What makes a good Learning Object?

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Abstract

This paper reports findings from a pilot study aimed at investigating responses of Year 5 (N=96) and Year 9 (N=77) students in Tasmanian and Victorian classrooms simultaneously linked to online science learning ‘objects’ (bounded online teaching and learning experiences). Our partners in this project were the State Education Departments and the Catholic Education Systems of Tasmania and Victoria. Conducted over a six-week period in late 2003 most students had Internet access outside school hours and were encouraged to interact with the dedicated web site in their leisure time. Using the WebCT learning content management system we were able to monitor students’ interactions, and log their online pathways. The messages from students and teachers involved were clear. There is need for fast and efficient infrastructure for access, and the content of learning objects needs to be fast moving, appear real, include colourful graphics, and use minimal amount of text.

Keywords: New pedagogies, Information and Communication Technologies

Introduction

Informed by our current ARC Linkage research¹ our belief is that online learning or e-learning works best when the learner is in control of the process of accessing relevant content where and when it is needed (Robertson, Fluck, Webb and Leochel 2004). To this end we have taken the next step in our quest for pedagogical meanings by focussing our research on the new online learning objects. Defined by the International Technology Education Association, as ‘human-made environments or systems’², ‘online’ learning objects are part of the new digital software environment of virtual and flexible teaching and learning. In this paper we report on a research study to consider the efficacy of online learning objects designed around a science teaching module. The study was conducted with teachers and students located in Victorian and Tasmanian schools late 2003. We sought answers to three main questions:

- What makes a good learning object, or what are the characteristics which make an online object work or not work well?
- How are teachers able to capitalise on the opportunity to interact with another class using the same object?

¹ Robertson, M.E & Fluck, A On-line Learning and Authentic Teaching Skills in Primary Education (including APAI): LP0210823 ARC Linkage Project 2002-04
² See http://www.iteawww.org/
• What are the implications for teaching when all students have access to the online learning objects outside school?

The research extant

Refereed research publications in relevant areas are more likely to be in higher education (DEST\(^3\)). However, there is very little research to support the implementation of online learning initiatives into school education (Becta\(^4\)). Nor is there much evidence of relevant responses in teacher training (DEST 2001). At the same time as part of the ‘Backing Australia’s Ability Plan’\(^5\) the Australian government has invested $68 million over five years (2001-06) in the Schools Online Curriculum Content Initiative (since subsumed by The Learning Federation), in partnership with the New Zealand government. Multi-media developers successfully tendering for these lucrative government contracts are largely reliant on *ad hoc* pedagogical advice. Here-in lies part of what appears to be a much broader problem related to teachers and students as knowledge makers with the digital materials and one that we seek to investigate (Mann and Stewart 2000; Leach and Moon 1999). Like other forward thinking nations working in the leading edge zone of information and communication technologies (ICTs) Australia, its states and territories and New Zealand governments are encouraging research into new pedagogical approaches to help prepare the new knowledge workers and to transform the way we think about schools and schooling (see DEST ministerial papers *Learning for the knowledge society: An education and training action plan for the information economy 2001*\(^6\), *Teachers for the Twenty-First Century ministerial statement 2001*\(^7\)). Along with New Zealand, all states and territories are involved in this partnership with matching funding administered by the Australian and New Zealand Ministers of Education through the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA).

Expanded broadband connectivity is linked with the belief that online curriculum content will improve learning and result in smarter information use (The Learning Federation 2001). Under the umbrella organization of The Learning Federation\(^8\), the Commonwealth’s major contribution is the development of online ‘learning objects’. Strictly controlled through The Quality Assurance Framework they are targeted at improved outcomes in priority learning areas. Reflecting best known international practice the standards for developers are some guarantee towards the development of learning objects that are portable to multiple learning contexts; are inclusive of disability, ethnicity and other minority groups, and have the capacity for lasting relevance and transferability to each of the states’ curriculum frameworks. The Australian government recognises this need with its backing of curriculum content and its teacher professional development Curriculum Communities initiative.\(^9\)

