Online learning environments: Same place; different demographic space?

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This paper presents a large scale, quantitative investigation of the impact of demographic differences on the student experience of using an online learning environment (OLE). Female respondents generally gave higher ratings than males, and gave significantly higher ratings in both importance and satisfaction to a group of OLE elements related to online interaction and community. Postgraduate respondents generally gave lower satisfaction ratings than undergraduate students, though significant differences were few. Results on the basis of mode of enrolment were mixed. The discovery of significant differences between demographic groups highlights the importance of up-to-date and on-going research-based surveys of student perceptions of the OLE. The finding that elements of the institutional OLE are not universally perceived the same way by all students groups also challenges the value of standard, one-size-fits-all institutional policies and templates relating to the use of the OLE.

Keywords: online learning, demographic differences, gender, level of study, mode of study.

Introduction

Online learning environments (OLEs) are perhaps currently the most widely used and most expensive educational technology tool (Salinas, 2008; West, Waddoups & Graham, 2007), and, like many other learning technology trends before them, have been adopted by higher education institutions almost automatically and uncritically (Reynolds, Treharne & Tripp, 2003). Much of the research into online learning seems to assume no influence from the demographic characteristics of system users (Woods, Baker & Hopper, 2004). The identification of the need for more detailed exploration of the impact of demographic differences on the user experience of online learning can be found in the literature (Xu & Meyer, 2007). This paper presents a large scale, quantitative investigation of the impact of demographic differences on the student experience of using an OLE.

The influence of demographic difference on OLEs

It has historically been posited that a range of structural factors (access to technology, level of computer literacy, confidence in using computers, under-representation in science, mathematics and technology education, etc.) may have led to girls and women having less ability and opportunity to succeed in the use of educational technology (Gunn, McSporran, Macleod & French, 2003; Price, 2006). However, more recent research points to mixed results relating to the influence of gender in the use of, and satisfaction with, technology in education (Marks, Sibley & Arbaugh, 2005; Price, 2006). Some conclude that if a 'gender gap' did exist historically, it may have now closed (Gunn et al., 2003), perhaps in part due to the mainstreaming of technology use into most discipline areas of education (Marks et al., 2005). One more recently reported aspect of OLE usage that appears to exhibit a difference on the basis of gender is online discussion and interaction. It has been observed that female students reported online interactions more positively, and were more satisfied with the quality of discussion (Young & Norgard, 2006), and that female students reported a greater sense on online community (Shea, Swan, Li & Pickett, 2005). The impact of level of study (undergraduate versus postgraduate) as a factor influencing the use and perception of technology in education by students has been investigated in the literature. Generally, for reported student attitude and motivation to (Holcomb, King & Brown, 2004; Lim, 2004), and reported

student use of (Billings, Skiba & Connors, 2005; Shin & Chan, 2004), OLEs, level of study has not been found to be a contributing demographic factor. While there exists a large general literature that suggests that there is 'no significant difference' between the learning outcomes of face-to-face and distance education (Russell, 1999), large scale, representative published studies that specifically investigate for systematic differences in the use and perception of elements of an OLE within the same enrolled cohort of students on the basis of mode of study are rare.

OLEs 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. Starting first with a range of different systems used in different academic departments of the university, and primarily used for particular courses, units of study or functions, the university gradually moved toward centralisation 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 trialled 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). While there was significant use of online teaching and learning systems at Deakin prior to the introduction of DSO, and in some academic areas the breadth of usage was wide and the level of use comparatively sophisticated, across the entire university usage was varied and far from universal. Another key initiative in the university's strategy to expand its online and distance education profile was to require, from 2004, all its units of study to 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)

Aims

Given the scope of Deakin University's commitment (in terms of central infrastructure, policy development, and roll-out of online elements to all taught units) to online education, it was considered essential to evaluate the effectiveness of this investment. This current investigation focuses on the 2526 responses obtained from students at Deakin University, seeking to identify what elements of the OLE were valued and used most by students. The investigation seeks to provide a quantitative analysis of the perceptions of an OLE from a comparatively large sample of students, and to highlight any influence of demographic variables on these perceptions, thereby making a significant contribution to the literature in this area. Given that many Australian universities have recently determined or are currently deliberating on their next generation OLE, a better understanding of these factors will allow more informed policy and decision making regarding future developments in this area that is so important to all those engage in teaching and learning endeavours at Deakin University.

