# FCJ-007 Learning through New Media Objects

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2 Learning objects sneaked into educational technology vernacular in the latter half of the 1990s. [1] Its origin can be traced back to military training, where the Sharable Content Object Reference Model was invented (ADL 2003). Through workplace training and learning/ content management systems, these obscure objects have recently made their way into higher and K-12 education. At the time of writing, various Australian projects have started involving educational institutions in higher education (COLIS), K-12 (Learning Federation, EduNet) as well as vocational education and training (OTEN-DE).

3 Despite their popularity in e-learning, no one has a definitive answer to the question of what learning objects are, though a range of opinions have been expressed. Some answers are intuitive while others are more technically sophisticated. In the introductory chapter of The Instructional Use of Learning Objects, David Wiley gives an exemplary introduction to these objects:

> 4 Learning objects are elements of a new type of computer-based instruction grounded in the object-oriented paradigm of computer science. Object-orientation highly values the creation of components (called "objects") that can be reused... in multiple contexts. This is the fundamental idea behind learning objects: *instructional designers can build small (relative to the size of an entire course) instructional components that can be reused a number of times in different learning contexts*. (Wiley, 2000b, my emphasis)

5 This quote represents the general view of an instructional designer, for whom a learning object approach implies designing learning materials in bite-size chunks that learners can take "just-in-time, just-in-place" and in an amount that is "just enough" (Hodgins, 2001). These chunks of learning materials have the additional benefits of reduced production cost and effort through sharing or reusing between producers (Downes, 2000; Wiley, 2000a).

6 Different concerns are raised by university educators. Stephen Downes, an academic at the University of Alberta, stresses the potential benefits of applying the learning object concept to sharing university teaching resources. As these resources often reside in Learning Management Systems, he thus defines learning objects as 'online course components that are sharable and interoperable between Learning Management Systems' (Downes, 2000).

7 On the technical end, renowned standards bodies like the ISO (International Organisation of Standards) and IEEE's (Institute of Electrical and Electronic Engineers) Learning Technology Standard Committee have committed to developing standards for learning objects' associated technologies (Hodgins and Conner, 2000). For example, the IEEE Learning Technology Standards Committee (LTSC) launched a Learning Object Metadata working group in 1997 to define a minimal set of metadata attributes that can adequately manage, locate and evaluate learning objects (LOM, 2001). For the purposes of developing technical standards for metadata, a definition of learning objects is needed. The IEEE thus defined the learning object as follows:

> 8 Learning Objects are defined here as any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning... Examples of Learning Objects include multimedia content, instructional content, learning objectives, instructional software and software tools, and persons, organizations, or events referenced during technology supported learning. (LOM, 2001)

9 The IEEE technical definition for learning objects is deemed to be too broad for educators. David Wiley condemns it for its failure to exclude anything under the sun. In reaction to the all inclusive definition posed by the IEEE, Wiley proposed a restricted definition of learning objects as 'any digital resource that can be reused to support learning' (Wiley, 2000b). In addition, as an instructional designer, he emphasises the importance of thoughtful use of these objects to support learning (rather than have them simply referenced during learning).

10 The definition Wiley proposes happily marries education and computer science. The definition reinforces the associations the term itself arouses – learning in education, and objects in object-oriented programming. [2] Consider again the quote at the beginning of this paper. By substituting "instructional designers" and "instructional components" with "programmers" and "program codes", Wiley has channelled the concept of programming objects into education discourse. [3] Three benefits of using learning objects are highlighted – reuse, simultaneous access by multiple

users, and immediate updates of new versions – all relating to their technical nature. While the latter two benefits directly relate to using the Internet as the delivery medium, reuse is the well-known quality of object-oriented programming.

Reuse appeals to both software companies and educational institutions for the same reasons: minimisation of labour and ease of management for the ever-present desire of cost reduction. While some have attempted to argue that learning objects result in better learning experiences for students, most of the debates surround the return of investment in such objects. A brief survey of such arguments will reveal a computer science logic in them that can be roughly summarised as: because software reuse is economical, if we design learning objects like software objects, then education design can also be economical.

