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Students’ Perceptions of the Value of the Elements of an Online Learning Environment: Looking Back in Moving Forward

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In 2003, Deakin University implemented a centralized learning management system (LMS) under the banner of Deakin Studies Online (DSO), as well as implementing policies requiring all its units of study have at least a basic online presence from 2004. Given the scope of the university’s commitment to online education, it was considered essential to evaluate the effectiveness of this investment. Based on more than 5400 responses obtained from students in 2004 and 2005 as part of the DSO evaluation survey, the analysis presented here identifies those elements of the online learning environment (OLE) that are most used and valued by students, those elements of the OLE that students most want to see improved, and, those factors that most contribute to students’ perceptions that use of the OLE enhanced their learning experience. The most used and valued elements were core LMS functions, including accessing unit information, accessing lecture/tute/lab notes, interacting with unit learning resources, reading online discussions, contacting lecturers/tutors, and, submitting assignments online. The OLE elements identified as most needing attention were receiving feedback on assignments; viewing my marks; and reviewing unit progress. Students felt that using DSO enhanced their learning experience when they were: adequately supported by unit teachers and technical support services; when they are able to find and use unit information; and, when they are able to read the online contributions of other unit members. The retrospective analysis of data collected in the period 2004-2005 has been shaped by a forward looking agenda. The array of elements available within, and in association with, traditional LMSs which has emerged since that time raises the future challenge of how to maximize and evidence educational value through the optimal combination of elements from the portfolio of e-learning technologies increasingly available to educators.

Keywords: online learning environment; student evaluation; satisfaction; learning experience; e-learning portfolio

Online learning at Deakin University

In Australia, Deakin University is a major provider of distance and online education. In addition, it teaches on-campus at four campuses located in three cities in the State of Victoria. Initially, Deakin saw itself as a major distance education provider, with some degree of separation between its teaching methods and materials used for on-campus teaching as opposed to off-campus teaching. The use of distance education methodologies and materials for both student cohorts gathered momentum in the early to mid-1990s under the strategic umbrella of flexible teaching and learning, and with a growing ‘technological imperative’ (Holt & Thompson, 1995) for the use of online systems for learning delivery and communication. In more recent
times the University has implemented institution-wide online teaching and learning systems to provide opportunities to bring together all students in the one learning community. Such inclusively designed online learning environments are seen to provide all students, irrespective of their official mode of enrolment and location, with equal access to learning resources and channels of communication with their teachers, fellow students, and academic and administrative support services. Pragmatically, many universities are now confronted with the need to provide more flexible, time- and/or place-independent study pathways in the face of growing trends towards increasing part-time employment and student mobility. It would seem that even traditional, school-leaver campus-based student cohorts are taking on the characteristics of their mature-aged, in-employment, off-campus counterparts. This is happening to such an extent that we might argue that many students now seem to be having the distance-type learning experience to one degree or another.

Online learning environments (OLEs) have been a feature of educational landscape at Deakin University since the early 1990s. Starting first with a range of different systems used in different academic departments of the university, and primarily used for particular course, units of study or functions, the university gradually moved toward centralization through the implementation of a corporately supported learning management system (LMS). Iterating through a number of commercial LMSs, the university eventually settled on the WebCT LMS in 2003, branding it internally as Deakin Studies Online (DSO). The new LMS was trialed in 2003, and fully implemented in 2004, concurrently, the university introduced policies requiring academic departments to migrate all OLE activity to the centrally supported LMS. University policy identified three classifications of online units: Basic Online (administrative support for unit); Extended Online (at least one component of teaching in the unit occurs online); and, Wholly Online (all of the teaching of a unit occurs online) (Deakin University, 2005), with these categories being analogous to those employed more widely in the sector (Browne, Jenkins, & Walker, 2006). Another key initiative in the University’s strategy to expand its online and distance education profile was to require that, from 2004, all its units of study have at least a ‘Basic’ online presence, where ‘Basic’ was defined in detail as:

- Essential elements
  - information about the unit (typically as a unit guide)
  - a discussion forum for student queries
  - a notification facility for unit announcements
  - a statement of expectations indicating how students are expected to communicate with staff, which will include how frequently staff in the unit will access the student queries discussion forum and how frequently students are expected to access the forum.

