

*Research Article***Realising e-Learning matters in a Bioscience Cohort**

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Abstract

The use of blended learning, face-to-face contact alongside e-based activities, provides academic staff with an opportunity to match their teaching strategies with the changing student cohort. This study reports students' perceptions of e-learning activities early in bioscience modules; students from all three levels of undergraduate study were included. Students in their first year were most receptive to e-learning, using the opportunity to access learning resources from an 'off-campus' location and welcomed more blended learning. Students in their third year engaged to the same level as first year students but valued the task less, preferring face to face contact with staff. Second year students seem to be the key; they valued the task more than third year students but their qualitative comments indicated that they too were placing value on campus based activities. E-learning provides first year students with an opportunity, at 'high risk' times, to draw on familial support and to 'process' knowledge. Third year students should also be encouraged to take time for 'off-campus' learning, enabling them to 'process' learning. In the same way that a lack of slow-wave-sleep inhibits 'off-line' memory consolidation, third year students may be losing a valuable opportunity to enhance their learning experience.

Keywords: e-learning, institutional habitus, off-campus processing**Introduction**

The political agenda in the UK has driven higher education institutions to consider student success in a climate of increased diversity and efficiency. Yorke (2000) published a comprehensive list of contributors to student 'drop out', taking account of issues that arise from the increasing social diversity of the current student population:

- poor quality of student experience;
- inability to cope with the demands of the programme;
- unhappiness with the social environment;
- wrong choice of programme;
- matters relating to financial need; and
- dis-satisfaction with aspects of institutional provision.

This list provides key areas that need to be addressed by most institutions in meeting the needs of the changing HE environment; in particular, the student learning experience is pivotal. Influenced by the curriculum, assessment strategies, teaching methods and extracurricular support (Ramsden 2006) the learning experience may be one of the key factors that influence a students' feelings towards their potential success.

A learning experience which is contemporary and stimulating must, by definition, reflect the powerful influence of emerging technology on culture and everyday life. In the HE sector this is reflected in the ever increasing use of virtual learning environments, virtual lectures (O'Neill *et al*, 2004) and focus on feedback on assessment (Merry and Orsmond, 2007). With this in mind

the HEA, together with HEFCE and JISC have developed a ten-year strategy for e-learning with the purpose of supporting the use of technology across the sector whilst ensuring that good practice is fostered and disseminated (HEFCE 2005). The use of information technology, ranging from blogs to MP3 players and SMS text messaging, has the potential to facilitate '24/7' student learning 'anytime, anywhere'; a university education available worldwide and delivered from anywhere in the world. However, practitioners must be both confident in use of the technology and be assured that it is an effective and student-centred methodology. Higher education institutions should be reflective communities influenced by their students' evaluation of the learning experience offered and using the advice of the 'consumer' to shape the complex changes in the student learning experience required to ensure that student success is paramount in a new educational context.

Framed within the context of an institutional strategy in which e-learning is part of blended approach to facilitating student learning, we undertook a questionnaire based study of students' perceptions of an e-learning activity that formed part of a blended learning strategy in a one-semester bioscience module. Blended learning encompasses both virtual and face-to-face teaching strategies designed to enhance the student experience whilst meeting the learning needs of a changing student community.

Methodology

In the seventh week of the university calendar, translating to a week in early November, students across the bioscience subject areas at the institution were provided with a computer based activity; this replaced their usual face-to-face contact sessions for that week. At each level of study the compulsory module was chosen for inclusion; this decision removed any variability arising from different activities delivered in different modules within a year of study. All students were briefed in how to access the materials and none of the tasks required skills beyond those expected by subject benchmark statements. Students studying at first ($n = 71$), second ($n = 33$) and third year level ($n = 20$) were included in the study; activities were subject-specific and linked directly to taught-materials current at the time. The age profile of the students included in each group is shown in Table 1.

Table 1 Age profile of students taking part in the study. Students at Level 3 of their studies included an increased number from non-traditional groups when compared to those at Level 1 and 2 of their studies

Student group	<21 yrs	21-24 yrs	>25 yrs
Level 1 (n=71)	89%	8%	2%
Level 2 (n=33)	73%	16%	11%
Level 3 (n=20)	61%	9%	28%

Details of the activities and the level of feedback received are provided in Table 2; to ensure direct comparability the activity maintained certain core elements and all students were asked to complete the activity before returning to class the following week.

