherent in academics' curriculum work as the discipline (and their understanding of it) changes (Oliver, 2002). It is hardly surprising, given the unfamiliarity of this approach, that academics were unsettled and unsure, and appeared to need 'developing'. This situation might have been avoided, however, if the process of reuse had been approached in a different way.

The final point to be raised in relation to this chapter concerns the scope of reuse. Littlejohn proposes that it will be possible "to encourage the sharing and reuse of resources within and across disciplines". However, there is considerable evidence to suggest that cross-disciplinary sharing may be impractical (e.g. Becher, 1989; Oliver and Conole, 2002). The meanings of terms arise within communities of practice (Wenger, 1998); they do not necessarily generalise across them. What this means is that the terminology used to classify and describe resources (as well as all the concepts described within them) will be differently interpreted by each new community that encounters them (*ibid*) ? and communities are likely to consist of groupings whose boundaries are shaped by both institutions and disciplines. In other words, interpretations are likely to be specific to the level of a department, or smaller.

There are several ways in which this situation could be tackled, and Littlejohn proposes one: the use of information professionals such as librarians who have expertise in the re-interpretation and explanations of such classifications from one community to another. At least two other alternatives exist, however: to create such descriptions for specific communities (e.g. Friesen, 2002) or else to allow multiple descriptions to be attached to any single resource, so that several communities can re-describe in their own terms (Nilsson, *et al.*, 2002). Whichever approach is adopted, however, the issue of scope cannot be solved: resources must be understood in relation to specific contexts, rather than global definitions.

Discussion

Reframing reuse as information literacy

Bruce's study of information literacy (1997) starts by rejecting behaviouristic definitions, focusing exclusively on what people do, in favour of an alternative 'relational' model, in which the focus is on people and their relationship to situations. Her phenomenographic study identified seven conceptions of information literacy (p. 110):

- The information technology conception — information literacy is seen as using information technology for information retrieval and communication.

- The information sources conception ? information literacy is seen as finding information.
- The information process conception ? information literacy is seen as executing a process.
- The information control conception ? information literacy is seen as controlling information.
- The knowledge construction conception ? information literacy is seen as building up a personal knowledge base in a new area of interest.
- The knowledge extension conception ? information literacy is seen as working with knowledge and personal perspectives adopted in such a way that novel insights are gained.
- The wisdom conception ? information literacy is seen as using information wisely for the benefit of others.

Within this mapping of conceptions, an order was discerned. The first conceptions have information technology as their focus, with information use as a peripheral component; the latter have information use as their focus, with information technology as a peripheral component. This mapping is useful in highlighting some of the preconceptions within these chapters and in arguing that, in spite of their emphasis on context, they do not go far enough to explain how reuse can be enabled.

McNaught, for example, recognises the complexity of standards documents and the process of metadata coding. Coding tools, she argues, may solve this problem. Similarly, Littlejohn proposes a centralised repository for resources as a solution to the lack of high quality electronic resources for staff development. She goes on to describe how resources can be aggregated to form lessons ? a description that almost suggests materials development has replaced pedagogy. These, however, are technology-focused responses; they neglect the way in which these problems are experienced by academics (a point emphasised throughout Bruce's phenomenographic study). What do the various terms mean to the academics who code resources, or to those who attempt to retrieve them? And to what ends are they to be put?

These questions are not simply abstract or philosophical; they also have significant implications at a practical level. For example, a study in which the software tool *media adviser* was used by academics to describe their teaching practices showed that even commonplace terms like 'lecture' had complex, variable meanings (Oliver & Conole, 2002). There was no single, 'correct' interpretation of the term; instead, its used varied depending on the disciplinary context, the year of students taught,

the number of students present, the relationship of this session to others in the programme and so on. Not only did the meaning of the term vary from person to person, even within the same course team, it also changed for each person depending on the context in which it was used. Thus it proved impossible to provide a precise definition for the term; its meaning was determined in relation to other terms (such as 'tutorial', 'seminar', etc.) and a taken-for-granted context, as well as covering an ambiguous variety of actual practices. If the meaning of such familiar terms is inherently ambiguous, it is unlikely that new terms (such as 'virtual seminar') will mean the same in different contexts.

