Student Perspectives on a New Biomass Production Module for Fundamentals of Biorenewable Resources

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Abstract
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. Three new courses are taught through the VEC, each using multiple instructors and exchanges of video lectures between sites. The most heavily subscribed of these is a graduate survey type course entitled Fundamentals of Biorenewable Resources. In this paper, we report on student survey results for the biomass production module, which covered the production of corn, soybean, hay and forage, and short rotation woody crops, as well as biotechnology basics. The survey was administered using WebCT and SurveyMonkey in spring 2010. The survey instrument gathered student perspectives on the module content and delivery, and student learning. Quantitative and qualitative data were collected and analyzed.

Keywords
Survey, student, online, education, biorenewable

Disciplines
Agriculture | Bioresource and Agricultural Engineering | Engineering Education

Comments
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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 (Raman, Brown, Brumm, Anex, Eukon, Nokes, Crofcheck, Van Gerpen, and He, 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 type course entitled Fundamentals of Biorenewable Resources. In this paper, we report on student survey results for the biomass production module, which covered the production of corn, soybean, hay and forage, and short rotation woody crops, as well as biotechnology basics.

Objective

The objective of the study was to identify student characteristics or demographics that impact Biorenewable Resources and Technology (BRT) 501 student learning for both the standard video lecture and menu-driven autotutorial presentations (MDAP) delivered via Adobe Flash delivery methods.

Materials and Methods

New biomass production module content was developed for BRT 501 and then delivered to students through WebCT using video lectures or MDAP. The two versions contained nearly identical academic content. The module was taught during weeks 9 to 11 of the course.

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).

The survey was administered using WebCT and SurveyMonkey in spring 2010. The survey instrument gathered student perspectives on the module content and delivery, and student learning. WebCT indicated that all students were able to access the consent form which led to the survey. Twenty of the 46 students enrolled in BRT 501 completed a 37 question survey that covered demographics, online course and computer experience, learning styles, module content and delivery, self-reported student learning, communication, and production agriculture experience. The survey variables for the study are shown in table 1.
Table 1. Survey variables for the study.

<table>
<thead>
<tr>
<th>Best/worst module</th>
<th>Internet proficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biomass production knowledge before module</td>
<td>Learning Style: active vs reflective</td>
</tr>
<tr>
<td>Biomass production knowledge after module</td>
<td>Learning style: sensing vs intuitive</td>
</tr>
<tr>
<td>Biomass production video usefulness</td>
<td>Learning style: sequential vs global</td>
</tr>
<tr>
<td>Classmate interaction</td>
<td>Learning style: visual vs verbal</td>
</tr>
<tr>
<td>Compare online and classroom modules</td>
<td>Non-traditional student</td>
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<tr>
<td>Compare quizzes from different modules</td>
<td>Overall educational experience</td>
</tr>
<tr>
<td>Computer proficiency impact on learning</td>
<td>Quiz reflect material</td>
</tr>
<tr>
<td>Current major</td>
<td>Self-assessed learning</td>
</tr>
<tr>
<td>Degree pursued</td>
<td>Software proficiency: design</td>
</tr>
<tr>
<td>Employment status</td>
<td>Software proficiency: internet</td>
</tr>
<tr>
<td>Farm background and participation</td>
<td>Software proficiency: productivity</td>
</tr>
<tr>
<td>Gender</td>
<td>Student able to learn independently</td>
</tr>
<tr>
<td>Importance of instructor visible</td>
<td>Study time</td>
</tr>
<tr>
<td>Instructor availability</td>
<td>Take online class in the future</td>
</tr>
</tbody>
</table>

Results and Discussion

Of the 20 students completing the survey, eight received biomass production module information through video lectures and 12 through MDAP. Two students were female and 18 male. Only one student was a non-traditional student, defined as 30 or more years old. Three students were enrolled in school part-time while employed full-time and 17 were full-time students. International students made up 30% of the participants. Nearly all participants (95%) were graduate students, 15 M.S. and four Ph.D. Current student majors were 75% engineering and 25% other science majors such as agronomy or horticulture. Four students took the course online and 10 had taken an online course previously. Five students grew up on a farm.

Student computer proficiency is an important aspect of students’ ability to successfully learning online. BRT 501 required students to use WebCT to access lectures and class materials, productivity software for assignment development and submission, and internet to access videos, animations, and support materials. The range of responses was wide, indicating some students did not consider themselves proficient, which could challenge them in an online course. Howland and Moore (2002) found that students lacking technical experience had difficulties in their online course while proficient students did not.

Domestic and international students differed significantly on internet proficiency. It may be that more domestic students have internet access at home (Song, 2005), better access at home (cable/DSL vs. dial-up) (Song, 2005), or grew up using it frequently.

Students were asked to take the Index of Learning Styles and report their results on the survey. The average student in our study straddled the active reflective dimension, and had low sensing and sequential styles, and moderately visual style. Our results were very similar to those of van
Zwanenberg et al. (2000) and Zywno (2003) with one exception. The mean for all students in
the van Zwanenberg (2000) study and a subset of engineers from that study in the active-
reflective category were the only means that differed from our results by more than 1.0 on a
twelve-point scale.

Students selected the corn and biotechnology units as the best in the biomass production
module. The unit students considered worst was spread evenly among all five units. The most
common comment from students was a lack of interest in the unit.

The biomass production videos used to supplement the video lectures and MDAP were
considered slightly useful to useful. Mills and Xu (2005-2006) found that students liked the
movie clips offered in their course.

BRT 501 quizzes were given very frequently throughout the semester, which Angus and Watson
(2009) and Smith (2007) found improved student performance on the final exam. Students
considered the biomass module quizzes about the same difficulty as quizzes for other BRT 501
modules. Most students felt the questions on the quizzes reflected the module material at an
acceptable to good level.

Students were asked what helped them learn most and detracted from learning in the biomass
production module. Students indicated pictures, diagrams, and videos were used to effectively
illustrate concepts. One of the learning detractors was prior knowledge of biomass production,
which encompassed 25% of survey respondents.

Students liked the convenience and accessibility offered by an online course. This agrees with
the findings of Arbaugh (2005) and Harlan and Doubler (2004). One student stated, "It is nice to
do them [lessons] when you are available." Another student said it was their “only option right
now for pursuing [a] MS engineering degree."

About two-thirds of students commented on instructor availability, even though they gave a
neutral mean score. A recurring theme of student comments throughout the survey was the
desire to have time with the instructor and classmates, to have a connection with them. The
majority of students thought it was important for the instructor to be visible or present,
regardless of the delivery method. Bernard, Abrami, Lou, Borokhovski, Wade, Wozney, Wallet,
Fiset, and Huang (2004) found that lack of connection to the instructor and fellow students
impacted online student retention.

Students without a farm background showed a significant increase in self-assessed biomass
production knowledge, whereas students with a farm background did not. There was a
significant increase in self-assessed biomass production knowledge for all BRT 501 students.
This indicates the module was useful in bringing the self-assessed biomass production
knowledge of three-quarters of the participating students closer to that of students who grew up
on a farm. This self-assessment is supported by student scores on the biomass production
quizzes and final exam questions for the BRT 501 course.

**Conclusion**

The survey results for BRT 501 covering demographics, online course and computer
experience, learning styles, module content and delivery, self-reported student learning,
communication, and production agriculture experience were summarized. The VEC institutions
are in a unique position to take advantage of linkages already in place among the institutions
and add linkages to new institutions so the impact of cooperative program delivery on student
learning and educational cost management could be measured.
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