Use and perceptions of use of a blended learning resource: are students engaging with the materials?

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Abstract

Providing students with engaging learning resources is an important target of teachers at university. Being able to cater for large groups of students with diverse academic backgrounds has been one of the pivotal activities of teachers of first year students for decades. An increasing requirement in the sector is to provide for the more talented students, those who are able to take advanced and talented student programs. Whilst at the University of Sydney we have provided a range of activities to help all students in first year biology, an increasing push has been for us to provide something more challenging for the advanced course students. This paper describes the development and use of a resource – HBOnline - for advanced first year human biology students. Whilst there is some emphasis on the development of the online materials, the delivery of these is blended with the face-to-face lectures, laboratory sessions and the preliminary associated research looks at the use of these new resources and the performance of students.

Introduction

The educational research literature shows that students who make use of every learning opportunity approach the final assessment tasks with a greater likelihood of high performance outcomes (for example, Buchanan, 2000; Zakrzewski & Bull, 1999). In first year biology we have evidence that supports this (Peat, et al., 2005). Focusing on the use of online self-assessment opportunities (i.e. formative assessments) we have shown that students who use these materials are more likely to outperform others who do not use the materials, if we control for ability (as indicated by their UAI). In addition we have shown that this relationship is strongest in second semester teaching and learning experiences, which may indicate a transition affect.

First year biology courses at the University of Sydney have traditionally been delivered each week by three face-to-face lectures and a laboratory class (3 hours long). There has never been provision for tutorials or discussion workshops or other student-centred activities outside the laboratory classroom. In the last ten years there has been a move to reduce the face-to-face teaching (eg. from three lectures a week to two) and to introduce student-centred independent study materials (aligned with the paper-based lab notes). Whilst this has given students more choice as to when they do the work it has not necessarily given them a better learning environment that encourages engagement with and deep processing of the materials.

More recently, the human biology course has consisted of two lectures a week, a three-hour lab class and a one-hour independent study module (ISM). The ISM was introduced some years ago in response to student comments and requests to provide independent materials and to reduce the face-to-face component of the unit. The ISM material was paper-based, and

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incorporated into the laboratory manual. In the latest review of the course, and in response to favourable comments by students about online learning, it was decided to increase flexibility in learning by introducing more content from existing legacy materials to the online learning environment - HBOOnline. The development of HBOOnline took into consideration both the structure of the online environment (WebCT) and the content.

Part of the reason for the re-development of legacy materials was to address the main criticism from students that they found it difficult to complete all the activities within their timetabled face-to-face class and were unable to access feedback for these activities outside structured classes and consultation time (duty tutor). The original materials were mostly paper-based laboratory class activities or independent study modules (which could be done anywhere at any time). The main aims of HBOOnline were to convert content rich, linear print courseware into online courseware which supports authentic case-based learning and incorporates additional online learning resource materials; increase the flexibility of the learning environment; enhance student participation in coursework material; provide timely and constructive feedback; and monitor students’ progress through the courseware. Because the material includes case studies that can be worked online by peer groups, HBOOnline also aims to increase students’ communication, collaboration and problem solving skills.

This paper describes the development of the new resources and some preliminary research into investigating the way in which students are engaging with the materials and whether this may be influencing student learning.

Development of new materials

Using WebCT it was decided to explore the ways in which the facilities within WebCT might be used to create activities for students that lead them to interact more fully with the learning materials and thus develop a deeper understanding of the content being presented. The resultant activities involve more contextualised materials including case studies, and real-life scenarios for the students to work with. In addition there is a greater linkage between the lecture and lab-based part of the unit and the online materials. This is provided by interweaving information about the online materials in the paper-based information for lectures and labs and by referring to these paper-based materials in the online arena.

The re-engineering of existing materials provided the opportunity to revisit and systematically clarify the learning outcomes and the objectives. The learning outcomes for the course are to
- develop a familiarity with foundation issues in human biology;
- develop the ability to relate learning to real life;
- enhance written, oral and interpersonal communication skills;
- encourage responsibility and independence as learners;
- establish experience in cooperative learning;
- develop skills in accessing and summarising information; and
- gain experience with observing and recording; asking relevant questions; making decisions and forming conclusions on the basis of observations; scientific reporting; and using computers.

Structural features of WebCT that improve readability and navigability such as the Course Menu, Welcome page and navigation instructions were discussed, trialed and incorporated in the new structure. The content included legacy material from paper-based laboratory notes,
the ISMs and new materials, such as the case studies. In essence, HBOnline consists of four modules that cover all the topics in the course.

Each online module consists of a set of objectives and activities, stated at the beginning. The functionality of WebCT was used to enhance student collaboration via the use of the Discussions and Student Presentation (on our website called ‘Peer Groupwork’) Tools. For the latter, the same groups of students from the same timetabled practical sessions are encouraged to meet online to develop their groupwork.