- Additional elements
  - Optional support elements may include electronic resources for the unit if available. (Deakin University, 2005)

The period, therefore, between 2003 and 2005 represented an important time in which the University strategically repositioned itself with a demonstrably strengthened commitment to online education. It represents a significant historical context of investigation.

Deakin University administers a central student evaluation of teaching survey (known as student evaluation of teaching and units – SETU) following every offering of a unit of study. The implementation of this central survey coincided with the implementation of the LMS in 2003. The importance of OLEs to teaching and learning at Deakin University is reflected in the inclusion in SETU of a scale item that seeks the respondent’s level of agreement with the statement “The online teaching and resources in this unit enhanced my learning experience”. Given Deakin University’s commitment to online education, performance on this SETU item is considered crucial, and it is one of only three SETU items for which the performance of all units are reported to the University Council. In Australia, since 1993, all universities have been required to participate in the Course Experience Questionnaire (CEQ) – a survey sent to all Australian university leavers.
shortly after graduation seeking to measure their satisfaction with their university studies in wide range of dimensions. The CEQ data is publicly available, and is used by third parties to create university ‘league tables’ (Niland, 1999). Beyond influencing public perception about the quality of teaching and learning at a university, the CEQ data is also used by the Australian government as one input into the Learning and Teaching Performance Fund (LTPF). The LTPF aims to reward those Australian universities that best demonstrate excellence in undergraduate learning and teaching, and over AU$82 million was available for distribution in 2007 based, in part, on CEQ ratings. Beyond the individual unit of study level, the pervasive presence of the OLE in all units means that it contributes significantly to a student’s overall perception of their teaching and learning experience at Deakin University.

Given the scope of the university’s commitment (in terms of central infrastructure and roll-out of online elements to all taught units) to online education, it was considered essential to evaluate the effectiveness of this investment. In 2003, a pilot survey of staff and students using DSO was conducted to establish perceptions of importance and satisfaction with various elements of the OLE. Following the full mainstreaming of DSO in 2004, the survey instrument was revised, and the survey process was expanded to include all Deakin staff and students, and repeated again in 2005. The survey was administered using a university online survey tool. These surveys produced a large pool of data, some of which has been reported previously (Challis, 2005). Since the time of the initial conduct of the surveys, the critical influence that the pervasive OLE has on student perceptions of their learning experiences at Deakin University has been fully recognized, as has the flow-on impact of this perception on national teaching and learning indicators and funding opportunities. Moreover, with the advent of other e-learning technologies and open source learning environments, there is a need to refocus on further analysis of previous data collected in order to most effectively map future directions for the university’s OLE. This current investigation focuses on the more than 5400 responses obtained from students in 2004 and 2005, seeking to identify what elements of the OLE were valued most by students, and, what factors contributed to students’ perceptions that use of the OLE enhanced their learning experience. Better understanding these factors will allow more informed policy and decision making regarding future developments in this area that is so important to student learning at Deakin University.

**Methodology**

During 2004 and 2005, all students at Deakin University were invited to complete the DSO evaluation survey. The DSO evaluation survey sought responses from students relating to:

- demographic and background information;
- perception of importance and satisfaction with a range of OLE elements;
- a number of overall OLE satisfaction measures; and
- open-ended written comments about the OLE.

The survey included a scale item seeking the respondent’s level of agreement with the statement “The use of DSO enhanced my learning experience”. This item was considered particularly important, given that it is essentially identical to the SETU item relating to student satisfaction with the OLE. There were three minor differences between the DSO evaluation survey in 2004 and 2005. Firstly, the phrasing of one scale item was varied for 2005 to reflect the fact that it was no longer the initial phase of the university-wide roll out. Secondly, an additional scale item was added for 2005 asking respondents to indicate their main source of support for using DSO. Finally, an additional scale item was added for 2005 asking respondents to indicate the importance of, and their satisfaction with, the level of support they had received for using DSO. The complete DSO evaluation survey is included in Appendix 1. As required by Deakin University human
research ethics procedures, the surveys were anonymous and voluntary. The collected data were analyzed and the following information was compiled:

- response rate and demographic comparison information;
- importance-satisfaction analysis;
- overall satisfaction measures; and
- multivariate linear regression to find the significant independent survey items contributing to the dependent survey item “The use of DSO enhanced my learning experience”.

Nearly 1000 open-ended written comments were received – this rich qualitative data source is worthy of its own separate analysis, and is not included here.

