TECHNOLOGY ENHANCED AGRICULTURAL EDUCATION LEARNING ENVIRONMENTS: AN ASSESSMENT OF STUDENT PERCEPTIONS

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Abstract

The purpose of this descriptive research study was to evaluate the effectiveness of Web-enhanced agricultural education pedagogy as perceived by students in a collegiate agricultural education program. Overall, respondents agreed there were many benefits to Web-enhanced courses and perceived all Web site components under study to be very useful. It was recommended that Web-enhanced instruction be increasingly utilized in agricultural education settings in order to encourage learning, increase problem-solving skills, and increase technological literacy.

Introduction

The educational field has witnessed many profound changes over the past few decades. Traditional educational models have emphasized a teacher-centered environment in which the majority of information is disseminated through the teacher (Simonson & Thompson, 1997). With today's highly technological society, this mode of education has come under great scrutiny with many educational professionals and legislators calling for change. Educators and other related professionals across the nation have started to realize the importance of having students become independent thinkers, explore complex problems, and apply the knowledge to real-life situations (Simonson & Thompson). According to Simonson and Thompson, many experts in the field of education recognize technology as an essential component to support this new wave of thought sweeping the academic world.

More than 1,000 universities today offer courses utilizing the Web in the United States (Wingard, 2004). The advantages of Web-based instruction for institutions of higher learning include having a wider array of course offerings available in addition to being time or location feasible (Wingard). Over the past few years many universities have begun to utilize Web-based instruction to enhance on-campus traditional courses, without full knowledge of the benefits of this addition. Universities have made significant investments in course management platforms, expanding networks, staff training and support systems, all in an attempt to transition traditional courses to more Web-enhanced formats (Park, 2003). According to Goldberg (1997), and Wheeler and Jarboe (2001), the combination of online activities and traditional classroom instruction has become the most popular way to use Internet teaching tools. Wheeler and Jarboe identified that students with access to traditional instruction and a Web-based learning environment, do better overall than students who are taught entirely with one of the aforementioned methods. Kahn (2000) found that Web enhancement incorporates the best of two worlds: efficiency of student administration and an enjoyable, flexible learning environment that infuses diversity of learning styles.

Web-based Learning

The World Wide Web provides a powerful new resource for education in agriculture and the life sciences (O'Kane & Armstrong, 1997). Instruction delivered through technological means has been shown to be effective in disciplines such as microbiology, anatomy, engineering and medical science (Fasce, Ramirez, & Ibanez,

1995; Inglis, Fu, & Kwokchan, 1995; Jones & Kane, 1994; Tothcohen, 1995). According to Murphy and Boyd (2000), computer based instruction has been utilized to teach subject matter in the areas of farm safety, landscape design and construction.

While distance education has been the predominant focus of the literature, instructional technology utilization in the traditional classroom must not be overlooked. Murphy and Terry (1998) stated that the opportunities are numerous for agricultural educators to utilize instructional technology in their daily task. Utilizing Delphi techniques, Murphy and Terry conducted a nationwide study to develop consensus and provide focus for future research concerning the adoption of electronic communication, information and imaging technologies for instructional use in agricultural education settings. One of the major objectives of the study was to gauge agricultural educators opinions in relation to the positive effects they feel electronic technologies will have upon agricultural education instruction. Responses tended to lean toward the following four areas: (1) an increase in the availability of educational opportunities, (2) improve informational resources for faculty and students, (3) more effective instructional materials, and (4) more convenient delivery methods for instructors.

According to Schmidt (2002), in order to successfully Web-enhance a course, one must address the following four components: administration, assessment, content, and community. An instructor can address one, several, or all components when developing a Web-enhanced course. The administrative component of courses establishes the foundation for the organization and administration of the Web-enhanced course. The tools of the administrative component are designed to increase instructor productivity and efficiency. This component, if designed correctly, allows a teacher to spend more class time interacting creatively with students addressing higher level thinking skills rather than on mundane activities such as distributing materials or collecting assignments. The assessment component addresses how student performance and learning can be assessed via the Internet. A major advantage of assessing via the Internet is the ability to provide instant feedback to the student. The content delivery component focuses on the communication of course content and online learning activities. As with the traditional instructional environment, learning is strongly impacted by the teacher's ability to communicate the subject matter. The community component addresses the sense of community among learners, and between learners and teachers. The quality of the online course depends on the established learning community (Seabolt & Arends, 2000). According to Peters, Nutter, and Toto (2000), the key to a successful online community is that teachers create good questions and case studies. Communication tools in an online environment can be characterized as either synchronous or asynchronous.