Another implication of this new perspective is to re-cast the developmental process academics may need to engage with in order to reuse materials. Littlejohn proposes a three-stage model, beginning at a basic level (discovering, searching and evaluating), moving to intermediate (supporting resource authoring) and moving to an advanced level (integration and contextualisation of resources). Such a model is rational and functional, but sits uneasily alongside the study of curriculum development practice (Oliver, 2002) which suggests that academics are already well versed in integration and contextualisation and are happy to author materials (within the various media with which they are familiar). Where they have no prior experience is in the browsing of specialist repositories such as the one proposed. In other words, the study of curriculum practice suggests that the 'levels' of development may need to be reversed ? what is 'basic' to them may be integrating resources to form curricula, whilst where they are least likely to be confident is in this new form of information searching.

There are, thus, two possible directions in which development might be required ? and the reason for this is that each study has adopted a different perspective when viewing this situation. Littlejohn's model can be related to the first four kinds of information literacy described by Bruce (using information technology through to information control). The study of curriculum practice starts from purposes, neglecting details of method, and thus relates to the latter three kinds of information literacy (building up a personal knowledge base, developing new knowledge and using knowledge wisely). Each neglects the alternative perspectives, which may make it appear that the academics described need further development in those areas. Whether these academics need to learn curriculum skills or technical skills is impossible to determine from either study, because of the presuppositions (the focus) of each. Instead, what is needed is new research that draws upon the whole range of described perspectives (or reconciling the existing research). This would allow a more considered, responsive analysis of the situation ? one that is more likely to identify where academics' experiences actually lead to problems.

Thus solutions focused primarily on the technical questions surrounding re-use are unlikely to radically transform the current situation. For progress to be made, a more holistic approach must be adopted, in which personal understandings and development are valued alongside

technical 'solutions' which may otherwise simply replace old problems with new ones.

Questioning the play of power around reuse

It has been observed that many educational initiatives in recent decades have served to disempower academics, ostensibly in order to empower students but often in ways which are suspiciously favourable towards governmental concerns and industrial agendas (Holley & Oliver, 2000). Such changes have sparked serious fears amongst academics who feel alienated by this 'automation' of teaching (Noble, 1998). Given these fears, it is important to question the way in which power is shifting around the process of reuse.

McNaught, considering the tension between maintaining a comfort zone and pushing boundaries, suggests that "the culture of the organisation needs to be able to embrace change while offering staff opportunities to manage their own levels of comfort with the change". It is interesting to examine this assertion in relation to Barnett's discussion of different types of criticality (1997). Here, he differentiates between being allowed to find the optimal path within a situation and the right to question why the situation has arisen in the first place. The former, he argues, is representative of the kinds of critical thinking valued by industry; the latter he links to the critical role universities traditionally take. Clearly, in McNaught's solution to this dilemma, academics are positioned within the former, more restricted, kind of criticality. There is no indication at any point that staff might be allowed to challenge, resist or abstain from the change. The voice of academics is clearly subsumed here by the centralised imperatives of 'the organisation'.

Littlejohn positions not only academics but also advocates of reuse in the same position. Like McNaught, Littlejohn accepts certain external imperatives that then shape her response to the 'issue' of reuse. She argues that "there are several compelling reasons [why teachers should share their resources], many of which lie within the economics of education". She goes on to discuss how "to achieve this within current economic restrictions". Before the discussion has begun, the opportunity to challenge these presuppositions has been closed down. What if one were to reject the idea that education should be governed by economics? This notion is hardly heretical; indeed, the current economic imperatives for reuse only seems to have come to the fore in UK government policy in an appendix to the Dearing report ? a policy which advocated the re-framing of Higher Education as a service contributing to global economic competitiveness (NCIHE, 1997). There is an alternative: to view universities as a social good. This perspective has been pitted against economic arguments, with each in turn gaining the upper hand and then losing it again, for well over a century (Taylor, 1999). However, no matter what academics ? or advocates of reuse, for that matter ? think that Higher Education should be for, the argument within these chapters has been drawn out of the realm of values or ideals and into the world

of fiscal and human resources. Those who question whether allocated resource should drive change, arguing instead that such resources might be granted to worthy projects as needed, are immediately rendered heretics.