New technological developments are not focussed entirely on online learning objects around the world. In the United Kingdom, British Educational Communications and Technology Agency (Becta) ICT Research reports suggest the benefits of Handheld Computers (PDAs) in Schools (2003)\(^10\), the positive influence of interactive whiteboards on learning outcomes (Glover and Miller 2001) and the need to rethink ‘homework as ‘home-school work’\(^11\). In the

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\(^{4}\) see [www.becta.org.uk](http://www.becta.org.uk)/research/reports


\(^{8}\) see [http://www.thelearningfederation.edu.au](http://www.thelearningfederation.edu.au), Accessed May 2004


\(^{10}\) Online at [http://www.becta.org.uk/research/reports/portalbict.cfm](http://www.becta.org.uk/research/reports/portalbict.cfm), Accessed May 2004

\(^{11}\) online at [http://www.becta.org.uk/research/reports/homeschoollinks/casestudies/S_brindley.cfm](http://www.becta.org.uk/research/reports/homeschoollinks/casestudies/S_brindley.cfm), Accessed May 2004
United States, Clark (2001) reported that in 2001 more ‘virtual schools’ came online than in
the previous 5 years. These findings highlight the urgency for pedagogically linked research,
such as we describe in this paper.

The Study

Sample
This pilot study was designed to test the feasibility of a more ambitious national project in the
future. It relied upon the goodwill of colleagues in four school systems – the Victorian and
Tasmanian state education systems and the Victorian and Tasmanian Catholic Education
Systems. There were a total of eight schools and teachers. They included one class of fifteen
year-olds and one of eleven year-olds in each state from each of the two school systems. In
all, the samples involved 96 eleven year-old students and 77 fifteen-year olds. A description
of the classes is pertinent to the research outcome. It is particularly relevant for highlighting
potential differences in the profiles of school populations likely to be interacting with the new
online learning resources. Numbers refer to student numbers involved in this research project.

Victoria
School A (Secondary High School, suburban Melbourne, n=25). This school was situated
outside the urban centre and experienced numerous difficulties associated with ICT
governance. At one point the firewall protecting the school network was programmed to
forbid access to the project materials.
School B (Catholic Secondary School – Suburban Melbourne, n=5). This large school had
good Information Technology infrastructure and support staff for student queries.
School C (Primary school in outer Melbourne, n=24). This school community is well
supported with Information Technology infrastructure and skilled staff. The school population
is predominantly from middle class professional backgrounds.
School D (Catholic Primary school in inner Melbourne, n=24). The school community is
primarily comprised of new arrivals to the country with Vietnamese being the predominant
spoken language other than English. The school employs a full-time translator.

Tasmania
School E (Secondary High School – suburban Launceston, n=19). This school is well
equipped and supported with Information Technology infrastructure. It mainly draws students
locally from a mainly middle class suburban catchment with a proportion of students from
troubled backgrounds (including homeless).
School F (Catholic Secondary School – suburban Launceston, n=28). This school is well
equipped and supported with Information Technology infrastructure. The school is the major
provider of Secondary Catholic Education in the region.
School G (Primary school in suburban Launceston, n=24). This school is located in a middle
class suburban location with reasonable levels of Information Technology infrastructure.
School H (Catholic Primary School, n=19). Located in outer Launceston this school has
recently been upgraded and attracts children from a wide area for its facilities.

The Research Design
As well as seeking answers to the questions set out in the introduction to this paper we sought
to know more about the following:

- To what extent do students access the online learning site after school hours.
- How and what uses do students make of the discussion tools in the WebCT
environment.
- What are the perspectives of the teachers supporting their students in the project.
To ensure all students had after-hours access to computers we supported the Tasmanian sample with computers at home - where none existed. Affirming our hunch regarding the extent of home access to the Internet and computers, few were needed. The average was three computers per class. Pentium II computers loaded with licensed, free and open source software were supplied to the students and families concerned. Some parents were also supplied with introductory internet connection kits which increased the proportion of students able to access the materials from home. Meetings were held with parents to explain the project. For the Victorian sample we needed to rely on existing out of school access facilities and were assured by their teachers that such access existed for the majority of students and where it was not available access could be arranged after-hours using the school facilities.