What has been missing in the learning object debate is the recognition of these digital resources as new media objects. By comparing learning objects with Manovich's new media objects, I will first show that learning objects are culturally translated from programming objects through the use of new media in education, and some characteristics of programming objects simply do not apply to them. Second, I will show how one of the grandest promises for learning objects – reuse – fails both in programming objects and in learning objects. Third, I will discuss some common issues that are faced by new media producers and learning object producers. Using the work of new media theorist Lev Manovich, this paper will find a way to sort through the haze of great learning objects promises.

## New Media Objects vs. Programming Objects

*Round 1: Rapid Application Design and Selection*

Advocating the benefits of learning objects, Canadian researcher Stephen Downes argues that traditional learning material production has always been an artisan work (2002). University lecturers often create new course materials for each semester from scratch. As a solution, Downes offers two processes borrowed from computer science: Rapid Application Design (RAD) and Object-Oriented Design. Rapid Application Design refers to the way 'a designer can select and apply a set of pre-defined subroutines from a menu or selection within a programming environment' (2002). Object-oriented design, as defined by Downes, is the idea that 'prototypical entities are defined, which are then cloned and used by a piece of software as needed' (2002). Downes concludes:

> Online course developers, pressed for time and unable to sustain $24,000 development costs, will begin to employ similar methodologies. An online course, viewed as a piece of software, may be seen as a collection of re-usable subroutines and applications. An online course, viewed as a collection of learning objects, may be seen as a collection of re-usable learning materials. The heart – and essence – of a learning object economy is the merging of these concepts, of viewing re-usable learning materials as re-usable subroutines and applications. (Downes, 2002)

Lev Manovich discusses the operations of selecting and applying pre-defined operations associated with RAD in a wider cultural context. In discussing how art has changed over the last few centuries, he notes the painstakingly slow process of art-making in pre-industrial artisan culture. With the move into mass production and automation in the twentieth century, some artists began to assemble collages and montages from already existing cultural parts. There comes a turning point where 'the industrial method of production entered the realm of art' (2001b: 121). Manovich writes:

> In contrast, electronic art from its very beginning was based on a new principle: modification of an already existing signal... The artist was no longer a romantic genius generating a new world purely out of his imagination; he became a technician turning a knob here, pressing switch there – an accessory to the machine. (Manovich, 2001b: 121-2)

Manovich shows how this new principle is applied to various software programs:

> Adobe Photoshop 5.0 comes with more than 100 filters which allow the user to modify an image in numerous ways; After Effects 4.0, the standard for compositing moving images, is shipped with 80 effects plug-ins; thousands more are available from third parties. Macromedia Director 7 comes with an extensive library of "behaviors" – ready-to-use pieces of computer code. (Manovich, 2001b: 120)

What is noteworthy for our discussion is that these software programs are commonly used in new media course material design. The same tools that construct new media objects are used to construct learning objects. From the point of view of those producing these objects – including teachers and instructional designers – the current process is more like that of an artist than that of a programmer. Nonetheless, just as art production is now facilitated by software, learning object productions are also benefiting from RAD.

21 The benefits discussed above are different to those originally proposed by Downes. There is a crucial difference between saving cost through using software that supports designers in the new media/ learning object production process, and software that replaces the human designer. What is at stake here is that while the teacher/ instructional designer, like Manovich's artist, becomes 'an accessory to the machine', their activity is not dictated by an algorithm. To view an online course as a "collection" of course materials (or learning objects) is problematic because the assembling of the collection is still the most costly part of the construction. The convolution of the two has led many to jump into a "learning object solution" which promised to save cost in the long run, but they found that their initiative investment never remunerated.

22 *Round 2: Metadata and Automation*

23 The initial investment in learning object projects are usually put into producing large numbers of learning objects that are supposed to be usable in multiple contexts. To be used by different people who do not know about their existence poses a demand on learning objects to be "discoverable" or "accessible". To accomplish this goal, most learning object projects involve metadata tagging.

24 Metadata literally means data about data. Anyone who has used a library catalogue would not find them too unfamiliar. The catalog record of a library book is the metadata for that book. Librarians have long been "meta-tagging" library books and resources. The process is laborious and requires professional training, but results in the sort of efficient discoverability that we have enjoyed in our libraries.