Another critical perspective on this process of change can be drawn from the work of Freire (1970). Freire describes a situation wherein individuals who are oppressed, seeking to escape from their situation, seek to emulate their oppressors. They act as the oppressors do, appropriating their ideas and practices; they thus come to identify with the oppressors, rather than with the oppressed (cf. Wenger, 1998, and his discussion of the way in which individuals identify with communities whose practice they choose to adopt, rather than solely in terms of the community they originate from). McNaught describes a situation that is apparently benign, but which, when viewed from this perspective, could be reinterpreted as an exercise of oppressive power. A learning technology mentor programme was set up in which academics learnt the skills involved in designing and implementing online courses and then promoted and supported similar activities within their own departments. The purpose of this "was to achieve widespread adoption of online learning as part of effective a change in the culture of academic work". Unless such a change arose as the spontaneous desire of the academics involved, it seems likely that participation in this process must have arisen as a response to external pressures. Thus, rather than experiencing self-determined development, these individuals were inducted into the practices and values of communities that stand to benefit from these changes (as will be argued below). They were then sent back to spread the word amongst their fellow oppressed. Such use of power can clearly be effective; its elegance has to be admired; to be sure that it was not oppressive, however, it is imperative that the principles that led to its operation be questioned.

Littlejohn describes a similar incident. She recounts that "there was a tendency amongst tutors to seek out large resources which fulfilled a number of objectives [?] however, it was found that by engaging tutors in discussions about the advantages and disadvantages in using resources of different granularities, they were better at making decisions about which materials were most appropriate for reuse." There is a clear presupposition here that the technology specialists know something that the academics do not. There is no recognition that the reverse might equally be true. The criteria for 'better' decisions are determined by the specialists, and academics are taught to conform, in spite of evidence to suggest that these new practices are in marked contrast to tried and tested approaches ? such as the selection of a textbook as a way of shaping a course (Oliver, 2002). Such one-way development (as opposed to mutual development) echoes the exhortations of Merrill (2001), who argues that:

> *Too often instructional designers leave these important what-to-teach decisions to so-called subject-matter-experts (SMEs). Often a SME knows how to perform the task that is the goal of instruction but is unaware of the knowledge components that are required to acquire this knowledge and skill. A primary role of the instructional designer is to determine these granular knowledge components and their sequence*

This process of devaluing the expertise of academics is a worrying trend. It echoes the ways Lisewski & Joyce (2003) describe learning technologists as seeking to establish their own power by serving the dominant ideology of managerialism, rather than by developing their own specialist expertise, worthy of respect in its own right. Taking educational processes out of the hands of academics and placing them under the purview of management serves to weaken academics' sense of professional identity by carving off areas of responsibility. It also allows learning technologists to grow in importance whilst academics are marginalised. Such a trend seems inherent in the model of staff development proposed by Littlejohn. In this, the arrival of a new technology unsettles existing staff practices; deficient skills are identified and named; training is then created and applied to staff who are framed as lacking in relation to these new practices. Positioning this process as something new and unfamiliar, rather than just another part of their existing practice, serves to split e-learning off from 'normal' academic work (Oliver & Dempster, 2003) ? this simply reinforces the 'mystery' of e-learning, allowing a 'priesthood' to arise who have a powerful gatekeeper role, which involves them revealing these secrets to the uninitiated.

Such tendencies are recognised within the literature on knowledge management. Wenger (1998) outlines how 'economies of meaning' can arise, in which dominant communities coerce others into adopting their understanding of a situation. The local understandings of other communities are marginalised, sidelined; the sanctioned 'truth' is the understanding held by those in power. Farrell (2001) explores how this process operates, focusing on texts that attempt to define standards or best practice. These are argued to standardise what 'counts' as knowledge, sanctioning some beliefs and rendering others heretical. This process is insidious. Defining something as 'best practice', for example, serves to impose external authority whilst obscuring its identity: external values are held up as an ideal, but the authors of the text are not seen to be the ones who proposed them. Thus the demands of authorities (government, management, etc.) are no longer seem as impositions ? instead, "they seem transparently natural and right, just 'best practice'" (p. 211). Hard at work throughout this process are 'discourse technologists' ? "people whose job it is to intervene in the textual practices of work at local sites in order to shift discursive practice to standardised global discourses" (p. 211). Although this role is implicated in the process of imposing dominant meanings, it need not simply serve to impose the values of management. Instead, discourse technologists can act to create a 'pedagogic space' (p. 212) in which structures of power can be unsettled. However, such a process requires negotiation,

Not instruction; it must be a dialogue, not simply indoctrination. Such space for dialogue can be hugely powerful, providing valuable new insights into the process being described (Wenger, 1998); it is also a pre-requisite for the kind of critical, reflective practice that it is argued that learning technologists ought to aspire towards (Lisewski & Joyce, 2003). However, such space that seems worryingly absent from exhortations such as, "encouraging resource sharing is complex. It is perhaps one of the major challenges currently facing learning technologists" (Littlejohn, 2003a).