This project was organised to run for the first six weeks of the last term in 2003. The Victorian classes were not able to join the project until the last three weeks of the scheduled duration because of a mismatch between the states’ holidays. A course was established for each age group in WebCT containing six learning objects, a chatroom and discussion board, a calendar and ‘Send in your Report’ quizzes. Data were collected through teacher meetings, WebCT log files and quiz responses, individual teacher interviews and presentations by teachers at the two subsequent conferences conducted in November 2003 and March 2004\(^\text{12}\).

Establishing the WebCT site was managed within the Tasmanian Department of Education with access for all schools and students involved. Selection of the online learning objects to be used for the research was more problematic. Copyright was a major issue governing the selection of the learning objects and permission needed to be sought for their use. This led to one of the limitations of the study and restricted the numbers of the available learning objects. More recent learning object development has the benefit of increased sophistication of design features. Nevertheless, those selected provided a good range of the types of activities and interaction tools which might be included for learning objects developed in the future.

The objects available to each year group are described in Table 1 with a sample ‘printscreen’ page from the two most popular objects in Figure 1.

<table>
<thead>
<tr>
<th>Grade5/6</th>
<th>Grade 9</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grumpy in the desert:</strong> distinguishing compounds from chemical elements.</td>
<td><strong>Give Me A Brake:</strong> predict the way different vehicles and weather conditions affect the length of a skid.</td>
</tr>
<tr>
<td><strong>Inter-Galactic Cook Off:</strong> reactions that cause a chemical change.</td>
<td><strong>Biology Food Web:</strong> Roll your mouse over each Antarctic creature to find what eats it, and what it eats.</td>
</tr>
<tr>
<td><strong>Metal Munchers:</strong> Identification of metallic elements.</td>
<td><strong>It's About Numbers:</strong> Find out how the numbers of one species affect the others in the ecosystem.</td>
</tr>
<tr>
<td><strong>Ecosystem Game:</strong> Construct a food web.</td>
<td><strong>It's Not Just Wind:</strong> Design a windmill to generate electricity throughout the year.</td>
</tr>
<tr>
<td><strong>Field Trip:</strong> Load a field pack for a scientific trip in Antarctica.</td>
<td><strong>Far Out Lenses:</strong> Simulation of building a telescope and discover the optical principles involved.</td>
</tr>
<tr>
<td><strong>Gobbliser:</strong> compare your diet with the Recommended Dietary Intakes.</td>
<td><strong>The Robbery:</strong> solve the crime using forensic science.</td>
</tr>
</tbody>
</table>

\(^\text{12}\) For details of these professional learning conferences see See Research Project website: http://www.educ.utas.edu.au/users/ilwebb/Research/index.html
Results

The results that came from log files of student and teacher interactions with the learning objects and the associated WebCT site were relatively easy to collate. What follows is a series of tables which report these findings for each of the age groups followed by teacher observations of their students’ interactions and personal involvement.

Year 5 students

For the Year 5 students Table 2 shows the popularity of each online learning object. Gobbliser (see Figure 1) had nearly twice as many hits as the next most visited object, but each page was only looked at for a short time. As illustrated with the ‘print screen’ excerpts in Figure 1, possible reasons for students’ preferences could be linked to the visually colourful and apparently ‘fun’ characters; they are interactive, and have a number of ‘quirky’ features that are known to appeal to students.