25 In the case of learning objects, a metadata record means information (data) about a particular learning object. It would consist of a number of fields, including a description, its author, date of creation and other information that would help people find the learning object efficiently.

26 In new media contexts, the World Wide Web was made usable when it was opened for searching. Early methods of free-text search resulted in dumps of unrelated pages. Later search engines, such as Google, improved search results by methods such as tracking the popularity of individual pages, rather than by indexing the words and the levels assigned by tags present. The technology is constantly improving, and in 2001, the World Wide Web Consortium has also taken an initiative in moving towards a "semantic web". Using technologies like RDF (Resource Description Framework), robots can crawl through web pages and pull out semantically relevant pages, not simple matches by surface meanings (W3C 2001).

27 In a similar way, "discoverability" or "accessibility" is a pressing problem for learning objects. The problem is most commonly approached using the traditional library method – the metadata tag. In fact, metadata standards occupy a vital position in learning object discussions. In addition to the IEEE Learning Object Metadata working group mentioned earlier, a wide range of learning object metadata standards have been defined, including names like the Dublin Core (2002), IMS (2002), and CanCore (2002). The choice of library methods for this learning object problem should not be surprising when one considers the ongoing intimate relationship between education and libraries. Nonetheless, a number of research projects on using semantic web technologies for searching learning objects are also in progress. [4]

28 Whether it is metadata or methods borrowed from the semantic web, the short-term goal of the research is to enable reliable searching. A long-term goal, exemplified by the statement of purpose of the IEEE project, is 'to enable computer agents to automatically and dynamically compose personalized lessons for an individual learner' (LOM 2001). Here we meet another of Manovich's principles of new media, the principle of automation.

29 The relationship between metadata and automation is two-fold. Low-level forms of automation in the digital age include automation in generating presentations from templates, applying filters on images, and dynamic web pages. Low-level automation makes object creation much easier than

traditional forms of media. The ease of object-creation also means a proliferation of the number of objects created. 'By the end of the twentieth century, the problem was no longer how to create a new media object such as an image; the new problem was how to find an object that already exists somewhere' (Manovich, 2001a: 35). Here we find the motivation in meta-tagging every learning object and the desire for "high-level" automation, where computer agents understand the deep meaning of these objects, and eventually, are able to compose lessons without human intervention.

30 The presence of metadata makes learning objects awkward in comparing them to programming objects. There is not an equivalent need for searching for objects in programming. The closest to them are documentations, which are designed specifically to be not machine-readable, but human-readable.

31 New media objects do not usually have equivalents of metadata. The sheer mass of new media objects available on the Internet makes it impractical to meta-tag them. Meta-tagging only occurs in closed resource libraries, where collections are acquired with specific guidelines and usually for specific purposes. Examples include audio and video libraries in a production house. In light of this, learning object repositories are not radically different to other new media object libraries.

32 In employing metadata, learning objects are made equal to books. Yet the analogy is problematic because unlike books, being digital means learning objects are likely to be variable. Variability is another of Manovich's principles of new media objects, which blatantly challenges one dichotomy often used in learning object discourse – reusability and repurposability.

33 *Round 3: Reusability, Repurposability and Variability*

34 As a computer scientist, Wiley emphasises the importance of distinguishing between the two:

> 35 By reusability, I mean the ability to take a learning object as is and reuse it wholesale. By repurposability, I mean the ability to extract portions of a learning object and adapt them to new learning contexts. (Wiley, 1999: 2)

36 In short, reusability differs from repurposability in that the former leaves the object unmodified. His view is that reusability is what is important for learning objects because the value of object-oriented code is that it requires no modifications. That is, no extra work will be needed to use the same code in a different program. Programming codes are notorious for their illegibility, and having programmers "opening the black-box" to repurpose the code is extremely undesirable.