This uncritical link between learning technologists and management is further evidenced elsewhere in these chapters. In the closing section of her chapter, for example, McNaught asks, "how can an organisation decide if it is within the zone of effective change?" She goes on to suggest that one part of this decision might involve tasks such as SWOT analyses. This discussion is particularly telling. Organisations do not do SWOT analyses; individuals do. However, the use of the label 'organisation' acts to naturalise the fact that specific individuals take decisions on behalf of the institution. It is rendered natural, obvious, that someone in a senior position should undertake such a task, in the same way that it is only natural that a senior individual should then devise a policy to respond to this exercise, and that a similar individual should use McNaught's model to represent their institution, since these models "can be a powerful focus for celebrating and realigning change". Such 'natural' assumptions validate the fears identified elsewhere in the literature (e.g. Holley & Oliver, 2000; Noble, 1998): that academics' identities are being re-conceived on their behalf, without their input. In fact, this is not necessarily the case; such analyses could be undertaken in an open, consultative way. However, for any one individual to act in this way on the behalf of others places them in a position of power over their colleagues. Unless this forms part of an open process, their beliefs will shape future practice, their values will determine the professional identities of their colleagues. McNaught does advocate at the outset that such change be undertaken in a collegial way ? but there are no echoes of this warning in the advice given about advancing such changes at the end of the chapter.

Conclusions

McNaught and Littlejohn set out in their chapters to propose ways of dealing with the complexities of context and personal development in relation to reuse. This paper has provided a critique of these proposals, re-framing them in terms of information literacy and the use of power. The purpose of this critique is not to dismiss the proposals offered in the initial chapters, but to generate new insights and opportunities that can be used to extend our understanding of the phenomena being described.Reconsidering the chapters in the light of information literacy research showed that these proposals do not encompass the range of ways in which staff may experience the problem of reuse. Focusing on technical or process issuesmay make for a

tractable, solvable set of problems, but it fails to take account of the ways in which academics' use of resources contributes to their personal development and the development of their discipline. What is required is either new research or the reconciling of currently disparate bodies of work that each focus on one end of Bruce's continuum of descriptions of information literacy. Without such an holistic account, the only solutions that can be proposed will necessarily be piecemeal. Thus these chapters may represent an important contribution to our understanding of part of this process, but they should not be seen as telling the whole story.

Examining this process in terms of the exercise of power reveals the tendency for reuse to marginalise academics. The process judges practice in terms of values esteemed by managerialism: efficiency, control and transparency. The complex, tacit expertise of academics in designing curricula (and, through this scholarly process, developing both themselves and their disciplines) is ignored. It might be possible to set this aside as an innocent oversight, were it not for the way in which these processes seem to benefit the same groups who are the strongest advocates of reuse. Learning technologists in particular seem poised to wrestle away from academics responsibilities for part (if not all) of the curriculum design process, legitimating their importance and strengthening their currently precarious role within universities. Given that we as learning technologists stand to gain whilst others lose from this process, it is all the more important that we are cautious and circumspect in the way in which we encourage reuse. If values, descriptions and practices are imposed, it would be fair to criticise this process as one that serves our own interests; only by approaching this issue in an open way, encouraging dialogue and valuing the different voices and values of academics, can we hope to avoid the charge of serving our own ends through advocacy of reuse.

Finally, it is important to recognise that the points made above are not unique to these chapters, or indeed to the topic of reuse. All educational change involves the development of new literacies and the exercise of power. What is important from this critique is to recognise the value-laden, disruptive and threatening nature of such processes. In both research and practice, we must seek to examine such processes, holding these issues in mind so that we are sensitised to their influence on the ways in which we work. Since we cannot work without disrupting literacies or exercising power, we should at least recognise that this is what we are doing. We should also recognise that those we influence may need time and experience to understand these new approaches, become fluent with them and be able to come to terms with the way that their identities have been re-formed by them. Training alone will not resolve these transformative anxieties; however, careful and respectful collaboration and dialogue with academics might.