At the next face-to-face session, in a controlled environment, the students were presented with a questionnaire containing a number of questions designed to gather quantitative data and a small number of questions gathering qualitative responses. The questions were phrased to avoid ambiguity and investigated four themes as shown in Table 3:

Table 2 Details of the e-learning activities and subsequent follow up by year group. Each year was provided with an e-learning activity to replace a standard 2 hour teaching slot

Student group	Activity	Feedback/ Follow up
Level 1	Students were asked to access a short lecture; they were then required to access interactive, online web materials. Alongside they were required to complete a series of short answer questions requiring both knowledge and application of the e-material	Questions were submitted within a short time frame. Feedback was detailed but formative. Subsequently students were required to show engagement with feedback through summative submission of the work in a portfolio.
Level 2	Students were provided with an annotated lecture which they were required to read and understand before completing an online interactive worksheet prepared commercially.	The materials were discussed at the next class session and feedback given on a group basis. Subsequent material required engagement with the e-learning activity.
Level 3	Students were required to complete a detailed short course prepared by another HE provider but freely available on the Web and fully interactive.	The materials were discussed at the next class session and used as a foundation to facilitate delivery of complex materials in subsequent sessions of the module.

Table 3 Themes of the questionnaire designed to evaluate students' e-learning experience

Theme	Associated Questions
level of engagement with the activity time(s)/ place(s) accessed	'did you complete the e-learning task' 'where did you access the task' 'when did you access the task' 'how many times did you access the task'
value of the approach as part of a blended learning strategy	'how long did you spend on the task in total' 'did you find this task to be a useful learning experience' 'would you like us to use more e-learning activities'
students personal study practices	'which of the following teaching strategies do you find most useful' 'in a normal week how long to you spend on independent study related to this module'

Closed format questions, in the form of multiple choice responses, were adopted to collect quantitative data. This facilitated the statistical analysis of student responses and delineation by year group.

Qualitative responses were open format and a thematic analysis used to draw out students perceptions of the e-learning task.

'Please write one sentence explaining your perceptions of the value of the e-learning task'

Since data were not normally distributed, and in some cases sample size was small, a Kruskal-Wallis one-way ANOVA was performed, using SPSS 15, on the students studying at levels 1, 2 and 3; in all cases $df = 2$. As this test does not show where the significant differences exist the data were plotted and significances derived. Where no significant differences were found

between the levels of study, a chi-square test was performed to see whether students were responding selectively.

Results

(a) Level of engagement overall

In total, 124 questionnaires were completed. 82 (66%) students completed the task, 34% did not. There was no difference in this level of engagement between students at levels 1, 2 and 3. When considering students across all levels of study, a Chi-square test revealed that a significant number of students who did not complete the activity (48%) stated that the reason for their lack of engagement was because they *'didn't have internet access'*; $\chi^2 = 23.48$, $df = 4$, $p < 0.001$. Of the remaining 'non-completing' students 24% *'didn't know they had to do it'*; 12% *'found it too difficult'*; 6% *'couldn't see the point of the task'* and 10% *'had technical difficulties'*.

(b) Times/places accessed

Figure 1 shows that when asked about the *'Location where task was accessed'* Level 1 students are significantly more likely to study at home or another location away from the university compared to both Levels 2 and 3 ($\chi^2 = 7.55$, $p < 0.05$).

Figure 1 A significantly increased number of level 1 students completed the required e-learning task at home or at another off-campus location compared to both Levels 2 and 3 ($\chi^2 = 7.55$; $p < 0.05$). Error bars represent 95% confidence limit of the mean

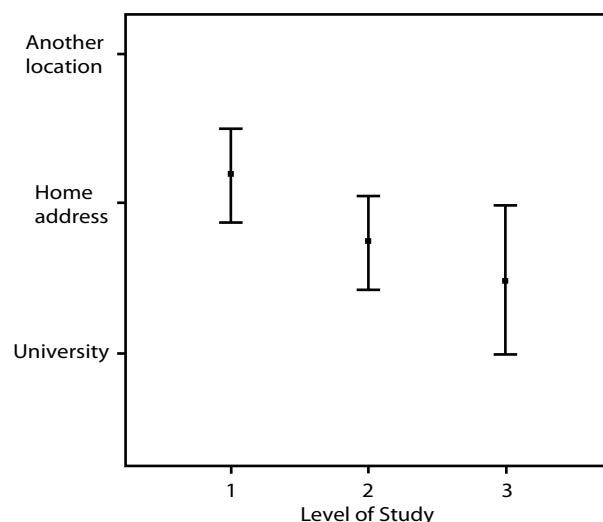
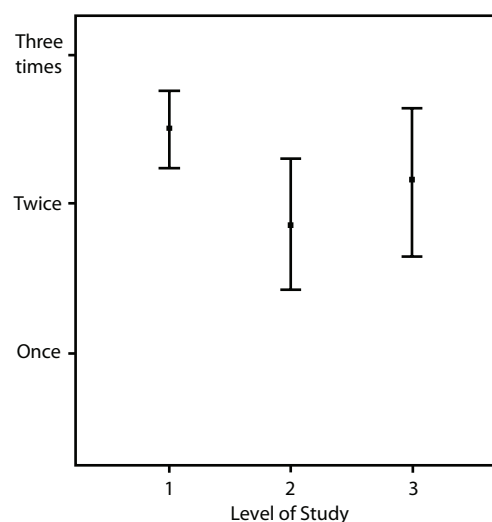