Results and discussion

Response rate and demographic information

Table 1 provides a summary of the response rate and demographic information for the overall enrolled student population and survey respondents in 2004 and 2005. The effective response rate was 9.2% in 2004, and 7.8% in 2005. A range of demographic information was available for the overall enrolled student population (Deakin University, 2007), as well as collected as part of the survey, including gender, mode of study, level of study, enrolled faculty, and campus attended. This permitted a comparison between the respondent sample and the overall student population on these demographic dimensions, as presented in Table 1. Although the response rates obtained are comparatively low, they are not unexpected for an online voluntary survey (Cook, Heath, & Thompson, 2000), and the generally good match between the sample and population demographic characteristics in both years suggests that we can have confidence in drawing more general inferences from the respondent data. Responses for questions 6 and 7 of the survey don’t add to the analysis here, hence, are not reported.

Table 1. Response rate and demographic information

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents</td>
<td>2908</td>
<td>31641</td>
<td>2526</td>
<td>32354</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>58.9%</td>
<td>56.8%</td>
<td>61.5%</td>
<td>57.3%</td>
</tr>
<tr>
<td>Male</td>
<td>41.1%</td>
<td>43.2%</td>
<td>38.5%</td>
<td>42.7%</td>
</tr>
<tr>
<td>Mode of study</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-campus</td>
<td>62.3%</td>
<td>60.4%</td>
<td>61.8%</td>
<td>64.7%</td>
</tr>
<tr>
<td>Off-campus</td>
<td>37.7%</td>
<td>39.6%</td>
<td>38.2%</td>
<td>35.3%</td>
</tr>
<tr>
<td>Level of study</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate</td>
<td>73.9%</td>
<td>73.4%</td>
<td>75.1%</td>
<td>73.7%</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>26.1%</td>
<td>26.6%</td>
<td>24.9%</td>
<td>26.3%</td>
</tr>
<tr>
<td>Faculty</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arts</td>
<td>14.0%</td>
<td>19.4%</td>
<td>16.0%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Business and Law</td>
<td>43.8%</td>
<td>37.1%</td>
<td>34.4%</td>
<td>36.9%</td>
</tr>
<tr>
<td>Education</td>
<td>9.0%</td>
<td>13.1%</td>
<td>12.0%</td>
<td>13.7%</td>
</tr>
<tr>
<td>Health and BS†</td>
<td>13.5%</td>
<td>13.9%</td>
<td>17.6%</td>
<td>14.2%</td>
</tr>
<tr>
<td>Science and Technology</td>
<td>19.7%</td>
<td>16.5%</td>
<td>20.1%</td>
<td>15.2%</td>
</tr>
</tbody>
</table>
Importance-satisfaction analysis

The DSO evaluation survey asked respondents to rate the importance of, and their satisfaction with, a range of elements of the OLE at Deakin University. A rating of 1 represented low importance, while a rating of 7 represented high importance. A rating of 1 represented low satisfaction, while a rating of 7 represented high satisfaction. For both importance and satisfaction a ‘not applicable’ option was also provided to permit students not using a particular element to avoid having to provide a contrived rating. Table 2 provides a summary of the mean responses for the importance and satisfaction ratings from 2004 and 2005.