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A Comparison of Issues in Reuse of Resources in Schools and Colleges: Chapter 17

by Allison Littlejohn, Insung Jung and Liz Broumley
Commentary by Terry Anderson

This chapter forces us to confront an issue that has long haunted education technology focused reformers — what if we build it and nobody comes? Will learning objects end up alongside programmed learning machines, educational television, and video conferencing as technologies that were cool in their day, but never had anywhere near the impact on formal education that was predicted by early proponents. Perhaps the best way to ensure valued and valuable use of any technology is to ensure that lessons learned from early implementations are recycled back into design of subsequent products. Fortunately, we are yet in early times in the development of objects and thus the potential for both incremental and substantive change to the way we design and use these latest techniques is great. As importantly, the design and construction processes related to educational objects use and adoption are much different than the monolithic models of earlier technologies. Educational objects promise a flexibility of design and implementation that allows for and even demands creative input from both professional designers and practicing teachers. Thus, articles such as this one by Littlejohn, Jung and Broumley that not only document issues and concerns of early adopters but further provide new design models and heuristics are especially valuable.

The article presents the results of two geographically and educational diverse case studies that focus on adoption and use of learning objects. The first reviews an interview-based study of 283 Korean K-12 teachers who had access to a national repository of objects. The second case study focuses on the experiences of tutors developing and delivering educational modules for a new distributed postsecondary network located in Northern Scotland. The article provides brief summaries of these studies and a link to the full Scottish study, but none to the Korean one. As in any good multiple case study the authors help us to compare and contrast the two cases through a table that builds on the four categories introduced by Campbell (Chapter 3 in the text) of cultural, educational interoperability and technological. The cultural variables that are found in both studies are familiar and in most cases similar — both samples have issues related to familiarity and access to the technology, lack of time, and concerns about motivation and reward related to adoption of any new technology. Cultural differences, though, are significant. The Korean K12 teachers are teaching to a standardized national curriculum. In contrast, the Scottish tutors, like most higher education teachers, are individually developing and delivering their own localized curricula. Finally, the context of the Korean teachers includes a large scale federally sponsored and mandated repository of curriculum that has been established for years.

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The Scottish tutors are forced to create their own content and tag and store it for reusability. These tutors are motivated only by a sense that reuse is a good thing and may save them some time in subsequent revisions. Oddly, the authors don't look at the larger cultural dimensions related to teaching and learning between the two samples that anthropological scholars such as Geert Hofstede (1991; 1986) have identified. For example it would be interesting to determine if any Hofstede's five cultural dimensions — of individualism, power, uncertainty avoidance, achievement or long term orientation — are directly related to learning object creation or adoption.

Educational, interoperability and technological issues are remarkably similar despite the fact that Korean teachers are using educational objects in classroom situations, while their Scottish teachers are developing distance-learning content. Not surprisingly, higher education teachers focus on content development, while K-12 teachers leave content creation to texts and other commercial content objects and focus on acquiring and using objects that support learning activities.

What the two cases provide for us is a snap shot of object use in the real world. The short summary statistics and the expansion in the original articles help us focus on the adoption issues that are most likely credible and useful to teachers making real adoption and use decisions. The authors speculate that the standardized curriculum of the K12 context is likely to lead to more extensive and rapid adoption of objects since the larger economy of scale that determines the market for object production and use is likely to lead to higher quality products. However, this view sees learning objects as being static entities much like textbooks that demand large press runs to amortize production costs. I like to think of objects as being more malleable than this and gaining their economy of scale by their capacity to easily be contextualized or morphed to meet a variety of curricula needs. In this latter view, objects may in fact be more attractive in areas in which culture demands local accommodation and development of curricula.

As a good chapter should, the authors next take us from the data to the theoretical by presenting a model or framework for "module design and evaluation". The module combines Biggs' (1999) design that attempts to constructively align learning objectives, assessment tasks, and teaching methods and throws in Mayes' (2002) categorization of courseware at three levels: content, activities, and discussion. Unfortunately, the single example of the framework provided is focused on the "design of online courseware" itself. This confusing habit by which educational technology researchers provide examples from the study of educational technology itself does nothing to help the reader generalize to more diverse educational contexts.

Surely educational technology researchers will eventually discover that there is a world of education beyond the study of educational technology itself!