Methodology

During June and July of 2005, all students at Deakin University were invited via email to complete the DSO evaluation survey. The DSO evaluation survey was administered using an online system and 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 complete DSO evaluation survey is included in Appendix 1. As required by Deakin University human research ethics procedures, the surveys were anonymous and voluntary. Students were only able to respond once to the survey. The collected data were analysed and the following information was compiled:

- response rate and demographic comparison information;
- importance-satisfaction analysis; and
- overall satisfaction measures.

Survey items 6-8 relating to support in the use of DSO, while important, are not reported here due to space constraints. 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. The effective response rate was 7.8%. A range of demographic information was available for the overall enrolled student population (Deakin University, 2008), 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 rate obtained is comparatively low, it is not unexpected for an online voluntary survey (Cook, Heath & Thompson, 2000), and the generally good match between the sample and population demographic characteristics suggests that we can have confidence in drawing more general inferences from the respondent data.

Overall importance-satisfaction results

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’ (N/A) 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, with the standard deviation of the means given in parenthesis. The proportion of respondents indicating ‘N/A’ for each element is also given. For some OLE elements the standard deviation of the mean rating is comparatively high, indicating significant variation amongst the ratings given by individual students. As noted in the literature, “Gathering samples of students and amalgamating them into averages produces an illusory ‘typical learner,’ which masks the enormous variability of the student population.” (Merisotis & Phipps, 1999, p. 15) The following sections investigate whether there are systematic differences in the rating of particular OLE elements between the demographic groupings identifiable in the data collected in the DSO evaluation survey.

Results by gender

A method for visualising the difference between the importance-satisfaction mean ratings between dichotomous demographic groupings was developed. Using a two-dimensional grid, importance and satisfaction rating pairs for a survey item can be plotted as a point, with the importance rating as the vertical coordinate and the satisfaction rating as the horizontal coordinate. By using the corresponding

demographic importance-satisfaction rating pairs for a survey item as the end points of a line, a two dimensional vector can be plotted for each survey item that visually represents the difference in mean importance-satisfaction ratings between the dichotomous demographic groupings for OLE elements.

Table 1: Response rate and demographic information

	Sample	Population
Respondents	2526	32354
Gender		
Female	61.5%	57.3%
Male	38.5%	42.7%
Mode of study		
On-campus	61.8%	64.7%
Off-campus	38.2%	35.3%
Level of study		
Undergraduate	75.1%	73.7%
Postgraduate	24.9%	26.3%
Faculty		
Arts	16.0%	20.0%
Business and Law	34.4%	36.9%
Education	12.0%	13.7%
Health and Behavioural Sciences	17.6%	14.2%
Science and Technology	20.1%	15.2%
Campus†		
Burwood	52.5%	58.3%
Toorak	6.8%	5.5%
Waurn Ponds	25.8%	19.6%
Waterfront	7.5%	6.3%
Warrnambool	4.7%	5.3%
Offshore	2.7%	5.0%
†In 2008, Deakin divested itself of the Toorak campus, with all Toorak operations moving to the Burwood campus		

Table 2: Mean importance and satisfaction ratings

OLE element/function	Importance	Satisfaction	N/A
9. Accessing Unit Guides/unit information	6.32 (1.11)	5.19 (1.52)	2.2%
10. Accessing lecture notes/tutorial notes/lab notes	6.51 (1.02)	5.01 (1.58)	2.7%
11. Contacting your lecturer via internal unit messaging	5.63 (1.58)	4.63 (1.73)	6.5%
12. Contacting other students via internal unit messaging	4.73 (1.78)	4.60 (1.68)	10.1%
13. Using calendar	3.08 (1.83)	3.94 (1.78)	25.0%
14. Interacting with learning resources	5.62 (1.40)	4.68 (1.49)	7.3%
15. Contributing to discussions	5.08 (1.64)	4.82 (1.61)	7.5%
16. Reading contributions to discussions	5.62 (1.46)	5.05 (1.61)	5.2%
17. Using chat and/or whiteboard	3.59 (1.90)	3.70 (1.73)	33.7%
18. Working collaboratively in a group	4.67 (1.88)	4.00 (1.75)	30.0%
19. Completing quizzes/self tests	5.36 (1.76)	4.68 (1.75)	26.1%
20. Submitting assignments	6.30 (1.34)	4.58 (1.91)	21.8%
21. Receiving feedback on assignments	6.36 (1.19)	3.86 (1.90)	18.7%
22. Viewing my marks	6.42 (1.12)	4.27 (2.01)	11.8%
23. Reviewing unit progress	5.96 (1.34)	4.17 (1.76)	14.3%