Table 2. Mean importance and satisfaction ratings from 2004 and 2005

<table>
<thead>
<tr>
<th>Question</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. How important is support for using DSO to you, and what is your level of satisfaction?</td>
<td>Not used</td>
<td>5.74</td>
</tr>
<tr>
<td>9. Accessing Unit Guides/unit information</td>
<td>6.01</td>
<td>4.79</td>
</tr>
<tr>
<td>10. Accessing lecture notes/tutorial notes/lab notes</td>
<td>6.44</td>
<td>4.63</td>
</tr>
<tr>
<td>11. Contacting your lecturer via internal unit messaging</td>
<td>5.64</td>
<td>4.19</td>
</tr>
<tr>
<td>12. Contacting other students via internal unit messaging</td>
<td>4.75</td>
<td>4.11</td>
</tr>
<tr>
<td>13. Using calendar</td>
<td>3.29</td>
<td>3.71</td>
</tr>
<tr>
<td>14. Interacting with learning resources</td>
<td>5.66</td>
<td>4.37</td>
</tr>
<tr>
<td>15. Contributing to discussions</td>
<td>5.07</td>
<td>4.34</td>
</tr>
<tr>
<td>16. Reading contributions to discussions</td>
<td>5.49</td>
<td>4.62</td>
</tr>
<tr>
<td>17. Using chat and/or whiteboard</td>
<td>3.81</td>
<td>3.39</td>
</tr>
<tr>
<td>18. Working collaboratively in a group</td>
<td>4.77</td>
<td>3.74</td>
</tr>
<tr>
<td>19. Completing quizzes/self tests</td>
<td>5.04</td>
<td>4.10</td>
</tr>
<tr>
<td>20. Submitting assignments</td>
<td>6.22</td>
<td>4.13</td>
</tr>
<tr>
<td>21. Receiving feedback on assignments</td>
<td>6.28</td>
<td>3.54</td>
</tr>
<tr>
<td>22. Viewing my marks</td>
<td>6.30</td>
<td>3.83</td>
</tr>
<tr>
<td>23. Reviewing unit progress</td>
<td>5.90</td>
<td>3.78</td>
</tr>
</tbody>
</table>

A method for visualizing and interpreting importance-satisfaction data is the importance-satisfaction grid (Aigbedo & Parameswaran, 2004) – where the importance rating is plotted on the vertical axis and the satisfaction rating is plotted on the horizontal axis. Figure 1 shows the 2004 data plotted as an importance-satisfaction grid – the number labels correspond to the question numbers given in Table 2. The grid is divided
into quadrants using the grand mean values for all importance ratings as a vertical divider and the grand mean of all satisfaction ratings as a horizontal divider. The interpretation of the quadrants is normally as follows:

- Quadrant D: low importance and low satisfaction – low priority items;
- Quadrant C: low importance and high satisfaction – possibly doing more than necessary on these items;
- Quadrant B: high importance and high satisfaction – keep up the good work! and
- Quadrant A: high importance and low satisfaction – concentrate improvement efforts on these items.

However, given that students are not normally free to choose many aspects of their study, in the context of higher education, the results of the importance-satisfaction grid need to be interpreted with some caution. Figure 2 shows the 2005 data plotted as an importance-satisfaction grid.

Figure 1. Importance-satisfaction grid for 2004 data
Figure 1 and Figure 2 showed remarkable similarity in the general location of OLE elements within the importance-satisfaction grid. Students didn’t seem to value the internal messaging element of the OLE for contacting other students. This finding was not surprising given the array of options that students already have for contacting other students – on-campus students can simply meet in-person, student use of mobile phones is almost as ubiquitous as their use of email, existing third-party instant messaging tools are already used by many students, and the OLE for every unit of study is required to include an online discussion forum. Students didn’t seem to value using the calendar element of the OLE. This finding was not surprising, given that few staff use this avenue for reminding students of unit-related dates. Students are able to use this element to record their own appointments, but, they only have access to it when they are logged in to the OLE. Students didn’t seem to value the chat/whiteboard element of the OLE. This finding was not surprising, given that this element did not initially work reliably, forcing those needing synchronous communication functionality to seek alternative arrangements. Students didn’t seem to value working collaboratively in groups. This result is perhaps not surprising, as it would be easier for on-campus students working in groups just to meet in-person, and, off-campus students might prefer to work individually. However, this result is somewhat problematic, as Deakin does include ‘collaborative and teamworking skills’ amongst the set of graduate attributes it aims to develop in all it students (Deakin University, 2008), and, it highlights that not all teaching and learning activities are enacted simply to please students, nor should all activities necessarily aim for high ratings of student importance and/or satisfaction.

Students were generally satisfied with the OLE functionality of contributing to online discussions and completing online tests, though, they did not rate these elements as particularly important. This may be due to these elements generally not being used as a formal component of the unit assessment, i.e., student use of these tools did not, generally, count for marks in a unit. It is well known that students, not unreasonably, most highly value those elements of their study that most directly relate to assessment (James, McInnis, & Devlin,
OLE elements that students were generally happy with and rated highly included accessing unit information, accessing lecture/tute/lab notes, interacting with unit learning resources, reading online discussions, contacting lecturers/tutors, and, submitting assignments online. These elements could all be considered ‘basic’ OLE elements, and, an institution should aspire/hope to get a satisfactory rating from students for these elements.