Table 2: ‘Hits’ by the Year 5 children

<table>
<thead>
<tr>
<th>Grade 5 Science</th>
<th>Page Name</th>
<th>Hits</th>
<th>Time</th>
<th>Time/Hit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great Food! Great Health! –</td>
<td>Gobbliser</td>
<td>398</td>
<td>18:22:09</td>
<td>2:46</td>
</tr>
<tr>
<td>Inter-Galactic Cook Off</td>
<td></td>
<td>207</td>
<td>20:08:06</td>
<td>5:50</td>
</tr>
<tr>
<td>Ecosystem</td>
<td></td>
<td>164</td>
<td>17:44:11</td>
<td>6:29</td>
</tr>
<tr>
<td>Grumpy in the Desert</td>
<td></td>
<td>162</td>
<td>12:26:32</td>
<td>4:36</td>
</tr>
<tr>
<td>Field Trip</td>
<td></td>
<td>140</td>
<td>13:35:40</td>
<td>5:49</td>
</tr>
<tr>
<td>Metal Munchers</td>
<td></td>
<td>135</td>
<td>12:47:21</td>
<td>5:41</td>
</tr>
</tbody>
</table>

The number of hits made by the 96 students enrolled in the course varied from 0 to 211, as shown in Table 3. To explore the distribution of usage, the number of hits made by each student was entered against their name and the list sorted by this number. For summary
purposes, the sorted list was grouped, and the maximum number of hits for each group is shown in Table 3. This cumulative frequency distribution shows that the median number of hits was about 29, nearly five accesses per learning object. Only a very few students accessed the material more than 100 times.

Table 3: The distribution of ‘hits’ by percentage

<table>
<thead>
<tr>
<th>Students</th>
<th>1-10</th>
<th>11-20</th>
<th>21-30</th>
<th>31-40</th>
<th>41-50</th>
<th>51-60</th>
<th>61-70</th>
<th>71-80</th>
<th>81-90</th>
<th>91-96</th>
</tr>
</thead>
<tbody>
<tr>
<td>max hits</td>
<td>0</td>
<td>6</td>
<td>13</td>
<td>21</td>
<td>29</td>
<td>37</td>
<td>46</td>
<td>57</td>
<td>74</td>
<td>211</td>
</tr>
</tbody>
</table>

As well, the time of day of each access was an indicator of out of school use of the learning objects (see Table 4). Using the same ordered list as above, the central student in each group was examined to see at what time each day he or she logged into WebCT. Times before 08:30 or after 15:00 were taken to be outside school time, and the inference was that this was likely to be from home. Students may have been using school equipment for some of these instances, but the assumption was that they were then operating outside the set class hours, and were effectively in a pre- or after-school care situation rather than under normal teaching supervision. Table 4 shows the distribution of school and home accesses obtained by this process. Examination of the total accesses of this sample shows 48 percent were from home, a figure at variance with later analysis.

Table 4:

<table>
<thead>
<tr>
<th>Students</th>
<th>1-10</th>
<th>11-20</th>
<th>21-30</th>
<th>31-40</th>
<th>41-50</th>
<th>51-60</th>
<th>61-70</th>
<th>71-80</th>
<th>81-90</th>
<th>91-96</th>
</tr>
</thead>
<tbody>
<tr>
<td>number of school accesses (0830-1500 hours)</td>
<td>0</td>
<td>4</td>
<td>11</td>
<td>5</td>
<td>12</td>
<td>17</td>
<td>27</td>
<td>16</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>number of home accesses</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td>17</td>
<td>8</td>
<td>62</td>
</tr>
</tbody>
</table>

An analysis of time of day of the first and last access of the materials showed that 78 percent of these student access times were at school and 22 percent were from outside school.

Following their interaction with each online object students were asked to complete the ‘Send in your Report’ quiz. Table 5 is illustrative of the information reported on one of the learning objects.

Table 5: Student reports on learning objects *Grumpy in the desert* (N=12).