Figure 2 Students in Level 1 accessed the e-learning significantly more times than Level 2 students but no significant difference was noted when comparing Level 1 students to Level 3 students. ($\chi^2 = 6.87$ $p < 0.05$) Error bars show 95% confidence limit of mean.



When asked *'when did you access the task'* 84% of all students who completed the task did so outside the usual session time. Of this 84%, a significant majority (64% $\chi^2 = 136.78$, $df = 5$, $p < 0.001$) completed the task at another time on a week day. There was no significant difference between students studying at levels 1, 2 and 3.

Figure 2 shows the results for *'How many times did you access the task'*. Level 1 students accessed the task significantly more times than Level 2 students but not Level 3 students. ($\chi^2 = 6.87$ $p < 0.05$)

With regard to the *'length of time spent on the task'*, chi-square showed that a significant number of students $\chi^2 = 44.93$, $df = 3$, $p < 0.001$, (51%) spent between 2-4 hours, 33% spent between < 2 hours, compared with only 16% who spent 4 or more hours completing the task. There was no significant difference between students studying at levels 1, 2 and 3.

(c) Value of the approach as part of a blended learning strategy

When questioned about how 'useful they found the task as a learning experience', 84% of those who completed the task stated that they found it helpful ($\chi^2 = 38.24$, $df = 1$, $p < 0.001$). There was no significant difference between levels of study.

Figure 3 shows that both Level 1 and 2 students responded significantly more positively than Level 3 students when asked 'Would you like more e-learning' ($\chi^2 = 11.56$ $p < 0.05$).

Figure 3 Level 3 students, when questioned, responded less positively to the offer of more e-learning compared to both Level 1 and Level 2 students ($\chi^2 = 11.56$ $p < 0.05$). Error bars show 95% confidence limit of mean

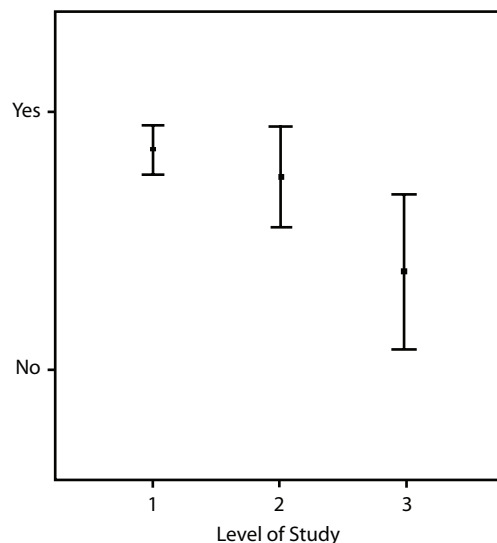
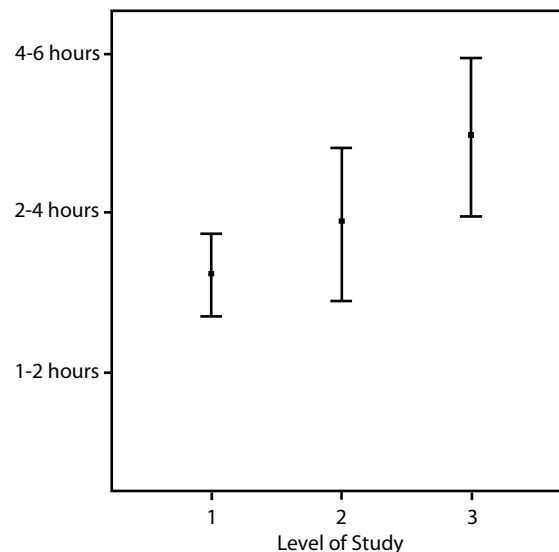


Figure 4 Level 3 students reported that they completed more independent study than students at either Level 1 or Level 2 of their studies ($\chi^2 = 8.75$, $p < 0.05$). Error bars show 95% confidence limit of mean



(d) Students' personal study practices

In response to 'which of the following teaching strategies do you find most useful' chi-square revealed that students prefer lectures (37%) and tutorials (28%) significantly more than practicals (9%), ($\chi^2 = 13.71$, $df = 3$, $p < 0.05$). However, 26% expressed no preference. There was no significant difference between levels of study.