Figure 1 presents the difference in mean importance-satisfaction ratings between male and female respondents. The male ratings for each survey item are represented by the circular end of the line and the female ratings for the corresponding survey item are represented by the arrow end of the line. The overall mean ratings for that OLE element is given by the cross marker on the line. The numbering of survey items corresponds to the item numbers given in Table 2. Based on a t-test of differences in mean ratings between male and female respondents, accounting for inequality of variance, Figure 1 also indicates where the corresponding ratings were significantly different ($p < 0.01$). A solid black line indicates that both the importance and the satisfaction ratings were different; a dark green line indicates that only the

importance ratings were different; a light green line indicates that only the satisfaction ratings were different; and a yellow line indicates that there were no significant differences in the ratings between genders. Table 3 presents the mean ratings for the three 'overall satisfaction' questions included on the DSO evaluation survey. Note that these three items used a response scale of 1 to 5, rather than the 1 to 7 used elsewhere. Table 3 gives the mean responses by gender and indicates the significance of the observed differences in ratings between genders, based on a t-test of differences in mean ratings between male and female respondents accounting for inequality of variance.

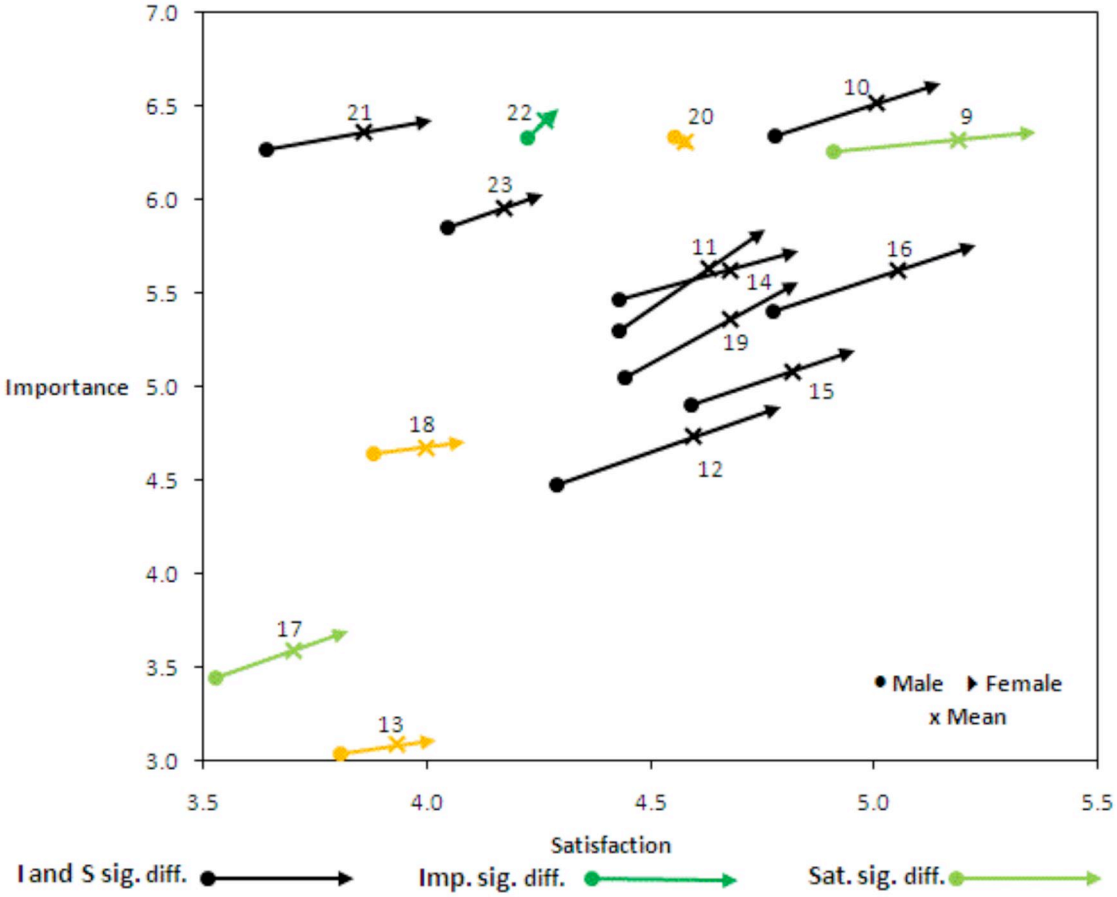

Figure 1: Mean importance-satisfaction results by gender

Table 3: Overall satisfaction ratings by gender