<table>
<thead>
<tr>
<th>Loading speed</th>
<th>Slowly (took more than 3 minutes)</th>
<th>Moderately (took about one minute)</th>
<th>Fast (took less than 30 seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>42%</td>
<td>50%</td>
<td>8%</td>
</tr>
<tr>
<td>Smooth running</td>
<td>Yes - it was very quick to respond</td>
<td>OK - I could see it working</td>
<td>No - it ran so slowly I kept getting mistakes</td>
</tr>
<tr>
<td>42%</td>
<td></td>
<td>50%</td>
<td>8%</td>
</tr>
<tr>
<td>Accessed from</td>
<td>Home =17%</td>
<td>School =83%</td>
<td></td>
</tr>
<tr>
<td>What was learned</td>
<td>I learnt that you use a magnet to separate tea leaves and iron fillings and you use paper filters to separate water and sand.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommend to a friend?</td>
<td></td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>Recommendations</td>
<td>This object would be better if you make Bruce not a wincer.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average rating</td>
<td></td>
<td>6.45/10</td>
<td></td>
</tr>
</tbody>
</table>

The quiz asked questions related to where they accessed the learning object, the loading speed, how well it seemed to run, what they learnt, their recommendation regarding its perceived value that they would report to friends, and, finally, their overall recommendation.
These data were very useful in gathering an overall report directly from the students, and were incorporated into the results. Loading speed was an issue especially where broadband width connectivity was limited. This was more likely to occur at home and on some of the older computers in school classrooms.

Table 6 provides a set of sample responses to the objects. As their comments reveal they were frustrated by the slow loading of the objects.

**Table 6: Year 5 responses to selected learning objects.**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fieldtrip</strong></td>
<td>‘It was good and fun but there should have been a bit more at the end not just you are now ready for your field trip.’ (Female)</td>
</tr>
<tr>
<td><strong>Fieldtrip</strong></td>
<td>The game field trip was OK they could have made it a bit more inventive. And not so silly with some of the things that they put in as a choice. Like the gameboy for instance. And the end part when you have got them all right it just says congratulations (very boring) it could be a bit more exciting. (Female)</td>
</tr>
<tr>
<td><strong>Galactic cookoff</strong></td>
<td>‘It was really good but it was slow.’ (Male)</td>
</tr>
<tr>
<td><strong>Ecosystem</strong></td>
<td>‘It repeated it self too much.’ (Male)</td>
</tr>
</tbody>
</table>

A further set of responses for the Year 5 came from their chat room conversations illustrated in the following discussion between two boys both from School H. Their experiences appeared social as well as ‘educational’. Names of the boys have been changed.

```
“James>>hi
Billy>>how r ya
James >>hi
Billy >>hurry up
James >>good thanks
Billy >>hurry up
James >>your stuped
Billy T>>dont swear ill tell mrs x…!!!!
Billy >>arent we supposed 2 be talkin about webct
James >>no
Billy >>u sure!!
James >>no
Billy >>then we r supposed 2 be talkin about it
James >>no
Billy >>wich one did u like
James >>the one with the goberlizers
Billy >>i made my dude really fat!!!!!!
James >>ok
Billy >>k
James >>i like the gobilizer one the best
Billy >>2
James >>m t
Billy >>wat the hell does tat mean????????
James >>dont now
Billy >>ur strange!
James >>y2
Billy >>wat does dat mean????????
James >>dont now
Billy >>i was hopin dat some punchbowl people were on!
Billy >>cya again soon
James >>bye
Billy >>bye”
```
The mix of SMS text or abbreviated language and personal exchanges seem part of an exchange ritual that supports other findings related to e-learning. When learners work collaboratively they are more likely to sustain their interest and assist each other in problem solving (Robertson et al. 2003). In this conversation the boys are supporting each other’s interest in the objects. Arguably their entry into the chat room conversation has a novelty effect. The space provides a place where they feel relatively ‘private’ from their teacher’s gaze. Although their exchanges seem more about ‘talking’ themselves through the site their exchanges provide a useful insight to what appeals or is engaging the interest of these younger students.

In brief, the conversations of the students in the chat rooms revealed much about their preferences related to the online learning object material. At the same time the relaxed manner of their dialogue suggested the ease with which they developed trust within the site and felt able to casually interact or engage with the material in both formal and informal levels. Popular culture skills and interests are reflected in the students’ learning object preferences and in the ways in which they behaved.