Students gave the highest importance rating in combination with the lowest satisfaction rating to the following OLE elements: receiving feedback on assignments; viewing my marks; and reviewing unit progress. Given the critical importance of timely formative/progressive feedback for delivering information about progress and clarifying expected and actual performance, so as to influence students to take a proactive role in their learning and for their development as self-regulated learners (Nicol & Macfarlane-Dick, 2006; Yorke, 2003), these importance-satisfaction results should be of concern, and act as a flag for action that could have a positive impact on the contribution of the OLE to student learning. Interestingly, none of these three most critical elements from the DSO evaluation survey relate specifically to any inherently ‘online’ aspect of the OLE; they are simply basic concerns about assessment, feedback and progress that all students share, regardless of mode of study. It has been noted elsewhere that quality frameworks for online learning often contain little that is particular to ‘online’, and, that good teaching and learning is good teaching and learning, regardless of mode (Oliver, 2003).

Along with the relative importance of OLE elements, it is instructive to understand the level of usage of each element. The question of element usage was not asked directly on the DSO evaluation survey, but, could be inferred by considering any importance-satisfaction rating (other than ‘not applicable’) given to an element as an indication of usage. On this basis, Figure 3 shows the reported proportions of usage for elements of the OLE – the element numbering employed is the same as given in Table 2. In this context, ‘usage’ is determined both by academic staff electing to employ/make available a particular element of the OLE in their unit, as well as students electing to use, or not, the OLE elements available to them. The most highly used elements were those found in Quadrant B of the importance-satisfaction grid, that is, those elements students valued and were most happy with. Most of the least used elements were those found in Quadrant D of the importance-satisfaction grid, that is, those elements considered of least value by students. As with the importance-satisfaction analysis, there is a high degree of consistency in level of usage between the two years considered.
Overall satisfaction measures

The DSO evaluation survey asked respondents to rate their level of agreement with three statements about their satisfaction with aspects of their use of the OLE at Deakin University. A rating of 1 represented strong disagreement, while a rating of 5 represented strong agreement. Table 3 provides a summary of the mean responses for the satisfaction measures from 2004 and 2005.

Table 3. Mean responses for the satisfaction measures from 2004 and 2005

<table>
<thead>
<tr>
<th>Item</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>24. The use of DSO enhanced my learning experience</td>
<td>3.23</td>
<td>3.67</td>
</tr>
<tr>
<td>25. I felt adequately supported by those teaching my units to use DSO effectively</td>
<td>3.01</td>
<td>3.31</td>
</tr>
<tr>
<td>26. I felt adequately supported technically to use DSO effectively</td>
<td>3.15</td>
<td>3.50</td>
</tr>
</tbody>
</table>

Based on an independent sample t-test assuming unequal variances, for all three satisfaction questions, the mean satisfaction ratings between the two years were significantly different ($p < 1 \times 10^{-19}$ in all cases); being significantly higher in 2005 compared to 2004. Given that 2004 was the first year of the university-wide, compulsory roll-out of the OLE to all units of study, it is not unreasonable to expect that, by 2005, following a year of experience with the OLE, that students, academic staff and the university support systems (academic and technical) would all be better placed to use and support the OLE, and hence, be more satisfied with it.

The change in the mean satisfaction rating for item 24 was found to broadly mirror the trend in the university-wide mean rating for the equivalent question item contained in the SETU student evaluation of teaching survey, as shown in Figure 4. Figure 4 shows the university-wide mean SETU rating for the OLE item for the period semester 1 2003 to semester 2 2006, encompassing the period of the DSO evaluation survey data. Note that: ‘Sem 1’ refers to semester 1; ‘Sem 2’ refers to semester 2; ‘Summer’ refers to the summer semester.
that runs across the summer break between years; for the period Summer 03-04 to Summer 04-05, and for Summer 05-06, only mean rating data rounded to the nearest first decimal were available; and, where the additional required data were available, 95% confidence intervals for the mean rating have been estimated and shown.

Figure 4. University-wide student evaluation OLE satisfaction rating over time

**Multivariate linear regression**

As noted previously, the DSO evaluation survey item “The use of DSO enhanced my learning experience” is considered particularly important, given both the emphasis placed on the OLE by Deakin University generally, and, the presence of essentially the identical question in the SETU evaluation conducted for every unit. For both 2004 and 2005, a multivariate linear regression of all the DSO evaluation survey items was performed against item 24 – “The use of DSO enhanced my learning experience”. All other items were initially introduced as independent variables, and step-wise regression was performed until all remaining variables were significant. Table 4 presents the linear regression model variables, and their corresponding coefficients and significance, in order of their contribution for the dependent variable, based on 2004 data. Table 5 presents the same information based on 2005 data.