Question	All	Male	Female	Significance
24. The use of DSO enhanced my learning experience	3.67	3.49	3.79	$p < 4 \times 10^{-11}$
25. I felt adequately supported by those teaching my units to use DSO effectively	3.31	3.20	3.38	$p < 0.0002$
26. I felt adequately supported technically to use DSO effectively	3.50	3.39	3.57	$p < 8 \times 10^{-5}$

In general, the vectors in Figure 1 exhibit a strong coherence in direction, with female students reporting higher importance and satisfaction ratings for OLE elements, though not all ratings were significantly different. The higher mean satisfaction ratings given by female respondents for all OLE elements are supported by the significantly higher mean overall satisfaction ratings given by female respondents in Table 3. Included in those OLE elements rated significantly higher on both importance and satisfaction by female respondents is a core group of elements relating to online interaction and community – '11 contacting your lecturer', '12 contacting other students', '15 contributing to discussions', '16 reading discussions' and '21 receiving feedback on assignments'. These results support the similar observation noted previously in the literature that female students reported online interactions more positively, were more satisfied with the quality of discussion, and reported a greater sense on online community (Shea et al., 2005; Young & Norgard, 2006).

Results by level of study

Using the same general schemas as Figure 1 and Table 3, Figure 2 presents the difference in mean importance-satisfaction ratings between undergraduate and postgraduate respondents, and Table 4 presents the mean overall satisfaction ratings by level of study.