Figure 4 shows that when students were asked how many 'hours per week of independent study' they undertook Level 1 and 2 students spend significantly less time studying independently than Level 3 students ($\chi^2 = 8.75$, $p < 0.05$).

Discussion

This preliminary study provides an insight into how e-learning is viewed by students within the context of a module with a blended learning strategy. First year students are viewed by many to be the most vulnerable in terms of 'non-completion' and 'lack of success' (Smith and Beggs 2002). Yorke and Longden (2004) have recently investigated issues around student success in higher education. One of their key recommendations was that feedback to students is pivotal in motivating, building confidence, enhancing reflection and therefore promoting engagement. The e-learning activities reported in this study were intended to motivate, enhance flexible learning and at the same time provide an opportunity for open-dialogue and formative feedback. Similarly, a sense of 'fitting in' or 'institutional habitus' (Thomas, 2002) is important particularly for students leaving a supportive family network for the first time. Students from a non-traditional

background, in terms of HE, need to be acclimatised to the environment of a university, or the university needs to adjust its self to be more relevant and accepting of those of non-traditional background, and fundamental to this is the development of relationship between students and peers and academic members of staff (Thomas, 2002). However, when considering the student learning experience and the role that the curriculum and teaching strategies play in it, it is difficult not to be drawn to the biological concept of slow-wave-sleep (SWS) sleep. Whilst this comparison may seem unlikely, SWS sleep is thought to be important in the 'off-line' consolidation of memories (Fischer *et al*, 2007) – taking this analogy into a learning context it is pivotal that students are facilitated in their integration and processing of knowledge and learning. Our data suggest that first year students used the e-learning activity to spend time 'off-campus' at their home address whilst still engaging with the learning process and therefore with the institution (Fig 1). These students were more likely to access the material outside of the usual session times and to access the activity more times than the either of the other year (Fig 2). Furthermore, a significantly increased number of first year students indicated that they 'would like more' e-learning activities throughout the academic year compared to third year students (Fig 3). When assessing first year student responses to the open, qualitative question 'did you find this a useful learning experience' it was found that four themes emerged:

- *'It was good to work at your own speed'*
- *'I was able to increase the depth and breadth of my understanding'*
- *'I was able to use a new method of learning'*
- *'I found it hard to follow the task and needed someone to ask for help'*

Overall, the first year cohort who engaged with the activity found it valuable. Their qualitative remarks suggest that the benefits extended beyond convenience and travel issues but instead extended to deeper learning. Focus group intervention after questionnaire analysis, including both those who did and did not complete the task, could be used to draw out students perceptions of e-learning and could be subsequently built into a 'tutors toolkit for success'. Those who did not engage largely cited difficulties with accessing a computer that could support the Internet, a lack of awareness of the task and a range of other difficulties encountered when first attempting the task. This suggests that students should be surveyed, in advance of the e-learning exercise, to ascertain whether or not they have access to a computer with appropriate internet access.

These data have led us to reflect on the needs of first year students, particularly in comparison to their more experienced peers. Successful retention of first year students requires the university to understand their needs as young adults and the pressures that are introduced by university life. The HEFCE funded Student Psychological Health Project (University of Leicester 2002) conducted a large-scale survey of undergraduate students in 1998 and 2001. The 1998 survey, which included first year students, reported that 63% of students sought advice and help from friends and family, 52% from a personal tutor and only 36% sought support from academic tutors. Academic success and completion by first year students may be enhanced by factoring into the academic timetable time spent with social support networks at high risk times of the year, whilst ensuring that ties to the institution remain firm, for example through engagement with electronically based learning strategies. These off-campus activities enable students to develop their understanding and process information in an e-learning context in a similar way to the role of rapid-eye-movement (REM) sleep in ensuring that memories are preserved. However, tutors should be aware of the potential barriers that 'institutional habitus' can form to engagement with computer-based tasks (Thomas, 2002). Students who have little experience of either the philosophy or mechanics of conducting learning through electronic tools will require additional support and guidance before embarking on the independent work. The preference of first year students for off-campus study may also reflect the changing nature of student life;

many students are now in employment or have responsibilities as carers for dependents. This would make a 'non-campus' activity more attractive, providing the 'anywhere, anytime' option that many students require. It is important to consider this data in light of 'vulnerable points' for year retention (Round, 2004); a first 'official' break in routine can be such a point and therefore it is important that engagement is enhanced through this activity. This is an area for further study.