37 According to Wiley, reusability is inversely proportional to repurposability. In other words, the more reusable an object, the less repurposable it is, and vice versa. The relationship is mediated by another concept that he names granularity (Wiley, 1999: 6). [5] Granularity roughly maps to the size of an object, though no one in the field has come to a precise definition. Nonetheless, the consensus is that the more granular (simpler, smaller) an object is, the more reusable it becomes. Wiley illustrates this point by comparing two objects: one photograph with no captions, and the same photograph with captions:

> 38 [The image with caption] has more meaning than [the one without]. Could [the captioned image] be used in a matching exercise on an assessment instrument? No. Would it be useful to an art student creating a collage? Probably not. Adding the label, box (to make the relationship between the caption and the image clear), and the caption increases the context of the photo, and therefore the meaning of the object, but it also decreases the number of ways the object could be recontextualized. (Wiley, 1999: 5)

39 If we apply this general principle to text and multimedia productions, when an object is large and contains more contextual information, it is usually not suitable to another situation. Smaller objects can "fit" into more contexts and hence are more reusable.

40 The same desire for reusability is shared by media producers for its appeal in minimising cost and effort. However, new media objects demand a fuzzier divide between reusability and repurposability. Manovich identifies variability and modularity as two of his principles of new media. Variability denotes how a new media object 'is not something fixed once and for all, but something that can exist in different, potentially infinite versions' (2001a: 36). Being variable, new media objects are expected to adapt to different contexts. Both the image, and the image with caption, will be subjected to repurposing if the need arises. Thanks to the ease of image manipulation with digital technology, the captioned image is just as useful for an art student

creating a collage as the one without a caption. Today, most operating systems come with image manipulation programs. Even the most basic Paint program that comes with all Windows operating systems can perform cropping as a simple two-step operation (selecting, then cropping).

41 Like new media objects, learning objects yearn for adaptation or "contextualisation". In addition to the stigma associated with plagiarism and possible infringement of copyright, academic practice is hardly ever a matter of copy and paste. In a study that compares the issues in the reuse of resources in schools and colleges, Littlejohn, Jung and Broumley (2003) note that 'commonality of curricula does not necessarily mean that staff will reuse externally produced materials, unless the materials can be contextualized by the teacher' (Littlejohn, Jung and Broumley, 2003: 219).

42 In summary, the problem with Wiley's arguments is that they show ignorance towards the medium. The reuse/repurpose divide is a false dichotomy in the face of the medium and teaching culture.

**The Truth about Reuse**

43 My discussion thus far has argued for a distinction between what reusability means for programming objects and new media objects, but in the following pages, I will suggest that reusability is really an ideal that is never actualised even in computer programming. A digression into the origin of object-oriented programming will clarify my point.

44 The first object-oriented programming language, SIMULA (SIMUlation LAnguage), was developed between 1962 and 1967. The language's main development goal was to provide means to conceptualise a complex system (Holmevik, 1995). It was intended to be both a system description and a programming language, and 'its construction would thus require both systems reasoning and programming skills' (Holmevik, 1995).

45 This gave birth to the concept of objects and classes, and systems conceptualised as made up of objects that perform actions at run time. Objects are particular instances of classes, or prototypes. A real world example for a class may be cars, and an example of an object from the class car is my Camry. As a member of the class car, you would expect my Camry to have properties of a car, with a few variations. My Camry can also perform actions, such as drive, reverse, and stop.

46 To deepen this discussion, let us look at a common programming class, String. An instance of a String can be any particular string of alphanumeric characters, for instance, "hello world" or "one two three 456". A property of a String (a letter string) class may be the number of characters it contains. A String can also perform actions (or methods in computer science jargon) such as concatenate with another string, or return the number of characters it contains.

47 Object-oriented design is said to be reusable when classes are imported from other programs into a new program. For example, if I am modeling a system that asks a string to do something, I can write my own class, or I can simply borrow a String class that you wrote. In other words, reuse your code.

48 While this seems to be an attractive idea, code reuse rarely happens in practice. In an extract from the USENIX proceedings, Johnson (1994) explains the problem:

49 > So, I want to use your string package, but I want your string package to use my arena-based allocator. But, almost certainly, you have encapsulated knowledge of storage allocation so that I can't have any contact with it (that is a feature of OOP, after all), so I can't use your package with my storage allocator. Actually, I would probably have more luck reusing your package had it been in C [which is not an object-oriented language, KW], since I could supply my own malloc and free routines [to control memory allocation, KW] (although that has its own set of problems). (Johnson, 1994)

50 In short, reusing classes has not been particularly successful in OOP. If reuse is said to exist in OOP, it is the sort of reuse that was already present in structured programming – the reuse of code libraries and modules.