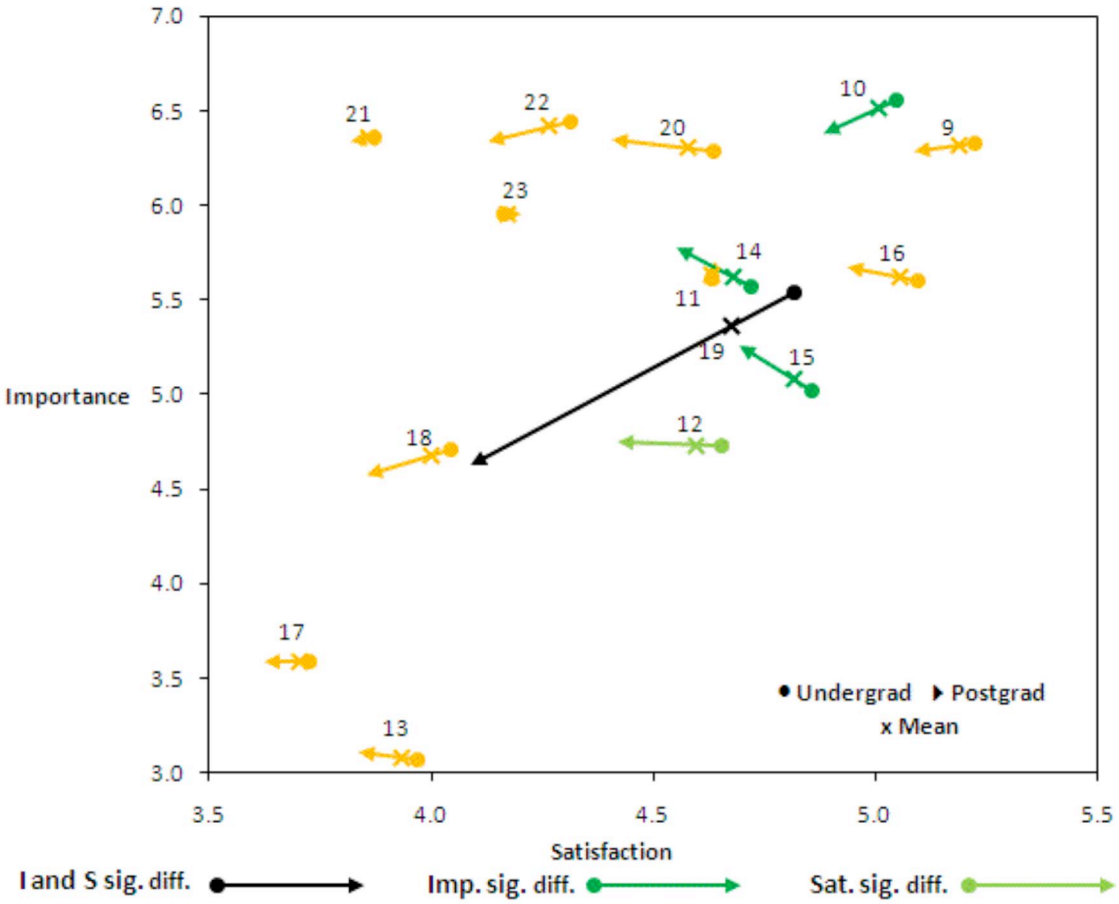

Figure 2: Mean importance-satisfaction results by level of study

Table 4: Overall satisfaction ratings by level of study

Question	All	Under.	Post.	Significance
24. The use of DSO enhanced my learning experience	3.67	3.71	3.55	$p < 0.002$
25. I felt adequately supported by those teaching my units to use DSO effectively	3.31	3.33	3.26	$p > 0.21$
26. I felt adequately supported technically to use DSO effectively	3.50	3.53	3.41	$p > 0.021$

While there is observed a general coherence in the direction of the vectors in Figure 2 (they point to the left – suggesting a generally lower satisfaction rating with elements of the OLE by postgraduate students), it is noted that the number of significant differences ($p < 0.01$) are few. Likewise for the overall satisfaction ratings reported in Table 4 – postgraduate respondents give lower mean ratings, however only the rating for '24 The use of DSO enhanced my learning experience' was significantly different. The findings here support the view found in the literature that level of study is generally not a significant demographic factor in student attitude and motivation to, and reported student use of, OLEs (Billings et al., 2005; Holcomb et al., 2004; Lim, 2004; Shin & Chan, 2004). For many students, especially those that progress directly from their undergraduate studies to postgraduate study, the distinction between 'levels of study' will be somewhat arbitrary, perhaps explaining the lack of a clear difference in perceptions of value and use of elements of an OLE. One clear departure from the general lack of significant difference in ratings observed in Figure 2 is item '19 completing quizzes/self tests'. This is perhaps due to the belief

that quizzes and self tests are related to objective mastery of discipline knowledge, and that such forms of learning are more clearly associated with the foundation learning that occurs in undergraduate study, rather than the higher level learning, that might include a substantial research element, that would traditionally be associated with postgraduate study.

Results by mode of enrolment

Using the same general schemas as Figure 1 and Table 3, Figure 3 presents the difference in mean importance-satisfaction ratings between on-campus and off-campus enrolled respondents, and Table 5 presents the mean overall satisfaction ratings by mode of study.