Problem Statement

The National Research Council (1988) in the book *Understanding Agriculture*, emphasized that in order for agricultural education to remain viable, educators should emulate the best current programs while generating new ways to deliver agricultural education. In order to keep pace with the aforementioned change in higher education pedagogy, North Carolina A&T State University's Agricultural Education Program began to infuse technology into the daily instruction of graduate and undergraduate courses in the Fall semester of 2000. In making this change, a great number of graduate courses were eventually converted to total distance learning delivery, while undergraduate instruction began to move toward a more "Web-enhanced" format. This change forced professors and students to become more technologically literate in relation to teaching and learning. What are the benefits of Web-enhanced learning? What components of the course Web sites do students find useful in relation to their learning?

Web-enhanced Course Defined

Web-enhanced courses are traditional, face-to-face courses that have successfully incorporated pedagogically sound uses of Web technology into the design and delivery

of the course (Center for Electronic Learning, 2003). A Web-enhanced course uses Web resources to augment on-campus courses (College of Dupage, 2003).

There are many benefits to creating a Web-enhanced course. One advantage is that students are able to refer to online materials anytime, anyplace. Additionally, instructors have access to a course roster that is updated daily during the semester, if desired. The faculty can track students' activity online, post a syllabus, enter scores in a grade book, and develop online quizzes that can be scored automatically.

The following benefits for students taking Web-enhanced courses have been found by instructors:

- Working online helps to encourage the development of important computer skills.
- Online research may be facilitated by instructor created links or by directing students to online library resources and research tutorials.
- Students learn to evaluate the validity of information found on the Internet which aids in developing critical thinking skills (College of Dupage, 2003).

Other advantages that have been found with Web-enhanced learning include accessibility, flexibility and communication. Accessibility allows students to be actively engaged in learning, leading to greater time on tasks and greater depth of knowledge. Also, classroom dialogue is enabled beyond the time and constraints of class time. Flexibility enables students to be given more practice with course materials, with almost instantaneous feedback. Additionally, course materials can be adapted to varying learning styles with Web-enhanced courses. Communication in Web-enhanced environments allows students to work more collaboratively with one another, allowing students to examine their existing conceptions and update or modify them (University College Worchester, 2003).

Theoretical Framework

Constructivism provides the theoretical basis for Web-enhanced learning in higher education. Constructivism is based on the premise that all individuals construct their own perspective of the world through individual experiences and schema. Constructivism prepares the learner for problem solving in ambiguous situations (Schuman, 1996). Constructivists believe that "learners construct their own reality or at least interpret it based upon their perceptions of experiences, so an individual's knowledge is a function of one's prior experiences, mental structures and beliefs that are used to interpret objects and events (Jonasson, 1991, p. 6-7)." According to Jonasson, what someone knows is grounded in perception of the physical and social experiences which are comprehended by the mind.

In constructivism, students are in control of their level of learning. Moreover, software can be designed to give the learner options and let them make choices. In Web-enhanced learning, the student learns new ways to learn and uses technology to learn. Software is a tool used to reach learning goals, particularly with the use of Internet based simulations and modeling to conduct research (Nordhoff, 1999). In a constructivist environment, the instructor is a facilitator of knowledge guiding the learning process. The instructor provides cognitive support and must be open-minded to the needs of individual learners. Constructivist learning is an active process, achieved through discovery and develops higher order and socialization skills. Constructivist learning is inclined to be inductive, from general to the specific. The Internet and multimedia CD's offer nonlinear access to information, and e-mail and the Internet makes cooperative learning possible.

Purpose / Objectives

The purpose of this descriptive research study was to evaluate the effectiveness of Web-enhanced agricultural education

pedagogy. In order to accomplish the aforementioned purpose, the following objectives were established:

1. To determine the demographic background of the students under study.
2. To evaluate the value of selected benefits of Web-enhanced agricultural education courses.
3. To evaluate the usefulness of various Web site components of agricultural education Web-enhanced courses.