51 It should now be clear that it is unfruitful to talk about learning objects as reusable by drawing parallels with computer science, since there is a lack of empirical support for reuse in OOP in the first place. Yet, this does not refute the link between OOP and learning objects. Instead, by using Manovich's understanding of new media objects, it becomes clearer that the linkage works culturally through the work practices of learning object producers. Manovich conceives of new

media as constituted by a 'cultural layer' and a 'computer layer'. These layers influence each other and result in a new computer culture – 'a blend of human and computer meanings, of traditional ways in which human culture modeled the world and the computer's own means of representing it' (2001a: 46). In the case of learning objects, it signals a new computer education culture. This new culture has two overarching themes that flow naturally from an object culture – mass production and commodification.

**Mass Production**

52 Manovich chooses to use the term new media object over new media product, artwork or interactive media for three reasons. First, the term is generic enough so that it does not limit the scope of his principles. Second, object makes a connection with computing science and the computing industry. We have already seen the term used in object-oriented programming. Third, it points toward the factory and industrial mass production rather than the traditional artist's studio, and it implies 'the ideals of rational organization of labor and engineering efficiency that artists wanted to bring into their own work' (Manovich, 2001a:14).

53 The third reason is important in learning object discourse. Stephen Downes criticises the traditional method of course development precisely because it was "artisan work" (2000). Adopting an object-oriented approach to course development means more than establishing technical standards, it involves implementing new policies and reorganising workflow in production houses. One excellent example of this is the OTEN-DE's TAFE Online project.

54 In this project, content writers were challenged to write pieces of text that could stand alone, which students could study independently of other components of the course. OTEN-DE's instructional designers worked hard to keep their Sharable Learning Objects (SLOs) unmodified from module to module while maintaining the flow of argument within a module. Initially, instructional designers analyse the content of each module and list its learning objectives. Basically, for each objective a Sharable Learning Object (SLO) is created to teach that objective. These SLOs are the basic building blocks of modules. The modules are then compared and where two modules share the same learning objective, a single SLO, rather than two, is created. In other words, this approach saves production work by taking advantage of the overlapping components of the curriculum across modules in the TAFE courses.

55 For example, one of OTEN-DE's SLO teaches the skill 'Determine and analyse client requirements'. This SLO is shared across 6 modules:

1. Connect Internal Hardware Components;
2. Install and Optimise System Software;
3. Provide Advice to Clients;
4. Develop Macros and Templates for Clients;
5. Customise Packages Software Applications; and
6. Provide Basic System Administration.

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57 Each of these modules contain several SLOs. A SLO is a plain text document that contains instructional content for the stated objective.

58 This approach defines clearly the boundaries of each role, and in eliminating ambiguity, it achieves what Manovich terms 'rational organization of labor and engineering efficiency' (Manovich, 2001a: 14). In enforcing the learning object approach, OTEN-DE redefined and clarified the roles of the instructional designers and the content writers. Though Manovich is referring to artists, the same principle applies to the process of learning object development in this instance. It is yet to be seen how this mindset of rational organisation plays out in university and school education, where the culture values creativity, critical thinking, and "people" elements highly.

**Commodification**

59 Learning objects do not only promise economic savings through mass production. As discreet pieces with metadata ready to act as price tags, they are only one step removed from becoming commodified assets.

60 However, one characteristic of new media objects has caused hiccups within the commodification process. The problem is caused by modularity. Modularity refers to the fractal-like nature of new

media objects. 'Media elements, be they images, sounds, shapes, or behaviors, are represented as collections of discrete samples (pixels, polygons, voxels, characters, scripts). These elements are assembled into larger-scale objects but continue to maintain their separate identities' (Manovich, 2001a: 30). For example, an HTML document is modular because it can reference images, video and audio files. These components can be easily substituted and deleted, but together they form a web page, a coherent object.

61 In the context of Wiley's captioned image example, new media objects typically would store the text (HTML) as separate from the image (JPEG or GIF file). Modularity means that both the text and the image, as well as the whole web page (which encompasses the former two) are all in the order of an "object". Manovich uses the term "object" to emphasise that his 'general principles of new media [are] true across all media types, all forms of organization, and all scales' (Manovich, 2001a: 14).