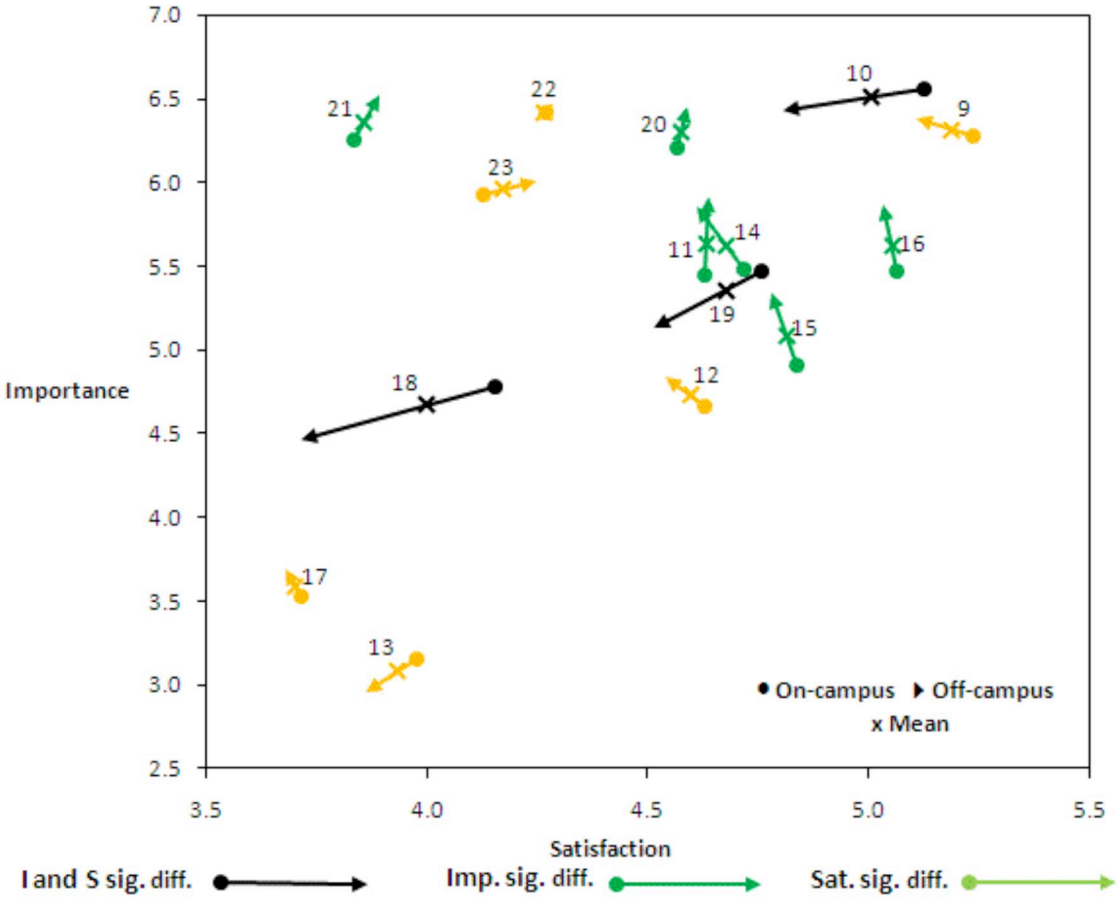

Figure 3: Mean importance-satisfaction results by mode of enrolment

Table 5: Overall satisfaction ratings by mode of study

Question	All	On-c.	Off-c.	Significance
24. The use of DSO enhanced my learning experience	3.67	3.71	3.61	$p > 0.03$
25. I felt adequately supported by those teaching my units to use DSO effectively	3.31	3.36	3.22	$p < 0.005$
26. I felt adequately supported technically to use DSO effectively	3.50	3.51	3.49	$p > 0.75$

The results visualised here by the plotted vectors in Figure 3 are less coherent than for gender or level of study. Likewise, only one of the items in Table 5 shows a significant difference in mean satisfaction rating between modes of study. There is a group of elements that are not rated significantly different between modes of study. This includes a sub-set of the OLE elements that have not generally been used due to technical problems or because they duplicate existing systems. Items in this group include '12 contacting other students', '13 using calendar', 'using chat/whiteboard' and 'reviewing unit progress'. The low general use of these elements of the OLE may contribute to the lack of differentiation in their value between modes of study. There is a second group of elements for which importance, but not

