Impact of Two Course Content Delivery Systems on Student Learning

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Abstract
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Keywords
Online, education, biorenewable, student, performance

Disciplines
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Comments
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Impact of Two Course Content Delivery Systems on Student Learning

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Introduction

In 2007, a USDA Higher Education Challenge Grant funded the creation of a Virtual Education Center (VEC) for Biorenewable Resources at three partner land grant institutions, Iowa State University, the University of Idaho, and the University of Kentucky (Raman et al., 2006). Three new courses were taught through the VEC, each using multiple instructors and exchanges of video lectures between sites. The most heavily subscribed of these was a graduate survey course entitled Fundamentals of Biorenewable Resources. In this paper, we report on comparisons of two online delivery methods used in the fundamentals course: 1) a standard video lecture using a tablet computer, and 2) a self-contained menu-driven autotutorial presentations (MDAP) delivered via Adobe Flash. The VEC aimed to explore the impact of two online course delivery methods on student performance. Due to the array of students in the course, Biorenewable Resources and Technology (BRT) 501, student performance in the course based on student major and gender was also examined.

Objective

The objective of this study was to determine if student learning in BRT 501 was influenced by course delivery method. Two methods were used – video lecture and menu-driven autotutorial presentations (MDAP) delivered via Adobe Flash. The influence of student major and gender on learning were also studied.

Materials and Methods

New biomass production module content was developed for BRT 501 and then delivered to students through WebCT using video lecture or MDAP. In both cases, the modules covered production of corn, soybean, hay and forage, and short rotation woody crops, as well as biotechnology basics. The two versions contained nearly identical academic content. The module was taught during weeks 9 to 11 of the course, allowing students to be sorted based on prior course performance to ensure the two groups were academically similar. Student performance data from the course were collected through WebCT assessments (quizzes and an exam) in spring 2010 and statistical analysis was used to determine student learning differences.

The Iowa State BRT 501 course had 51 students enrolled for spring semester, 44 on-campus and seven online. Four students, three on-campus and one online, dropped the course prior to the biomass production module. One on-campus student chose not to take the biomass production module quizzes and was dropped from the analysis. Students were enrolled as graduate students (42) and upper-level undergraduate students (4) from various majors, most of which were technical in nature (e.g., engineering, agronomy). After the course midterm exam, the 46 students were ranked based on academic performance in the first half of the class and then students were split into two groups based on their ranking. WebCT had a feature that allowed content delivery to specific groups, which was used to provide the video lectures to Group 1 and the MDAP to Group 2. After the biomass production presentations were completed and all quiz attempts made, the content from both delivery platforms was available to all students.

Assessment and grade data were collected from the WebCT grade book for all 46 students. BRT 501 student assessment data were collected for: all quiz attempt scores, midterm exam score, and final exam score. Student grades were also gathered. These were selected because they are good measures of student performance (Angus and Watson, 2009; Smith 2007). The grade book also identified students as on-campus or online. Student classification as graduate
or undergraduate; engineering or non-engineering major; and gender were also gathered from university records and information on the Internet.

Table 1. Student performance variables for which summary statistics were computed.

<table>
<thead>
<tr>
<th>Biomass module quiz total score first attempt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass module quiz total score final</td>
</tr>
<tr>
<td>Remaining modules quiz total score first attempt</td>
</tr>
<tr>
<td>Remaining modules quiz total score final</td>
</tr>
<tr>
<td>All quiz total score first attempt</td>
</tr>
<tr>
<td>All quiz total score final</td>
</tr>
<tr>
<td>Midterm exam score</td>
</tr>
<tr>
<td>Final exam score</td>
</tr>
<tr>
<td>Course grade</td>
</tr>
<tr>
<td>Biomass production module final exam questions score</td>
</tr>
</tbody>
</table>

Results and Discussion

Data were broken into ten student variables that were calculated for all students taking BRT 501 (see table 1). These variables enabled comparisons among teaching modules, delivery technologies, student major, and gender.

Student performance was not significantly impacted by the module delivery method, except for the biomass final exam questions. Students in the MDAP group scored higher on the biomass final exam questions than students in the video lecture group, with a mean of 30.4 vs. 29.4 points, which was statistically significant. This was unexpected since the information presented was nearly identical and all students had access to both delivery formats after completion of the biomass production module and prior to the final exam. None of the other student variable t-scores showed a significant difference for delivery method.

Students were deemed to have an agricultural major if their current major was agricultural engineering, agronomy, horticulture, or pre-veterinary medicine (undergraduate). Students with an agricultural major were outperformed by students with a non-agricultural major, most of whom were engineering students, on the midterm and final exams, and course grade. These differences were statistically significant. The t-scores for student total scores on the biomass production module quizzes, remaining modules quizzes, all quizzes, and biomass production module final exam questions showed no significant difference.

Female students scored significantly lower on biomass module first attempt quiz score total. There was one student’s score that was an outlier on the biomass quiz first attempt, which contributed to the significant difference among gender due to the small sample size. This difference disappeared for the highest quiz score attempt total, which showed no significant difference between scores achieved by female and male students. Other than this outlier of poor performance by one female student on the first attempt, the remaining gender performance agreed with Marks, Sibley, and Arbaugh (2005), who found that gender was not related to learning performance.
Conclusion

This study compared student performance in BRT 501 for two online course delivery methods (video lecture and MDAP), student major (agricultural and non-agricultural), and gender. The study found that student performance was not significantly impacted by the module delivery method, except for the biomass final exam questions. Students in the MDAP group scored higher on the biomass final exam than students in the video lecture group, with a mean of 30.4 vs. 29.4 points out of 31 possible points, respectively. Students with agricultural majors were outperformed by students with non-agricultural majors, most of whom were engineering students, on the midterm and final exams, and course grade. Female students scored significantly lower for biomass module first attempt quiz score total in this study. This difference disappeared for the highest quiz score attempt, which showed no significant difference between scores achieved by female and male students.

The VEC institutions are in a unique position to explore the value of the institutional linkages already in place and develop linkages with new institutions, measuring the impact cooperative delivery of programming has on student learning and educational cost management. The identification and development of models that relate how to effectively develop successful joint educational efforts could help higher education better serve students.

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References