**Table 4. Multivariate linear regression model for dependent survey item 24 – 2004 data**

<table>
<thead>
<tr>
<th>DSO evaluation survey item</th>
<th>Coefficient</th>
<th>Std error</th>
<th>Beta</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>26. I felt adequately supported technically to use DSO effectively</td>
<td>0.264</td>
<td>0.024</td>
<td>0.268</td>
<td>$p &lt; 3 \times 10^{-26}$</td>
</tr>
<tr>
<td>25. I felt adequately supported by those teaching my units to use DSO effectively</td>
<td>0.264</td>
<td>0.025</td>
<td>0.262</td>
<td>$p &lt; 4 \times 10^{-25}$</td>
</tr>
</tbody>
</table>
Table 5. Multivariate linear regression model for dependent survey item 24 – 2005 data

<table>
<thead>
<tr>
<th>DSO evaluation survey item</th>
<th>Coefficient</th>
<th>Std error</th>
<th>Beta</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>25. I felt adequately supported by those teaching my units to use DSO effectively</td>
<td>0.233</td>
<td>0.026</td>
<td>0.250</td>
<td>$p &lt; 5 \times 10^{-19}$</td>
</tr>
<tr>
<td>9(Sat). Accessing Unit Guides/unit information</td>
<td>0.162</td>
<td>0.018</td>
<td>0.231</td>
<td>$p &lt; 2 \times 10^{-18}$</td>
</tr>
<tr>
<td>26. I felt adequately supported technically to use DSO effectively</td>
<td>0.256</td>
<td>0.026</td>
<td>0.271</td>
<td>$p &lt; 2 \times 10^{-22}$</td>
</tr>
<tr>
<td>16(Sat). Reading contributions to discussions</td>
<td>0.085</td>
<td>0.016</td>
<td>0.127</td>
<td>$p &lt; 2 \times 10^{-7}$</td>
</tr>
<tr>
<td>19(Imp.) Completing quizzes/self tests</td>
<td>0.061</td>
<td>0.012</td>
<td>0.103</td>
<td>$p &lt; 5 \times 10^{-7}$</td>
</tr>
<tr>
<td>Constant</td>
<td>0.461</td>
<td>0.093</td>
<td>-</td>
<td>$p &lt; 9 \times 10^{-7}$</td>
</tr>
</tbody>
</table>

An Analysis of Variance (ANOVA) test suggests that the 2004 regression model is significant ($F_{1348} = 417.22, p < 3 \times 10^{-270}$), though the model predicts only 60.7% of the variation in the students’ perception of the value of DSO ($R^2 = 0.607$). The regression residuals were approximately normally distributed. An ANOVA test suggests that the 2005 regression model is significant ($F_{1143} = 294.0, p < 6 \times 10^{-202}$), though the model predicts only 56.2% of the variation in the students’ perception of the value of DSO ($R^2 = 0.562$). The regression residuals were approximately normally distributed. Both models explain just over half of the variation observed in the student satisfaction rating, hence there exist other factors with a significant influence on student satisfaction that were not included in the DSO evaluation survey. Strictly, all of these variables were ordinal rather than interval, so care must be taken in interpreting the multi-regression model literally. However, it does indicate those factors that contribute the most to the students’ response in survey item 24.

As with the importance-satisfaction analysis, here there was also a high degree of consistency between the results for 2004 and 2005. Students feel that using DSO enhances their learning experience when they are:
- adequately supported by unit teachers and technical support services;
- when they are able to find and use unit information in DSO; and,
- when they are able to read the online contributions of other unit members.

These findings provide some guidance for academic staff wishing to improve their SETU unit evaluation for the item relating to student satisfaction with DSO. These findings resonate with the outcomes of a very large national analysis of the Australian Course Experience Questionnaire. Although the CEQ does not specifically focus on online learning, an identified key ‘hot spot’ for students was ‘support’, in all its dimensions, including academic and information technology (Scott, 2006). These findings also resonate with two elements of the Australasian Council on Open, Distance and E-learning (ACODE) e-learning benchmarks for universities – those being: Benchmark 7: Student training for the effective use of technologies for learning; and, Benchmark 8: Student support for the use of technologies for learning (Australasian Council on Open Distance and E-learning, 2007).