While the general online information about the course, such as the welcome, syllabus and technical information, and the links to additional resources (for example to the first year Virtual Learning Environment) are available throughout the semester, the HBOnline modules themselves are released according to a prescribed timetable and so are completed by students in a sequence. The online learning activities complement the weekly lectures and laboratory sessions and together they build on previous topics and encourage students to use a constructivist model of learning. The human biology course looks at the anatomy and physiology of the body according to its systems, for example the skeletal and circulatory system. As the course progresses links are made between one system and another. Throughout the course skills such as microscope and dissecting techniques are also developed.

The online modules encourage students to read and consider the material by requiring them to complete assessments systematically to progress in the coursework. Each of the four HBOnline modules has formative and summative assessment sections. The formative assessment targets content from the lecture and practical notes and the ISM. Part of the design included an emphasis on interaction and provision of formative assessment resources and this led to a variety of interactive exercises being provided within each module. These included text-entry, matching, labeling and word-selection exercises. Students have the option of completing the section at any time and are provided with interactive, automatic feedback. The main objective of the assessment will be to ensure students progress through the unit, building up a knowledge base. The summative section has two subsections, a quiz, which covers everything in the modules and work done within a prescribed number of weeks, and a case study. The quiz is done under supervision, in a timetabled laboratory session. This is an individual assessment whereas the case study is a group activity completed over two to three weeks with a final face-to-face presentation in a timetabled session. Staff members mark the group work and each student in a peer group is given the same assessment mark. Feedback on the case study questions is then given as part of a face-to-face class discussion activity. Case-based activities were incorporated into HBOnline to encourage group work on real-life scenarios based on content covered in the course. Groups of 4 or 5 were given a case related to the topic just covered in the lectures, practical class and HBOnline. To ensure continuity in content and comprehension the cases contained questions to guide the groups through the activity (Figure 1).
Evaluation of use of new resources

The research questions we are attempting to answer are:
“How are the students interacting with the online learning resources (HBOnline) and does this affect their learning outcomes?”

The students in 2005 were surveyed at the end of the semester. The paper-based survey collected student demographics, including prior experience of biology at secondary school and prior expertise in online learning. Perceptions of usefulness of all the learning resources were investigated using a four point scale, with students classifying statements according to whether they use a resource, found it not useful, useful or extremely useful. Open-ended question asked students whey they had not used a resource (if relevant) and in what way the resource helped them in their learning (if they had used it).

As the whole presentation of the course was in a new format with different foci, we requested the students from the 2004 cohort to allow us to analyse their written answers to a set of short answer questions on the final exam, given that these questions were to be included in the 2005 exam. This will give us a comparative analysis of whether the students’ use of the HBOnline materials had encouraged them to engage more with the content and be able to provide better structured answers to the exam questions.

The implementation of the 2005 survey and the request to the 2004 students complied with the University of Sydney’s Ethics Committee Guidelines for research with humans and this enabled us to seek permission to correlate performance with usage/non-usage of materials and with perceptions of usefulness.

The survey was handed out to all students in class time in second semester in 2005. The response rate was 61%. The student responses included 73% female, 27% male; 98% fulltime

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enrolled; 95% school leavers; 98% enrolled in science related degrees; and 95% had completed a biology course in semester 1 2005. All students used home computer facilities and many used those on campus as well. Most students perceived that their incoming Information Technology (IT) skills were broad (use of computers, Internet, email, word processing, WebCT). When asked what additional skills had been learnt during the course, many students indicated that the use of databases had been added to their repertoire.

Analysis of the use and perceptions of usage of the learning resources are in Table 1. It is interesting to note that those students who used the resources, with the exception of the crosswords (previously reported in Peat et al. 2005), perceived them to be useful for learning, with the strongest support for the usefulness of HBOnline. Students who found HBOnline useful or extremely useful were the same students that found the practical and lecture notes useful. This suggests students are integrating information from HBOnline, the practical notes and the lecture notes.
Table 1: Comparison of the use of resources

