Technology Integration in an Agriculture Associate's Degree Program: A Case Study Guided by Rogers' Diffusion of Innovation

T. A. Drape, D. Westfall-Rudd, S. Doak, J. Guthrie and P. Mykerezi
Virginia Tech
Blacksburg, VA

NACTA
north american colleges and teachers of agriculture
connect | develop | achieve

Abstract

Using Rogers' Diffusion of Innovations as a model, the researcher examined technology integration and how the faculty in an Associate's Degree program chose to integrate technology into the students' experiences. This case study explored technology integration from a programmatic standpoint using video collection, observations, qualitative interviews and video coding using Noldus Observer©. Video observations were collected on 96 students and two faculty members; interviews were conducted with 10 students, two faculty members and the program director. The data illustrates that faculty are careful when choosing to integrate technology. They consider the priorities of the program leadership team, technology usage in the agriculture industry and students' comfort with technology when making decisions about integration. The researchers recommend that technology be integrated on a daily basis and be evaluated as a teaching tool; however, technology is not a substitute for an actual teacher.

Introduction/Conceptual Framework

Students in any educational setting need to learn how to integrate and use technology to be successful in a future career. These technologies may include using a word processor, troubleshooting hardware and software issues and using a search engine (McEuen, 2001). While any educational system cannot teach every skill, faculty can help integrate technology and model skills that students will need later in life. When faculty members require technology-based projects in their courses, they may help students develop a foundation of important career skills to draw upon in the future.

Diffusion of Innovation provides insight into the factors that may influence an individual to utilize a new technology for instructional purposes (Bennett and Bennett, 2003). A growing number of universities are encouraging faculty to utilize technology in their teaching and learning to turn their universities into high-tech learning communities. *"Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system,"* (Rogers, 2003, p. 5). Innovation-decision experience is the *"process through which an individual (or other decision-making unit) passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea and to confirmation of this decision,"* (Rogers, 2003, p. 20). The process can be influenced by prior conditions, characteristics of the decision making unit, perceived characteristics of the innovation and communication channels.

Rogers (1995) discussed five attributes that impact the rate of adoption: 1) relative advantage, 2) compatibility, 3) complexity, 4) trialability and 5) observability. *"Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes,"* (Rogers, 2003, p. 212). Many change agencies use incentives to increase the rate of adoption. The primary function of an incentive is to increase the degree of relative advantage. This suggests a need to focus on the specific pedagogical advantages of the instructional technology over a more conventional teaching tool (Bennett and Bennett, 2003). Most instructional technologies are flexible and can be put to many uses.

The second attribute, compatibility, *"is the degree to which an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters"* (Rogers, 2003, p.224). A faculty member may feel that the instructional technology is consistent with their values and philosophy of teaching

but needs to know how the technology will assist him or her in achieving his or her learning goals. In many circumstances, the introduction of instructional technology results in rejection by the faculty who do not account for the amount of time it takes to learn the new technology, or the resulting changes that are likely to shift their teacher-centered classroom into a learner-centered classroom (Bennett and Bennett, 2003). To help facilitate the change from teacher-centered to learner-centered, faculty development must evolve from teaching about a piece of technology to training faculty to use software in the learning environment (Rao, 1999, March).

The third attribute, complexity, "is the degree to which an innovation is perceived as relatively difficult to understand and use," (Rogers, 2003, p. 242). The rate of adoption is slower with more complex innovations. Instructional technologies can be very intimidating for faculty if they perceive them as too complex. As a result, learning how to effectively apply new technologies to enhance teaching and learning can be slow (Lynch et al., 2002). Even if the technology itself is not perceived as difficult, it may be too time consuming for a faculty to learn. To ensure the fear of complexity does not become an obstacle, it is important to stress that the content and outcomes of the training will work with the skills and abilities of the faculty involved (Bennett and Bennett, 2003).

The fourth attribute, trialability, *"is the degree to which an innovation may be experimented with on a limited basis. New ideas that can be tried on the installment plan are generally adopted more rapidly than innovations that are not divisible,"* (Rogers, 2003, p. 243). The greater the opportunity to try new things, the easier it is for faculty to evaluate and possibly adopt new technology. Trialability can be a challenge for many forms of instructional technology since they require faculty members to make substantial investments of time and energy to learn the basics of something new. It is important for faculty to try out new instructional technologies to form their own opinion of its use in their classrooms (Bennett and Bennett, 2003).

The last attribute, observability, "is the degree to which the results of an innovation are visible to others," (Rogers, 2003, p. 244). If the technology has a high rate of observability, it will be easier for a faculty member to learn about it, form an opinion about its potential benefits and uses and then make an informed decision about whether or not to begin adopting it into their courses. Observability indicates how critical it is to provide demonstrations to faculty to help them become familiar with it, ask questions about it and see it in use (Bennett and Bennett, 2003).

Current college-aged students are heavy users of the Internet, compared to the general population (Jones and Madden, 2002). Use of technology and the Internet is part of college students' day-to-day activities and it is integrated into their daily communication habits (2002). Today's college students check their email at least once a day, consider the Internet their personal library and treat technology as a way to express themselves through email.

There are nearly 14,500,000 students enrolled in colleges and universities across the country. These students have access to the Internet and other forms of technology at all times (Jones and Madden, 2002). The body of students currently in colleges and universities, known as millennials and were born after 1982, have been exposed to advanced technology and expect the integration of these tools in applications wherever they go (Howe and Strauss, 2003). This group of students views technologies such as text messages, mp3 players and web browsing as part of everyday life (Oblinger and Oblinger, 2005).