As noted above, there was evidence of other factors contributing to student satisfaction. Some insight into these ‘other factors’ might be provided by the results of a large online survey of students enrolled in units delivered on wholly online mode conducted at Deakin in 2005 and 2006 (Holt & Palmer, 2007). Based on 761 responses from 5862 students enrolled in 21 separate wholly online unit offerings (an overall effective response rate of 13.0%), a multiple linear regression of all the survey items was performed against the
dependent item “How satisfied have you been with this unit being offered wholly online?”. Five significant items were found to account for 70% of the variation in the dependent item. While three of these related to aspects on wholly online unit delivery, the second most significant item was “Having clear expectations of what is required to get good marks”, and the fourth most significant item was “How well do you think you're doing in this unit as a whole?”. This again highlights the fact that perceptions of the performance of an OLE can be influenced by factors that have little or nothing to do with online mode of learning per se, and, in working with an online teaching and learning environment, educators ignore generic issues of good pedagogy at their (and their students’) peril.

General discussion

The use of large commercial OLEs has risen dramatically to the point where they are effectively a ubiquitous feature of the higher education landscape (Browne, Jenkins, & Walker, 2006), often having replaced a range of custom-built online systems used in different areas of an institution. While commercial OLEs offer a range of affordances for teaching and learning, their implicit system designs also often impose rigid constraints on educators, with a one-size-fits-all technical design often being supported by similarly constraining centralized institutional strategies and policies for online learning (Gibbs & Gosper, 2006; Sharpe, Benfield, Roberts, & Francis, 2006). The large investments by vendors in the development of such commercial systems, as well as the commensurately large investments by universities in the licensing of these systems, both contribute to inertia in the support and availability of new features for use by educators and students. The rise of social software tools, such as blogs and wikis, have been enthusiastically adopted by many educators to expand the types of online learning experience they can offer to students (Gibbs & Gosper, 2006), but, these features have been slow to become widely available in commercial OLEs. Other recent developments include the emergence of open-source OLE systems (such as Moodle, Sakai and many others) and 3D immersive environments such as Second Life. Open source systems now compete with commercial OLEs on features, but are effectively free of cost to acquire, although, the expense associated with the need to have in-house expertise for the configuration and maintenance of such systems should not be underestimated (Grob, Bensberg, & Dewanto, 2004). All of these developments mean that the landscape for OLEs in universities has become more complicated, and, as current licensing periods for commercial OLEs come to end, the decisions faced by universities will be less clear-cut than they perhaps were previously. Understanding what elements of OLEs are used and valued by students and staff will be an essential element of making effective decisions for future e-learning investments.

At Deakin University, since the time that the DSO evaluation survey reported here was conducted, DSO has expended beyond being an internal tag for the WebCT LMS. DSO is now the Deakin University ‘brand’ for a portfolio of e-learning technologies that includes:

- the original WebCT (now BlackBoard Vista) LMS;
- ElluminateLive – a synchronous communication tool that supports audio, video, chat and whiteboard functions;
- iLecture – a system for audio-visual recording of presentations for later online distribution via streaming and downloading;
- Respondus – a tool for the development of online quizzes that can be directly imported into BlackBoard;
- StudyMate – a tool for the development of Flash format interactive online activities that can be directly imported into BlackBoard;
- Turnitin – a third-party online service for checking the originality of submitted work; ostensibly for the detection of plagiarism and collusion; and
- a set of social software tools – including Drupal, MediaWiki and Gallery2.
The status of the LMS has evolved from being the entirety of the OLE to effectively having an underpinning ‘hygiene’ role, with its presence and features being presumed and taken for granted, and, providing a linking platform for the support of other value-adding e-learning technologies. The University’s new teaching and learning plan countenances the addition of extra e-learning technologies under the DSO banner. The effectiveness of these various ‘add-on’ technologies also needs to be evaluated (Contreras-Castillo, Pérez-Fragoso, & Favela, 2006). While the investigation presented here was an attempt, at the institutional level, to evaluate the effectiveness of the newly introduced centralized OLE, given both the intervening period and the expansion of the range of technologies now included in the OLE, there is a pressing need to update this information, as well as for establishing on-going, systematic monitoring of the OLE (Sharpe, Benfield, Roberts, & Francis, 2006). It is not surprising that the original DSO evaluation survey instrument was something of an artifact of the historical period with its focus on user perceptions of the value of various features or functionality of a new technology product. With the changing times, comes a need to evaluate students’ perceptions of value of e-learning technologies in terms of their capacities to enable strong student engagement, quality learning experiences and quality learning outcomes (Coates, 2006). Evaluation of student satisfaction with technical-functional requirements now falls short of this need. More fundamentally, as the OLE has expanded from being solely the LMS to encompass a portfolio of e-learning technologies, a key question arises regarding the best ways in which elements from the portfolio of technologies can be organized and combined into learning systems to improve learning (Gibbs & Gosper, 2006). What combination of e-learning technologies, chosen from the available portfolio, creates the greatest potential educational value in a given teaching and learning context?