**Year 9 students**

For the older students, *Give me a brake* (see Figure 1) - the simulation of vehicle deceleration - proved to be the most popular, with 179 hits (see Table 6). This learning object had strong visual appeal, and perhaps covered a subject (for young people close to the legal age for acquiring a learner’s driving licence), which was intrinsically motivating. The time spent on it was very similar to the next most popular object *Investigate the robbery*. The latter was based upon a theft at a party (once again a topic considered to have intrinsic appeal for adolescents). However, several teachers and students reported great problems accessing this object, since it depended highly upon video clips which required particular plugin software to be installed and much higher bandwidth resources.

<table>
<thead>
<tr>
<th>Page Name</th>
<th>Hits</th>
<th>Time</th>
<th>Time/Hit</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Give me a brake</em></td>
<td>179</td>
<td>26:58:53</td>
<td>9:02</td>
</tr>
<tr>
<td><em>Investigate the robbery</em></td>
<td>146</td>
<td>22:13:06</td>
<td>9:07</td>
</tr>
<tr>
<td><em>Food Web</em></td>
<td>103</td>
<td>7:15:28</td>
<td>4:13</td>
</tr>
<tr>
<td><em>It's not just wind</em></td>
<td>93</td>
<td>8:09:34</td>
<td>5:15</td>
</tr>
<tr>
<td><em>It's About Numbers</em></td>
<td>71</td>
<td>7:34:08</td>
<td>6:23</td>
</tr>
<tr>
<td><em>Far out lenses</em></td>
<td>49</td>
<td>4:31:22</td>
<td>5:32</td>
</tr>
</tbody>
</table>

Year 9 students had little time for access to the chat room and discussion board components during the research period. However, their reports on each object help reveal the content of their experiences Sample comments related to the two ‘favourite’ learning objects are reported in Table 7. Both of these objects allow students to move quite rapidly through a series of choices leading to outcomes that are readily observable and linked with feedback on their selections from the menus provided. Adding to their attraction was the fact that specific feedback to students was available from the reports submitted for each object.
Table 7: Individual student comments related to sample objects:

<table>
<thead>
<tr>
<th>Investigate the robbery</th>
<th>Give me a brake</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘The robbery is my favourite game...I like finding the evidence but after you have played it a few times it gets boring. It is the hardest learning object to play. I would suggest it to anyone.’ (Female)</td>
<td>‘The braking game is good but it is annoying when the other activities don’t load. I had trouble getting into any of the others.’(Male)</td>
</tr>
<tr>
<td>‘I found it very interesting once the video clips started to work. The collecting of the information was fun...but it should tell you that you have caught the criminal.’ (Male)</td>
<td>‘I liked this game very much and it did not take very long to get the hang of. I hope the other games are as good.’ (Male)</td>
</tr>
<tr>
<td>‘I think the robbery was quite good but it does not tell you the answer. I think it was either Faith, because she matches the fingerprints and the blood or Jane because she matches the handwriting.’ (Female)</td>
<td>‘I think this page helps with your learning about road safety and what the difference is between treaded, bald and slick tyres, but it gets a bit boring after a while because the car travels too slowly.’ (Female)</td>
</tr>
<tr>
<td>‘I still don’t know who stole the medal because my computer was being stupid and I could not see the video evidence!’ (Male)</td>
<td>‘Today I completed the car test. At first I didn’t really understand what it was meant to be teaching us, but after trying it out a couple of times then I understood it and found it very interesting. I learnt a lot from this exercise.’ (Female)</td>
</tr>
</tbody>
</table>

One class of Year 9 students provided general comments on the whole website. Their seemingly critical comments are further evidence of online learning features that focussed their attention. The following student reflection provides a summary of their concerns.

The learning object website I thought was a bit boring I thought with the car going along the road it didn’t really show good graphics...the objects were all so dull. I think to amuse young adults they need to make them a bit more exciting and to explain better what to do. I thought that all the objects were very hard to understand.