Methodology

The population for this descriptive study consisted of all students (N = 43) who were enrolled in three Web-enhanced undergraduate agricultural education courses at North Carolina A&T State University during the 2002 – 2003 academic year. The three courses under study were Survey of Food and Agribusiness Industry, Introduction to Agriscience Education, and History and Philosophy of Agriscience Education in the American Public School System. A survey instrument to accomplish the objectives of the study was developed from a review of relevant literature in the field of agricultural education and curriculum and instruction. Some particular questions regarding the benefits and usefulness of course Web sites were adapted from a study conducted by Murphy (2001).

The survey instrument developed by the researchers consisted of three parts designed to measure the benefits of Web-enhanced learning, the usefulness of various Web site components, and background information of the students. Section one of the survey, "Benefits of Web-enhanced courses" consisted of 10 statements and utilized the following Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Uncertain, 4 = Agree, 5 = Strongly Agree. Section two of the survey, "Usefulness of Web site Components," consisted of 12 statements and utilized the following Likert Scale: 1 = Not Useful, 2 = Somewhat Useful, 3 = Uncertain, 4 = Useful, 5 = Very Useful. Section three, "Demographics," measured variables such as age, major, gender and ethnicity.

The validity of the instrument was assessed by a panel of experts consisting of five faculty in instructional technology who had conducted similar research at North Carolina A&T State University. The reliability of the instrument was measured during a pilot testing of the instrument with 20 agricultural majors not included in this study who had taken previous Web-enhanced courses in agricultural education. The Chronbach's Alpha reliability coefficient for sections one and two of the instrument were .85 and .91 respectively. Minor grammatical and style changes were made to the instrument. The survey instrument was administered at the culmination of each course. Students who were enrolled in more than one of the courses were not given the instrument more than once. All students enrolled in the three courses completed the instrument, no instruments were deemed unusable. Data collection took place during May of 2003. Readers should take note that the results of this study cannot be generalized beyond this study.

Findings

Table 1 presents the demographic information collected during the research study. The mean age was 21 years, with the majority of respondents being male. The majority of respondents were Black, and were majoring in agricultural education, followed by other majors (animal science and environmental science).

Table 1
Demographic Profile of Student Respondents

	M	*SD*
Age	21.21	4.82
	f	*%*
Gender		
Female	15	34.9
Male	28	65.1
Ethnicity		
Black	32	74.4
White	8	18.6
Other	3	7.0
Major		
Agricultural Education	21	48.8
Agribusiness	3	6.9
Agricultural Economics	3	6.9
Other	16	37.4

Table 2 presents the findings concerning the benefits of Web-enhanced learning. For data analysis purposes the following scale specifications were utilized: 1 – 1.49 = Strongly Disagree, 1.5 – 2.49 = Disagree, 2.5 – 3.49 = Uncertain, 3.5 – 4.49 = Agree, 4.5 – 5 = Strongly Agree. Having quicker access to grades was the variable that reached the highest level of agreement. Additionally, students felt that their awareness of technology was increased in Web-enhanced courses and that they also gained practical experience in using the technology. Convenience was seen as a major benefit to Web-enhanced courses especially in relation to time and communication with the instructor. Problem solving skills were perceived to be increased through Web-enhanced learning. Students also indicated that Web-enhanced courses were of a higher quality than traditional lectured based courses and that the Web site actually enhanced the face-to-face lectures of the instructor. Students also perceived that they had more access to course materials in a traditional classroom setting.

Table 2
Perceived Benefits of Web-enhanced Courses (N = 43)

Benefits	*M*	*SD*
Student to student communication/interaction is greatly enhanced with the use of Web-enhanced learning.	4.52	1.23
Quicker access to course grades.	4.37	1.29
More efficient or effective communication between the faculty and students.	4.30	1.28
Increases my awareness of current technology.	4.14	1.08
More access to course materials than I would have in a traditional classroom setting.	4.14	1.08
Saves me time.	4.12	1.24
My problems solving skills are enhanced with the use of the Internet in combination with traditional face-to-learning.	4.09	1.11
The course Web site enhances the instructor's face-to-face lectures.	4.05	1.25
Web-enhanced courses overall are of higher quality than traditional lectured based courses.	4.02	1.16
More convenient for me.	4.00	1.36

Note. Scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Uncertain, 4 = Agree, 5 = Strongly Agree

Table 3 presents the findings concerning the usefulness of selected Web site components. For data analysis purposes the following scale specifications were utilized: Scale: 1 – 1.49 = Not Useful, 1.5 – 2.49 = Somewhat Useful, 2.5 – 3.49 = Uncertain, 3.5 – 4.49 = Useful, 4.5 – 5 = Very Useful. Respondents indicated that components such as the on-line grade tool and lecture notes were very useful. Web site components such as the course syllabus, review materials/handouts, links to other online resources, multimedia materials, instructor background information, access to Power Point lectures and online discussion questions were seen as very useful. Web site components such as old test and practice exams were also seen as very useful.