Notwithstanding this concern with the model's presentation is a deeper concern that the framework model lacks sufficient specificity to actually guide learning object use and integration. The framework helps us get our heads around the fact that learning objects can meet courseware needs that go beyond the familiar text model of content that leads to discussion activities. However, it is less effective in providing any guidelines as to how learning outcomes, assessment, teaching and evaluation should be aligned. It certainly provides a nice reminder to see these four factors sitting side by side in the model, but there is little guidance as to how learning objects fit into the framework. This is especially challenging when current confusion in the field between so called "knowledge objects" which are devoid of outcomes and assessment or learning activity are confounded with other conceptions of learning objects at generally larger levels of granularity where all of these activities are referred to as components of the learning objects. As the authors suggest, perhaps more formal description of these contextual components of a learning object provided through the IMS learning design specification or other versions of an educational modelling language will help solve this problem. So for now, the framework provided only tells developers to remember these important components of effective learning contexts but gives us little more than a tabular heuristic to guide the process. The framework is a model and models are often the first and necessary step in theory formation. They identify the important variables — but further work is needed to expose the theoretical relationships between these variables.

To conclude there is much to be learned from the study of real applications of learning objects in authentic use and development applications. These chapter reviews two such studies and in the process helps to identify factors that will likely both exacerbate and promote re-usable learning object adoption. The framework provided is useful for reminding us that education is multi-faceted and multi-staged and that learning objects need to be integrated within culturally defined learning sequences. Thus, diverse needs often warp around instruction, support, assessment, and encouragement and each can be critical to effective use and integration.

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An Incremental Approach to Staff Development in the Reuse of Learning Resources: Chapter 18

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Commentary by Martin Oliver

See commentary by Martin Oliver on Chapter 16.

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Reuse of Resources within Communities of Practice: Chapter 19

by Rachel Harris and Carol Higgison
Commentary by Terry Anderson

I first experienced the tremendous cost savings potential of virtual conferences when I organized what I believe was the first professional development conference held on distributed digital networks in 1992 (Anderson & Mason, 1993). This first conference used a variety for pre-Internet (FidoNet, BitNet and Usenet) and Internet mailing lists to distribute discussion related to the International Council for Distance Education Congress held in Bangkok. At the time I was agraduate student, with no travel funds and was able to organize this entire virtual conference (with the help of many volunteers) for the total cost of a few faxes to Bangkok. The key to the economic advantage of virtual conferences is the capacity to allow access to professional gatherings without travel or other restrictions of place and in shifting the time requirements to allow asynchronous participation. Since then there have been many successful virtual conferences employing various combinations of synchronous and asynchronous interaction. However, few have been based on applicable theories related to development of communities of practice or relevant knowledge management theory nor have many evolved much beyond the "horseless carriage' emulation of face-to-face seminars or conferences.

The Online Tutoring Skills (OtiS) e-workshop described in this chapter makes a significant contribution to knowledge of how to effectively design and manage virtual conferences or e-workshops. In addition they provide a useful discussion and exemplar of means by which the content of these forums can be re-used and repackaged for wider and continuing use. The first contribution of the paper is a description of an innovative process for soliciting and evaluating content from within the community of practice. This was done by soliciting case studies that describe both the content and the context of an evolving field of professional expertise — that being on-line tutoring. Peers adjudicated the case studies and 35 were chosen from the 80 submitted. The second contribution was to pioneer a sophisticated instructional design for the two weeks of the e-workshop. This structure defined roles for participants ranging from authors, to raconteurs, moderators and contributors. Also delineated was a two-week schedule that mixed synchronous chat sessions with asynchronous discussion groups, keynote presentations and small group summary postings to plenary sessions. The structure was designed to facilitate knowledge extraction and growth amongst the community throughout the e-workshop. Finally, the paper helps us to extend the learning across longer periods of time, by documenting the process by which writing teams created chapters for a book during a post workshop phase of the e-workshop.

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This excellent paper ends with a discussion of a series of issues that arose during the e-conference and that could be described as a first look at best practice guide for e-workshop designers. I liked the article and I appreciate the serious conceptual and physical work put into organizing and documenting for re-use this professional development initiative.

The authors use Wenger's familiar model of a community of practice and with Preece's (2000) features of online community, to provide a strong theoretical base to the workshop design. The theory provides a scaffold to facilitate understanding of community formation during this workshop and how discourse within the community leads to knowledge construction and affirmation.