What focused their attention seemed to be how well the learning object performed as a ‘game’. Their criteria for success were frequently expressed in these terms with references to quality of the graphics, levels of excitement, ‘fun’ component and outcomes, or what could be taken away from the experience. As one student commented:

The site could be improved with better learning games, no password to get in, and have games that you can play against your classmates...’.

Speed of loading was a further issue for some students especially where video clips were included. Slow delivery of material will test students’ patience to continue as will repetitive images and incomplete solutions. For instance, with learning objects that created interest such as The robbery for Year 9 and Fieldtrip for Year 5 many comments referred to the frustration of being ‘suspended’ at the end without adequate debriefing. Having passed the test of firing their imagination they left the learning object site feeling disappointed at the absence of a solution or appropriate ‘ending’. The selection of their comments for the different objects shown in Table 8 further illustrates these expectations.
Table 8: Year 9 student reports on specific objects

<table>
<thead>
<tr>
<th>Object</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Robbery</td>
<td>‘I can’t finish this game as the video clips don’t work and I can’t access the rest of the evidence. I would really like to finish it...’ (Female)</td>
</tr>
<tr>
<td>It’s just in the wind</td>
<td>‘I didn’t really like this game much because I found it difficult to get started. I liked it in the end because it gave some good information.’ (Female)</td>
</tr>
<tr>
<td>The robbery</td>
<td>‘I think the robbery was quite good but it does not tell you the answer. I think it was either faith, because she matches the fingerprints and the blood or Jane because she matches the handwriting on the cheque.’ (Male)</td>
</tr>
<tr>
<td>Not stated</td>
<td>‘This site is ridiculous its too hard to get into and I think the site should be easier to access by all students over all out of 10 I would give this site a 4 grrr it jammed my computer.’ (Male)</td>
</tr>
<tr>
<td>Biology Food Webb</td>
<td>‘The biology food web is OK...It is quite interesting but you can get easily bored. So maybe you can add something else on there to play that is fun.’ (Male)</td>
</tr>
<tr>
<td>Windmill</td>
<td>‘I enjoyed this. I found it quite interesting. If you are in winter, and have big propellers it only used 6% of the battery whereas in summer it used something like 20%.’ (Female)</td>
</tr>
</tbody>
</table>

Teachers

Teachers working with students using online learning tools were familiar with ways of supporting student learning. They were expert in scaffolding the activities for their classes. Hence, all eight teachers entered this project enthusiastically but found the role they were asked to play became frustrating. Rather than ‘teacher’ we asked them to become ‘participant observers’ and facilitators of the project. This role prevented them from participating fully in the teaching process with their students. Nevertheless, they employed very supportive processes that encouraged the students to participate throughout the life of the project – an aspect that other researchers have found difficult in online contexts (Mann and Stewart 2000).

An unexpected teacher role developed in the one school where the majority of the children are of non-English speaking backgrounds. These younger Year 5 students found the quantity of text in some of the modules very challenging and the teacher was required to interpret in simpler language. Given the profile of the school this observation should not have been surprising. Nevertheless, the reactions of these children served as a further reminder of the need to choose objects very carefully to match the needs of learner. Another dimension to this complexity related to the graphics. The feedback was that they need to be self-explanatory and minimise the need for language.

Specific feedback comments from all teachers involved help elucidate these points:

- The students tended to click through the introductory text of objects to get rapidly into the activity, and hence did not focus their learning on the intended outcomes.
- Non-English speaking background children had no concept of what a ‘Penguin Rookery’ was, and a hyperlink to a picture and short explanation/definition would have helped immensely. Larger font text and ‘plainer English’ would also have helped.
- Positive object characteristics were sound effects, videos and the cartoon characters such as the alien in Inter-Galactic Cook-Off.
- It can be very frustrating not to have designer access to the WebCT course containing the six learning objects. This is the way in which teachers can scaffold the learning of
students, providing the introductory and reflective material they need, and which the objects themselves do not provide.