Students were asked to indicate which of three categories best represent their use of the resources and this is shown in Figure 2. With the exception of the use of self-assessment modules (available in the Virtual Learning Environment accessed through WebCT) students mainly indicated that they used these resources for learning new knowledge although HBOnline (the main subject of our investigation as it was the new component in the course) was equally used for revision, learning new knowledge and consolidating knowledge. This reflects one of the aims of the development of HBOnline. Perceived usefulness of the case-based activities in the understanding of human biology was also addressed in the questionnaire. 81% of students thought the case studies were useful or extremely useful.
Students who found HBOnline, the practical notes, the lecture notes and self-assessment modules useful or extremely useful accessed the course components differently. 43% of respondents accessed HBOnline every few days, compared to 32% once a week and 22% occasionally (the high access supports the suggestion that HBOnline was used to integrate course content). Practical notes were accessed by 53% once a week followed by 28% every few days and 19% occasionally. Lecture notes were accessed every few days by 73% of respondents, whereas 20% and 7% accessed the notes once a week or occasionally respectively. These patterns of access reflect the timetabling of lectures twice a week and practical classes once a week. 60% of respondents accessed the self-assessment modules occasionally compared to 10% once every few days and 10% once a week. This access pattern for the self-assessment modules reflects the findings of Peat and Franklin (2005). The difference in patterns of access between course component indicates many students are at least using a strategic approach to learning by using components when they perceive the need.

A focus group was conducted towards the end of the course to obtain comments on HBOnline. Students in a focus group indicated that: HBOnline was a better learning tool than the textbook (acknowledging the learning support of interactivity); that the diagrams and information in the online resource were clear, fun to work with; that the materials was easy to use and navigate (it was built by a professional educational designer); and it is a favoured revision tool (before taking a summative quiz). Whilst most students have accessed online content before, few have studied in the online environment before.

This preliminary analysis of some of the data collected is giving us a better picture of the way in which students engage in the materials and what they find useful to their learning. One of our research questions was to look at whether the new learning environment stimulated more engagement with the materials and whether this could be measured. We chose, as a measure, to look at the structure of students’ answers to two or three short answer questions in the final exam. As a comparator, we also looked at the structure of answers from students who had taken the course the year before HBOnline had been incorporated. The analysis of the structure of student answers was done using a SOLO (Structure of the Observed Learning Outcome) taxonomy approach (Biggs and Collis, 1982).

Two short answer questions were chosen in this study. The first question contained parts A and B. Analysis of these parts showed that the majority of pre-HBOnline and post-HBOnline students used multistructural approaches to answering the question (Figure 3a and 3b). Similar results were obtained for the second question (Figure 3c). The way questions are posed had a significant influence on how students approached answering the question. The first question (part A and B) limited the way students could answer the question whereas the second question provided students with more scope. This is reflected by the higher percentage of students using multistructural approaches to answering the second question (approx. 80% for pre- and post-HBOnline). Overall, there was little difference in the approaches of pre-and post-HBOnline students.
Figure 3a: Question 1, part A: Describe what each enzyme (A) does to its target food group (ie Carbohydrate, fat or protein) and in which part of the alimentary canal this occurs.

Figure 3b: Question 1, part B: Describe what each enzyme (B) does to its target food group (ie Carbohydrate, fat or protein) and in which part of the alimentary canal this occurs.
Conclusion

Any incorporation of new content, such as HBOnline, into a course needs to be assessed for their effectiveness in enhancing the student learning experience. Understanding students’ use and perception of HBOnline and how it fits in with existing components is an integral part of its development. The preliminary data indicate that students are integrating information from different components of the course. They appear to be taking a strategic approach to accessing the material. A large percentage of students had multiple Information Technology skills before starting the course and were therefore able to incorporate the online component, HBOnline effectively. HBOnline has been received favorably by students and was used by many students to link course material. The new case-based activities provided students with an opportunity, in groups, to apply the knowledge gained in the course on real-life scenarios. A large proportion of the students found the activities very useful in their understanding of human biology.

It was not possible to determine using SOLO taxonomy any significant difference in the approach taken by pre- and post-HBOnline students to answering specific short-answer exam questions. Further studies will require careful selection of questions that allow a greater range of responses from students. To improve students’ approaches to answering short-answer questions, clearer feedback of short answer questions indicating differences in unistructural and multistructural answers will be incorporated into the formative component of HBOnline.

Future work

Our plans are to continue to work on the data we have collected, and to identify what questions we should ask of the 2006 students to help us provide better learning resources. We need to inquire further of students as to why they may not use the resources (we have some information on this) and to try to understand the expectations of this talented group of

Figure 3c: Question 2: Describe the production and role of luteinizing hormone (LH) and follicle stimulating hormone (FSH) in the ovarian cycle.

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students. In addition we intend to interrogate the current data to look for correlations of use of resources and performance.

Acknowledgements

The development of HBOnline was supported by the College of Sciences and Technology Learning Initiative: Flexible Online Learning Team and the School of Biological Sciences Teaching Development Unit. HBOnline is enhanced by the availability of interactive exercises from the assigned textbook, Seeley RS, Stephens TD, Tate P (2005) Essentials of Anatomy and Physiology, 5th Ed. WebCT site that was made available by kind permission of the publisher, McGraw-Hill Education. The authors would also like to thank Ms Alison Lewis for her help with the SOLO taxonomy.

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Journal of computer Assisted Learning, 16, 193-200