Third year students, are perceived as more mature in their learning experiences and more established as reflective practitioners seeking to make meaning from complex theoretical frameworks. Figure 3 showed that whilst their engagement with the e-learning activity was not significantly different to that shown by first and second year students, in terms of number completing the task, a significantly reduced number of students wanted to have more e-learning as part of the teaching strategy when compared to other year groups. Furthermore, third year students appeared to spend more time on campus and accessed the e-learning activity there rather than at any off-site location (Fig 1); this is an interesting finding that leads onto further study. Explanations for this, and their reluctance to have more e-learning, could include an increased need for peer support using the campus as a meeting point; an increased familiarity and sense of 'institutional habitus'; increased confidence in accessing tutors or more simply reduced access to a personal computer off-campus. Such explanations could be attributed to both academic maturity and also to the large number of students aged 25 year and above, within the third year. Despite being taught the necessary IT skills this age group may have an inherent aversion to e-learning that is not technical in origin but rather cultural. It would appear that they prefer, and benefit greatest from, the intra and interpersonal relationships they have with their peers and their tutors.

For third year students, there was a wide diversity in time of day that the material was accessed but with the majority indicating that they accessed the tasks outside the usual session times (Fig 2). Qualitative comments of those who engaged with the tasks were themed under five headings:

- *'being able to repeat the task was valuable'*
- *'working independently helped increase my understanding'*
- *'the task provided more insight into lecture material'*
- *'face-face sessions are a better learning experience'*
- *'working with a computer is not a good way of learning'*

Those who did not engage with the task gave similar reasons to those stated by first year students including lack of internet access and technical difficulties.

The HEFCE funded Student Psychological Health Project (University of Leicester 2002) reported that students find the pressure of seeking a career and preparing for that career as significant stressors. These stressors would be expected to be most acute in third year cohorts; as such our data indicate that third year students place value on the advice and support of academic staff on campus particularly when compared to first year students who may place greater value in social support networks off-campus. Third year students may be better equipped to engage in reflective practice and independent study (Fig 4) but when taking an holistic view of their learning experience they have lost the value of processing and 'forming memories' that may come from 'time away' from the campus. The challenge therefore for academic staff is to ensure that third year students realise the importance of blended learning, in particular styles that encourage depth of understanding, reflection and constructivist approaches.

The responses of the second year cohort clearly indicated a 'moving on' from first year and 'moving towards' the attitudes of the third year group. The level of student engagement with the task and the reasons for non-engagement directly mirrored those reported for first and third year students. Students in the second year cohort, however, showed a preference for accessing the task off campus (Fig 1) but in the usual session time; they also accessed the task less times than students in other cohorts (Fig 2) but reported that they would like more e-learning opportunities. Qualitative comments were themed into six main themes:

- *'I enjoyed using a different method of learning'*
- *'being able to repeat the task enabled me to increase the level of my understanding'*
- *'I felt that I learnt more from working independently'*
- *'I needed help with the task and wasn't able to get it explained to me'*
- *'I like the face-face sessions more'*
- *'I hate time spent with computers'*

Whilst first year students are concerned with orientation, institutional habitus and familial support networks, second year students are developing as reflective practitioners and beginning to focus on career prospects and successful completion of their award. In terms of their engagement with the e-learning activity the second year cohort demonstrated that whilst still valuing 'processing time' they were beginning to feel the same pressures as third year students – this manifesting in their comments about the need for face-to-face contact and their preference for prescriptive learning rather than self-directed tasks. Our data suggest, therefore, that it is the second year that is the key to the continued success of, and engagement with, blended learning.

Overall, this study has highlighted the disparate attitudes of students to their learning experience. In particular, third year students appear to value face-to-face contact whilst first year students showed a mature approach, valuing the opportunity to increase the depth of their learning whilst off-campus. Second year students showed an innate enthusiasm for this activity; increased use of e-learning with this year group in the future would potentially provide a support mechanism to increase the depth of their learning. Interestingly, the staff team commented that the 'e-learning week' provided an opportunity to engage in more extended discourse with individuals and groups of students both through personal and electronic communication. This is a further additional benefit of this approach to student learning.

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