satisfaction, is rated significantly differently ($p < 0.01$), with off-campus students giving a higher importance rating. This group includes '11 contacting your lecturer', '14 interacting with learning resources', '15 contributing to discussions', '16 reading discussions', '20 submitting assignments' and '21 receiving feedback on assignments'. This group of OLE elements incorporates functions that could be expected to be viewed as 'value adders' by off-campus students, enhancing their overall teaching and learning experience, above and beyond what they would traditionally experience with printed study materials alone. Teacher-student and student-student communication elements are identified, but so are elements related to submission and return of assignments – a perennial bug-bear for off-campus students – where postal delivery times internal and external to the university might add more than a week to the turnaround time in both directions for hardcopy off-campus assignments. We note that, while off-campus students view these elements as significantly more important, here they are not any more satisfied with the performance of these functions than on-campus students – indicating a potential mismatch of off-campus students' expectations and actual system delivery. There is a final group of elements for which both importance and satisfaction are rated significantly lower by off-campus students ($p < 0.01$), with off-campus students giving substantially lower satisfaction ratings. This group is a somewhat mixed bag, including '10 accessing lecture/tute/lab notes', '18 working collaboratively in a group' and '19 completing quizzes/self tests'. Off-campus students would have traditionally been sent, via post, copies of most print material related to their studies. The move to distributing such material online may improve access times to such materials for off-campus students, but this comes at the cost of shifting the printing costs of such materials directly to the off-campus student, perhaps offering a reason for the lower mean rating of item 10 by off-campus students. The lower mean rating for item 18 by off-campus students suggests that the practicalities of online group work are potentially problematic (Liu & Tsai, 2008). To this final group of elements we might add the overall satisfaction item '25 I felt adequately supported by those teaching my units to use DSO effectively', which off-campus students rated significantly lower. This mean rating suggests that, in general, more can be done to support off-campus students in the effective and productive use of online technologies in their learning. Perhaps preparation for, and support in, online group work could be a priority starting point for any efforts in this area.

Conclusion

An examination of the observed variation in institutional level mean ratings of importance of, and/or satisfaction with, elements of an OLE given by students in a whole-of-institution survey highlighted some significant differences between demographic groupings. Female respondents generally gave higher ratings than males, and gave significantly higher ratings in both importance and satisfaction to a group of OLE elements related to online interaction and community. A recommendation here is that additional support be provided to all students, and male students in particular, in understanding the value of online learning communities (Shea et al., 2005). Postgraduate respondents generally gave lower satisfaction ratings than undergraduate students, though the occurrences of significant differences were few. One standout difference was a significantly lower rating for both importance and satisfaction by postgraduate students for the use of online quizzes/tests. These results suggest that, while differences based on level of study may be more in shades than black-and-white, it is important to consider the appropriateness of different features of an OLE to the predominant modes of learning of the intended student group. Results on the basis of mode of enrolment were mixed, but fell into three groups – i) no significant difference; ii) significantly lower satisfaction rating by off-campus students; and iii) significantly higher importance rating by off-campus students. The latter group of OLE elements incorporated functions that could be expected to be viewed as 'value adders' by off-campus students, enhancing their overall teaching and learning experience. While the study here showed no significant difference in satisfaction rating for this group of functions, the higher importance rating by off-campus students suggests attention to the use of these functions could yield improvements in the university experiences of off-campus students.

The discovery of significant differences between demographic groups in responses to items on the DSO evaluation survey, as well as the 2005 vintage of the data, highlight the importance of up-to-date and on-going research-based surveys of student perceptions of the OLE (Young & Norgard, 2006). It challenges the institution to understand the reasons for the observed demographic differences, and, if appropriate, to act to ensure a level of equity in online experiences for all students. The finding that elements of the institutional OLE are not universally perceived the same way by all students groups also challenges the value of standard, one-size-fits-all institutional policies and templates relating to the use of the OLE.

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Appendix 1: DSO evaluation 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 & Behavioural Sciences, Science & Technology]
5: Your level of study? [Undergraduate, Postgraduate]
6: How many semesters have you used DSO? [This is my first semester, 2 semesters, 3 semesters, 4 or more semesters]
7: 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: 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]

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