- The students thought that overall there was too much repetition when using some objects. For instance, in most of the simulations they changed a few initial conditions and then re-ran exactly the same basic situation again. Some objects required all the parameters to be re-set from the beginning.
- The loading time for the objects was sometimes too long (though we never figured out why it varied).
- After some casual use both in and out of class, one student was heard asking if all lessons could be based upon online learning objects, because they made things easier to understand.
- Some objects showed real life experiments which children could actually do themselves: this had value for teachers (no mess) but was seen as a useful adjunct to practical activities rather than a replacement.
- The ending was quite exciting in some objects, but others terminated with a disappointing “Congratulations – now try again!”

**Discussion**

The analysis of logon times aligned very closely with the access location information from students, making us confident that about one fifth of online learning object use was from outside school. Teachers generally supported, but did not require, students to extend their investigations beyond the classroom. However, in their reports, they were supportive of the value of such home-school work, where students were highly motivated to share their learning with other members of their home.

A good learning object was hard to define, comprising issues related to bandwidth requirements, local computer capacity and responsiveness and degree of interactivity. Most teachers believed that the online learning objects required introductory whole-class discussion before use, and many thought that some kind of confirmatory exercise (possibly an assessment) was needed after use to verify students had learned what was intended. The curriculum-bound scaffolding elements were noticeably missing from the learning objects, and we presumed this was because of their intended wide distribution. It would be worthwhile in a future project comparing these government/quasi-commercially produced objects with those emanating from open source projects overseas.

In practice it was very hard for teachers to capitalise upon inter-class communications using a particular object as a focus. However, in the one instance where such a connection was established, it was reportedly very popular and self-sustaining. The conversations between students quickly went beyond the focus object to embrace all students and teachers who were available online. Teachers reported that student learning was widened by these conversations in the ‘chatroom’. Hence, while their own involvement was restricted by the scope they had to shape the learner instructions there was evidence of goodwill and imaginative ideas of how best to use such materials in the future. Similarly, the students who made many quite candid comments were also willing to engage in the project and stretch their imaginations to see the potential benefits of learning objects.

**Conclusion**

The project identified some useful investigatory techniques for assessing the impact of online learning objects. What we have learned is that students in the research group were eager to
seek significant engagement with the learning materials outside school with their peers, and previously students in other schools and interstate whom they met online. They enjoyed the possibilities for dialogue which the WebCT tools enabled. Insofar as the group of students involved is generally representative of a broad band of the school age Australian population, then one could speculate that many others are also close to taking up similar extended learning opportunities.

Some of the characteristics which made learning objects attractive were often limited by bandwidth. The effects students and teachers wanted to see such as video, colourful animations and sounds are all bandwidth hogs. However, there were important design features such as the use of plain English, large fonts, hyperlinked explanations, affirmative conclusions and implicit parameter editing which could improve the reception of the objects. The difference between these two audience perceptions is an important distinction, since the first can be expected to improve with the roll-out of new technologies by communications carriers, but the second will not change without a new investment in object re-engineering.

The curriculum contextualisation of each object was ‘re-discovered’ in every classroom. Although teachers regarded them as useful learning materials in many ways, they were also aware of the significant effort required on their part to get students started, and to complete the assessment exercise. Text books do not have this additional labour, so one further recommendation for the online learning objects distribution is that they will benefit from such introductory support material. As this project has shown, there is a novelty factor with the learning objects at the moment which is unlikely to last once they are in more general classroom use. Apparent issues perceived as problems now may threaten their success in the future. Working in partnership as we have in this project is a way to maintain cooperation and learn from the users the real issues likely to lead to relevant and lasting learning outcomes.

On a positive note to finish, the project highlighted the potential benefits for students working within online learning spaces to broaden their communication skills. The same could be said of the teachers involved. By providing a community of practice (Wenger 1998), or an environment where participants could learn together, their professional learning was enhanced by the project. Teachers involved unanimously endorsed the underlying principles of action learning and action research involved in this pilot project. Authentic learning experiences enable the pedagogy to develop.

References