Table 3
Usefulness of Web site Components (N = 43)

Web site Components	*M*	*SD*
Access to student grades.	4.74	.44
Lecture notes.	4.70	.71
Study sheets, review materials, handouts that may be printed from the Web site.	4.70	.46
Links to other online information sources.	4.70	.56
Course syllabus	4.65	.48
Presentation materials used in class presentations/demonstrations (e.g. PowerPoint Slides).	4.60	.58
Contact information/links for the students in the class.	4.60	.73
Multimedia course materials (e.g. audio, video, graphics and/or animations).	4.57	.70
Practice exams and quizzes.	4.56	.79
Class discussion questions or chat areas.	4.53	.74
Old tests.	4.52	.98
Additional information (background) about the instructor.	4.51	.88

Note. Scale: 1 = Not Useful, 2 = Somewhat Useful, 3 = Uncertain, 4 = Useful, 5 = Very Useful

Conclusions

Overall, students agreed that Web-enhanced learning increased their awareness of technology, and was an effective means of communication, between faculty and students, and student to student. Constructivist theory emphasizes students creating their own knowledge base and interpretation of knowledge through active engagement with the learning environment. In Web-enhanced environments, communication is greatly increased by allowing students to work more collaboratively, which allows them the opportunity to examine their existing interpretations, and update them as needed (University College Worchester, 2003). With this said, it appears that collegiate agricultural courses with Web-enhanced environments engage students in more in-depth learning situations, which greatly benefits the overall learning achievement and cognition of students.

Students indicated that overall time savings and convenience were major benefits with Web-enhanced learning. Web-enhanced learning allows students consistent access to course materials, and allows out of class communication which enables students to be more actively engaged in learning (University College Worchester, 2003). With the time savings and convenience of content material access, students in this study recognized the benefits of Web-enhanced

agricultural courses and perhaps take advantage of them.

Problem solving skills and the quality of the course compared with more traditional settings were factors agreed upon by students. Web-enhanced learning allows the development of problem solving skills through the interaction of the student with Web-based materials in relation to the task of solving problems presented as course assignments. This directly relates to the constructivist principle of encouraging problem solving by placing learners in challenging situations, encouraging active engagement through discovery and the development of higher order and socialization skills. Additionally, the students' perception of the course being more challenging than traditional formats relates to the constructivist principle of instructors being facilitators of knowledge, guiding the learning process, and providing cognitive support which in all provides for a more enriched learning environment (Nordhoff, 1999). Given this finding Web-enhanced learning could be a pedagogical technique agricultural professors could utilize to stimulate higher order cognition.

Students indicated that the course syllabus, lecture notes, grade tool, communication tools in the course Web site, and review materials were the most useful components. Perhaps the overall Web site motivates students to take more interest in their learning. Nordoff (1999) indicated that Web-based materials could be a tool used to reach learning goals. One observation that the researchers made during the progression of each course was that students indicated how much they enjoyed having the course Web site accessible to them. In their opinion this was very different in comparison to traditional courses they had taken across campus, and even more effective.

Recommendations

Based on the findings and conclusions of this study the following recommendations were made:

1. Agricultural education faculty could use more Web-enhanced instructional formats in their pedagogical deliveries, utilizing a constructivist pedagogical style, thus enriching the overall learning environment and development of intellectual capital.
2. Place all course materials, including supplemental materials on the course Web site to increase overall course accessibility and flexibility in learning.
3. Incorporate more assignments that encourage students to use Web-based resources in collaborative groups, thus encouraging problem solving, increasing technological literacy, and improving socialization skills, ideals which directly relate back to the combination of Web-enhanced learning when combined with constructivist principles.

Implications

Technology has greatly impacted the global society economically, politically, and socially, and the field of education is no exception. Agricultural education as a discipline and colleges of agriculture must increasingly adapt to technological change, particularly in daily instruction in order to more effectively prepare the world's future agricultural leaders.

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