62 When applied to learning objects, producers have had problems defining the optimal granularity of an object. There is a dilemma in maintaining the balance between having objects too big so they do not get "reused" often, and too small so they are too petty to handle. Plus, assets too "raw" are incapable of achieving learning objectives. Lacking in a clear purpose can inhibit use, let alone re-use.

63 One of the factors that is supposed to help determine the optimal size of a learning object is what yields the maximum return of investment. Under this light, granularity still causes more problems than it solves. While smaller objects are theoretically more reusable, they can cause company losses in other ways. Consider the common watermarks found on online image libraries. Companies URLs are embedded into their images to decrease illegitimate use, or repurposing without the producers' consent. Here, the notions of repurposability/ reusability are deemed too simplistic for business returns. The lack of conceptual clarity of granularity has proved to be useless in determining the commercial value of learning objects.

64 The breadth of the term "object" – which Manovich deems a virtue – has backfired in learning objects when it comes to assigning intellectual property rights. It is tempting to revert back to distinguishing between reusability and repurposability to make things simpler. In light of the intellectual property issues, it is not surprising that David Wiley, the advocate of the reuse/ repurpose distinction, is also the creator of the Open Content licence.

65 The ideology behind the Open Content licence is that content should be made available to all people who are interested, and open content will be continually improved as different people work on it. Wiley borrowed the concept of Open Content from the Open Source software movement :

66 > In plain English, the [Open Content] licence relieves the author of any liability or implication of warranty, grants others permission to use the Content in whole or in part, and insures that the original author will be properly credited when Content is used. It also grants others permission to modify and redistribute the Content if they clearly mark what changes have been made, when they were made, and who made them. Finally, the license insures that if someone else bases a work on Open Content, that the resultant work will be made available as Open Content as well. (Open Content, 2002) [6]

67 The licence is designed to complement the work done in the Open Source software movement. 'Open Content is freely available for modification, use, and redistribution under a license similar to those used by the Open Source / Free Software community.' The content in Open Content 'is just about anything that isn't executable' (Open Content, 2002).

68 The motivation to create the Open Content Licence stemmed from Wiley's enthusiasm to share his course materials with others while retaining some rights over how the content is modified (Grossman, 1998). The Instructional Use of Learning Objects, whose editor is David Wiley himself, is published under the Open Content Licence and made both available free online and purchasable in print. Such is Wiley's conception of a new economic model for educational content.

69 Wiley rejects the one-teacher-to-many-students-under-one-institution model of content creation. Learning objects with the Open Content licence embody the belief that many-teachers-to-many-students will significantly reduce the cost for the lone teacher to create learning resources and that students will benefit from higher quality content. This view favours the lone teacher and

student, whom Wiley views as somewhat similar to isolated programmers participating in the Open Source software movement.

70 > Once the ratio of production cost to number of uses nears zero, access to learning objects can be made available for free. Better yet, Open Source development models can be adopted to drive the cost of learning object creation toward zero (the ratio of development work to volunteer developers), making learning objects freely available from their genesis... Each of these scenarios can provide teachers and learners with access to high quality educational materials they could never afford to produce individually. (Wiley, Gibbons and Recker, 2000; emphasis in original)

71 The integration of the Open Source concept into learning objects is evident when one compares open, web-based learning object repositories (e.g., AEShareNet, 2002; CAREO, 2002; MERLOT, 2002) with repositories of Open Source software (e.g., Freshmeat, 2002). [7] Both types of repositories usually consist of records of the object's description, author, version number, and licence type. Users are able to download and use the objects according to the licensing agreement. The process of participating in instructional design with learning objects, using content from these repositories, is not very different from that of programmers participating in Open Source software development.

72 Furthermore, the fact that the Open Content licence demands every modification be marked is in tension with the variability afforded in new media. Wiley's promotion of reusability over repurposability can be seen as an attempt to limit variability through simplifying and regularising the reuse of these new media/ learning objects. The principle of modularity also leaves the question of intellectual property rights uncomfortably open: When someone modifies an image within a web page, should he or she refer to the changes they made in regard to the image or the whole web page?