While I find the model and the description of the workshop useful, I'm left with lingering doubts related to the efficacy of the workshop from the participants' perspective. These doubts are based upon my own participation in virtual conferences over the years. Sorry, I meant e-conferences — I'm still not quite with it enough to preface most of my nouns with "e-" to gain currency! Do the majority of participants really connect and develop critical "mutual engagement" in virtual conferences? I know that I have enrolled in many such conferences — some I have followed religiously, others I have skimmed through lightly at the end of a busy day or week. Does reading the conferences alone count as meaningful "joint enterprise" or "shared repertoire"? Are those who read, but do not post, members of the community of practice? I realize that attendance alone at a face-to-face event doesn't guarantee meaningful participation or the development of the necessary sense of awareness of the proceedings that Langer (1997) refers to as mindfulness. But I'm left with a lingering suspicion that the commitment of physical attendance with concomitant removal of the distraction of other work responsibilities, email, telephone and family intrusions, differentiates the extent and perhaps the quality of participation in the e-workshop and thus the critical 'mutual engagement' may be missing from the communities thus formed. Of course, this lingering doubt is merely a hypothesis and begs some empirical verification. This is perhaps my only criticism of this paper — how do we know the level of commitment and participation in the community of practice or more importantly of development of personal or professional knowledge achieved by the participants? The study provides no survey data, transcript analysis of interaction, interview data, or even reports of the numbers of interactive messages exchanged by the "over 100" participants. I realize that such data is hard to gather as evidenced by the pathetically low return rate of electronic surveys from participants in my last virtual conference (Anderson, 1996). I also realize the challenges of measuring community, social or cognitive presence derived from the transcripts of these online interactions conferences (Rourke, Anderson,

Garrison, & Archer, 2001). These difficulties were motivations that led to my work with Heather Kanuka on a book on e-research techniques (Anderson & Kanuka, 2002) - he says, shamelessly promoting his own products J.

This chapter gives us a first rate example of the way to design a professional development activity based on sound theory and facilitated by a team of dedicated and more important skillful educators. However, the field is far too young to assume that theoretically derived intervention will necessarily lead to quality outcomes. These must be thoroughly tested. Of course the test results themselves then contribute to honing and further development of the theory.

Besides the theoretical strength of this chapter, the authors make a major contribution by documenting their "lessons learned" in a discussion of "online workshop management issues". The thorny copyright issue is addressed and I'm pleased to see that the workshop alerted participants to the fact that the "participants are free to use, develop and adapt the case studies, materials, ideas and exemplars developed in the e-workshop either to improve their own practice or to develop the skills of others". This certainly is in the spirit of open and free use of content, facilitates maximum reuse and helps build a sense of the gift culture that we need to counter the pressure for commercialization of so much public knowledge today. However, a more systematic and clear way to facilitate this re-use is to make clear who does own the copyright — I would assume the authors of the case studies or the posters of responses. Despite the desire to have their content reused, I think that many authors would prefer to retain the copyright, but specifically allow reuse by others. Defining the terms and formally licensing reuse of this type of text content is supported through the Open Content license [www.opencontent.org] or more recently through the exemplar work of the Creative Commons initiative [www.creativecommons.org]. Creative Commons in particular, provides a very easy to use system, accessed via a web-based wizard, to produces a series of licenses detailing authority to use and re-use copyrighted materials. It would be interesting to engage in a discussion on this forum of the copyright, ownership and re-use expectations of both formal presenters and the e-workshop respondents.

I found the suggestions for providing an appropriate mix of synchronous and asynchronous activities of particular importance. The synchronous activities in this case were text based, but it is becoming increasingly easy to use a variety of IP based audiographic products that I believe will increase humanization and ease of synchronous interaction by supporting voice discussion. Of course this will raise new access and re-use issues (relating to the challenges of searching and indexing voice),

but the tradeoffs of text chat versus voice chat are worth investigating. Finally, the authors highlight and illustrate ways to capture and re-use (the focus of the book) the knowledge generated during the workshop. As they argue, the effort to document and then provide for community review the case studies of professional practice in authentic contexts is a critically important and relatively efficient way to document the realms of tacit knowledge that mark professional practice. We need such systems to insure equitable access to opportunities for professional growth and knowledge building by all members of our society.

In summary, Harris and Higgison provide us with an illustration of the way that development activities undertaken by practicing professionals can be effectively and efficiently designed and managed. They further illustrate how the content and interaction of this activity can be repurposed for a variety of further work. Together, and perhaps most importantly, these descriptions of a real life model of an e-workshop, grounded in relevant theory, further contributes to the evolving theory of online community growth and its application to professional development.

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