Conclusion

Based on more than 5400 responses obtained from students in 2004 and 2005 as part of the DSO evaluation survey, the analysis presented here identifies those elements of the OLE used at Deakin University that are most used and valued by students, those elements of the OLE that students most want to see improved, and, those factors that most contribute to students’ perceptions that use of the OLE enhanced their learning experience. There was a high degree of consistency between the results obtained for 2004 and 2005. The most used and valued elements were core LMS functions, including accessing unit information, accessing lecture/tute/lab notes, interacting with unit learning resources, reading online discussions, contacting lecturers/tutors, and, submitting assignments online. The OLE elements identified as most needing attention were receiving feedback on assignments; viewing my marks; and reviewing unit progress. These functions, while not being particularly associated with learning online, are crucial for assisting students to become self-regulated learners. Based on a multiple linear regression of the DSO evaluation survey items, students felt that using DSO enhanced their learning experience when they were: adequately supported by unit teachers and technical support services; when they were able to find and use unit information; and, when they were able to read the online contributions of other unit members. The array of elements now available within, and in association with, traditional LMSs raises the challenge of how to maximize the educational value through the optimal combination of elements from the portfolio of e-learning technologies available to educators.

References

Appendix 1. DSO evaluation survey

The question/items numbering is that used in the 2005 survey.

1: Gender [Male, Female]

2: Which of the following best describes your primary status as a student? [On-campus, Off-campus]

3: Which campus is the one you attend most? [List of Australian campuses, Overseas campus, None of these]

4: Your faculty? (select all that apply) [Arts, Business & Law, Education, Health & Behavioral Sciences, Science & Technology]

5: Your level of study? [Undergraduate, Postgraduate]

6(2004): Is this semester the first time you have used DSO? [Yes, No]

6(2005): How many semesters have you used DSO? [This is my first semester, 2 semesters, 3 semesters, 4 or more semesters]

7(not in 2004): What is the main support resource you have used for DSO? [DSO Help web site, Deakin Learning Toolkit, Faculty Information and Research Section, Internal DSO Help link]

When using DSO, (a) how important do you find the following for studying your units and (b) how satisfied are you with DSO's contribution to your learning in the following areas? l=Low, 7=High.

8(not in 2004): How important is support for using DSO to you, and what is your level of satisfaction? [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]

9: Accessing Unit Guides/unit information [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]

10: Accessing lecture notes/tutorial notes/lab notes [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]

11: Contacting your lecturer via internal unit messaging [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]

12: Contacting other students via internal unit messaging [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]

13: Using calendar [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]

14: Interacting with learning resources [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]
15: Contributing to discussions [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]
16: Reading contributions to discussions [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]
17: Using chat and/or whiteboard [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]
18: Working collaboratively in a group [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]
19: Completing quizzes/self tests [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]
20: Submitting assignments [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]
21: Receiving feedback on assignments [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]
22: Viewing my marks [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]
23: Reviewing unit progress [Importance: N/A, 1 - 7] [Satisfaction: N/A, 1 - 7]

Please rate the following questions where 1= strongly disagree, 5=strongly agree
24: The use of DSO enhanced my learning experience [Agree: 1 – 5]
25: I felt adequately supported by those teaching my units to use DSO effectively [Agree: 1 – 5]
26: I felt adequately supported technically to use DSO effectively [Agree: 1 – 5]

Any other comments? [Free text entry]