73 While Open Content is only a minor initiative in the wider field of learning objects digital rights management (DRM), it illustrates how the extra layer of copyright complicates the relationship between new media and learning objects. Other initiatives like ODRL from the W3C are gaining popularity, but the question of embracing the modularity and the variability of new media/ learning objects remains unresolved. The same problem haunts new media producers, and one solution was through the Creative Commons project, where media producers are offered a range of user licences to assign to their new media objects (Creative Commons, 2003).

74 In the field of learning objects, Higgs, Meredith and Hand (2002) have suggested a distinction be made between "Enforced DRM" and "Attributed DRM". Enforced DRM is the current model for the recording and movie industries, and Attributed DRM, like the approach taken in Creative Commons, allows the creators of the content decide what rights they allocate to the user.

## Conclusion

75 In highlighting the relationship between new media objects and learning objects over that of programming objects and learning objects, I have shown how new media principles are applicable to learning object designs. The problem with an object-oriented programming view of learning objects is that it takes digital resources out from their educational technology context and places them with computer software. The latter categorisation does nothing to help teachers decide how these learning objects can contribute to their teaching. The hyped learning object discourse appeals to managers as it implies a reduction in production costs. However, in questioning the relationship between learning objects and programming objects, it is clear that the claim of reusability is ill-founded.

76 More importantly, the object-oriented view to education skews teachers to consider a content-oriented form of teaching, rather than a student-centred approach. It presents a risk of regressing into a behavioural model of education which was prevalent in the 1960s. As the human teachers/ designers are being black-boxed, and learning is seen as an algorithm that can be run, the student is subjugated to the content.

77 Learning object debates resonate with new media debates because of the common medium. Learning objects have cultural issues specific to education. This article has concerned itself with the task of separating issues that belong to the medium from those belonging to management and education, and a team-based approach to learning object production with experts in new media, management and education is necessary for all learning object productions.

## Author's Biography

Karen Woo is a PhD candidate at the Media and Communications school at UNSW researching film piracy. Currently, she is working on a COLIS project based at Macquarie University that looks at the users' perspective of learning objects. Previously, Karen has worked with OTEN-DE on the development of learning objects in the VET sector, and has written her Honours thesis on the cultural roots of learning objects.

## Notes

[1] Though this paper is dedicated to thinking about the object part of learning objects, I was told a number of times by others working in the field that "learning resources" or "learning aids" instead of "learning objects" should be used when we talk to teachers. The term is simply deemed "too techy" by many. How the terminology slips from one context to another is interesting but is beyond the scope of this paper.

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[2] I am only contending for a weak link between computer science and learning objects. Historically, the link may be stronger than that suggested here.

Perhaps the first to make the conceptual link between computer objects and education was John Spohrer, the founder of the Education Object Economy. His project began in 1994. Its goal was to create Java applets to be shared by educators around the world. As all EOE objects were all Java applets, they were real programming objects. Some themes of learning objects were already present in this early project, including sharing and reusability (EOE, 2002b). The relationship between computer science and the present learning objects are obviously less closely related.

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[3] I am using the Foucauldian definition of the word. Discourse is not limited to language and organising rational thought. Rather, it assumes a political approach, and sees discourse as a way of doing (Love, 2002).

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[4] For example, at the 2002 World Wide Web Conference, a paper was presented to address the link between semantic web and e-learning (Nilsson, Palmer and Naeve 2002).

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[5] Granularity is another concept borrowed from object-oriented programming. In a computer science context, it refers roughly to how simple or complicated a programming routine should be in order to achieve maximum reusability.

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[6] The basic idea behind open source is very simple: When programmers can read, redistribute, and modify the source code for a piece of software, the software evolves. People improve it, people adapt it, people fix bugs. And this can happen at a speed that, if one is used to the slow pace of conventional software development, seems astonishing. 'We in the open source community have learned that this rapid evolutionary process produces better software than the traditional closed model, in which only a very few programmers can see the source and everybody else must blindly use an opaque block of bits. Open Source Initiative exists to make this case to the commercial world' (Open Source, 2002).

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[7] CAREO is an open repository developed by the University of Alberta in Canada. The repository contains a collection of learning objects that can be freely downloaded and it welcomes contributions by educators around the world (CAREO, 2002).

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## References

ADL (2003),

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