Effectiveness of Web-based Materials to Support Learning in Botany

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Abstract

An online course has been developed to support learning of practical material in a Botany unit. Students received feedback after each laboratory session, with answers to exercises and images of specimens studied made available.

The effectiveness of this approach, in the context of the unit, was the focus of an evaluation study. This paper reports only on the usefulness of the WebCT online environment. The majority of students perceived that the online materials helped them to learn. There was heavy use of WebCT by students. However, most of this use was in the final two weeks of the semester, when students used surface learning strategies prior to exams. This approach was encouraged by the nature of the unit.

Introduction

This paper reports on a study of the effectiveness of a basic botany unit about Plant Diversity, which has been enhanced by online support materials. The unit gives a broad overview of the diversity of the plant kingdom. Students need to learn and remember a large amount of factual information, but lecturers also expect a deeper understanding of plant groups and their evolution.

The WebCT Learning Management System was used to make the print-based practical manual available to students online. After each laboratory session, value was added by replacing the relevant page with one containing digital images of the specimens studied in that practical, and feedback to laboratory exercises. Students now have access to high quality, colour images, to study at their leisure. The online materials were designed to provide students with flexibility of access, timely feedback, and opportunities for study and revision.

With the introduction of the online materials, a comprehensive evaluation study was undertaken to determine the effectiveness of these materials in the context of the unit. A previous paper [1] has reported on the overall structure of the unit of study, and potential improvements to it, while this paper focuses on the online materials.

The process of the evaluation study enabled several teaching staff to suggest a re-engineering of the unit, changing it from the traditional, teacher-centred mode to a student-centred, or problem-based approach. They proposed introducing a common theme to the unit, reducing the number and nature of lectures, and giving students activities to do in the rest of their study time.

Evaluation Plan

An evaluation plan was developed, informed by the Learning-centred Evaluation (LCE) Framework described in [2]. The core of the evaluation plan was an evaluation matrix, containing the specific questions to be asked, and the (multiple) data sources which could provide evidence to answer the questions. The larger study investigated the learning environment, learning process and learning outcomes of students, both in terms of the online material and the overall teaching context. This paper reports only on the usefulness of the online environment, using data from a student survey, observation and WebCT usage data.

The student survey, containing a mixture of closed and open-ended questions, was delivered online through the WebCT survey tool. It was intended that all students respond to the survey, but only 47 of 153 students did.

Results

Student responses to closed questions in the student survey are summarised in Table 1. There was a strong perception that the online material was useful and aided understanding. A majority of students felt that WebCT enabled them to use their time more effectively, and they had more confidence with the laboratory material. A student response supports this “It reinforces what I have seen in the lab and makes me more confident in my conclusions.”
However, student respondents had mixed feelings about whether the online materials made the unit easier. Some felt that it was easier and others disagreed. However, the majority of students felt that the online materials helped them to learn more effectively.

The WebCT system records the date and time at which each page of content is accessed (or ‘hit’). Overall, during the semester, students accessed WebCT content pages 3458 times. Only one student did not use WebCT at all, and 12 students did not access any content materials in WebCT. The remaining 140 students used WebCT content pages an average of 27 times each. An average of over 27 students accessed WebCT in any one week of the teaching part of the semester. The distribution of WebCT hits is shown in Fig. 1. It is clear that the majority of WebCT use was in the days prior to the theory exam.

Table 1. Summary of student survey responses to the usefulness of the online materials.

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was the online material useful?</td>
<td>38</td>
<td>2</td>
</tr>
<tr>
<td>Did it aid your understanding?</td>
<td>33</td>
<td>5</td>
</tr>
<tr>
<td>Do you have less need to attend lectures?</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Do you have less need to attend lab classes?</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Is your lab time is used more effectively?</td>
<td>22</td>
<td>12</td>
</tr>
<tr>
<td>Is your confidence with the lab material greater?</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>Is the unit is easier?</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Are you learning more effectively?</td>
<td>24</td>
<td>11</td>
</tr>
</tbody>
</table>

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**Table 1. Summary of student survey responses to the usefulness of the online materials.**

- **Was the online material useful?** 38 (Yes), 2 (No)
- **Did it aid your understanding?** 33 (Yes), 5 (No)
- **Do you have less need to attend lectures?** 1 (Yes), 4 (Maybe), 36 (No)
- **Do you have less need to attend lab classes?** 1 (Yes), 10 (Maybe), 30 (No)
- **Is your lab time is used more effectively?** 22 (Yes), 12 (Maybe), 7 (No)
- **Is your confidence with the lab material greater?** 20 (Yes), 15 (Maybe), 6 (No)
- **Is the unit is easier?** 14 (Yes), 14 (Maybe), 12 (No)
- **Are you learning more effectively?** 24 (Yes), 11 (Maybe), 6 (No)

**Figure 1. Distribution of hits on WebCT content pages in each week of the semester.**

**Discussion**

This paper reports a selection of the results of a comprehensive study of the effectiveness of a unit of study enhanced by online support materials.

A wide range of learning strategies were employed by the students. Some students were highly prepared and confident with the material, while others seemed to struggle with the basic concepts. Many students used the WebCT materials in the way they were designed - to complete and check their laboratory work, and for revision. On the other hand, many students used revision for surface learning, ‘cramming’ in the days before the exam. Some students used a mixture of both strategies.

The study found that:

- the online materials were perceived by students to be very useful, but only as a supplement to classroom material;
- WebCT use per student was high;
- the online materials functioned as designed, providing students flexible access to practical material, allowing them to check their work, and acting as a powerful revision tool;
- many students used WebCT for surface learning, as indicated by the characteristics of the unit;
- some students used WebCT in a way that could lead to deep learning.

The tertiary education learning literature would indicate that redesign of the unit to accommodate a more student-centred approach[3], and appropriate use of technology to match this approach [4], would lead to improved student learning outcomes, in the broadest sense. Nevertheless, the online materials evaluated here clearly enhance the learning experience for students, within the paradigm for which they were designed.

**References**