At the same time, educators across all age groups are becoming more comfortable with technology, choosing to integrate it into their own teaching. As colleges and universities begin to provide more support to their faculty, such as the Faculty Development Institute (FDI), faculty are able receive the support they need to implement tools more effectively and satisfy their students' and their own learning objectives (Oblinger and Oblinger, 2005). Students expect their faculty to be technologically savvy and will draw opinions of their professors based on their ability to integrate technology into a course (2005).

As faculty work to integrate technology and continue to feel pressure from their students and the educational systems in which they are employed in to adopt new technologies. There are still questions about the impact of instructional technology on student engagement and the association that may exist between technology use in a classroom and student learning. Faculty members who are supported through training, tutorials and assistance with the integration of technology into their curriculum have been more successful at this task (Oblinger and Oblinger, 2005). However, little is known regarding how much technology should be infused in a class and where it is the most appropriate teaching tool to assist students' with the curriculum they are learning. If technology is going to help or hinder education, one must take a closer look at the matter to help faculty - both seasoned and new - make informed decisions on what kinds of technology are necessary, as well as beneficial, to support the education of students in a collegiate system. Universities interested in adopting new technologies

may want more data on the effectiveness of their current technology integration strategies.

What Is Technology Integration In Higher Education?

Technology integration is the use of computers, interactive media, satellites, teleconferencing and other technological means in instruction to support, enhance, inspire and create learning (Larson et al., 2010; Redman and Kotrlik, 2004). In 1995, the Office of Technology Assessment reported that schools had made significant progress in implementing technology and helping teachers use basic technology tools; however, schools were still struggling to integrate technology into their curriculum (Kotrlik, 2003). Technology can help students meet higher standards and promote innovative approaches to teaching and learning that were not available before, but many faculty still struggle.

Diffusion of Innovation

Diffusion of innovation is a theory of how, why and at what rate new ideas and technology spread through cultures (Rogers, 2003). The four parts of the theory of diffusion: the innovation itself, how information about the innovation is communicated, time and the nature of the social system into which the innovation is being introduced all work together to affect the adoption of an innovation. Diffusion is the adoption of an innovation which then gains acceptance by members of a certain community (Surry, 1997). Diffusion relies on how these factors and other factors interact with one another to help or hinder the adoption of a practice or product among a group of people (Surry, 1997). Diffusion of technology in an academic setting can change the habits of technology use in individual faculty but can take as long as five to ten years (Kershaw, 1996).

Diffusion is the process in which an innovation is communicated through certain channels over time to members of a social system (Rogers, 2003). Post-secondary education looks at technology for adoption in various forms (2003). Technology has two components: hardware, a tool that holds technology and software, the knowledge needed to operate the tool (Rogers, 2003). Faculty must be able to exhibit expertise when working with hardware and software in a class (Antonacci, 2002). Diffusion of innovation focuses on the reinvention of products and behaviors so they become a better fit for the needs of individuals and groups (Rogers, 2003). Kershaw (1996) states that developing a plan, creating appropriate organizational structures, providing support and training and promoting technology for a variety of purposes will help further the diffusion of technology integration.

The social system of an organization has a structure or pattern of arrangements within the system. In the setting of post-secondary education, the social system can revolve around the school system with administrators, faculty and students or in a larger setting of a community where an education program is situated. The structure of the social system has a set of norms or established patterns that have been pre-established (Rogers, 2003). Faculty can serve as change agents – a group of people who attempt to influence their clients, students, parents, administrators, or other faculty - to adopt an innovation.

Students can benefit from using an online environment because it can create a more flexible and convenient environment (Mayes, 2011). Faculty can work with the changes and adapt to the social system of the online learning environment as a way to enhance the interactions that the students have during their time in the program(Hirumi, 2002). Students can benefit their own learning by using this blended approach and using the technology as a medium to download notes, take quizzes and collaborate online during the evening, weekends and other times when class is not in session. (Mayes, 2011) Students can return to the classroom where they can collaborate with their peers and faculty leading the class and continue to use the online interface as an additional guide to help them understand and make sense of the information (Hirumi, 2002). By offering numerous outlets for receiving information, students learn that they can access information provided by the faculty outside of class time as a way to guide their own learning. Diffusion of technology integration will depend on the faculty and the rate at which they choose to adopt new hardware and software. Depending on the amount of support, training and time faculty have, the innovation may be successful in a short amount of time or take as long as ten years to be successfully implemented (Kershaw, 1996). As universities look to implement new technologies into their academic areas, they need to keep in mind that adequate support needs to be available in order for the diffusion to be successful.

The purpose of this study is to examine the phenomenon created when faculty choose to integrate various instructional technology tools into their instructional methods. The findings shared here are a part of a larger study conducted as a full program evaluation to examine the influence of technology integration on the faculty and the students in an associate's degree program within a college of agriculture. The integration of instructional technology tools into a classroom influences the relationship between the faculty and the students and has the potential to influence the students' comprehension of the course material. The major

questions guiding this portion of the study were: 1) how do educators decide what and how much technology to integrate in their program? And 2) what influences educators' decision to integrate technology?

Materials and Methods

To address the research questions, the researcher chose a triangulated case study approach. Using recorded video, in-class observations and interviews with the instructors and students, the researcher examined how the instructors integrated technology and how the technology influenced student engagement, motivation and learning. The use of multiple sources of data provides multiple measures of the phenomenon. Triangulation of data collection was important to help address the problem of construct validity (Yin, 2009).

This was a single-case study of an associate's degree program in a college of agriculture and life sciences in the eastern United States. Ninety-six students volunteered to participate in this study throughout the course of the semester. Ten student participants provided feedback through recorded observations and interviews during the semester. Six of the ten students from the program were in their first year of the program while the other four students were in their second year of the program. All of the participants had the intention of either graduating or continuing their education at a four-year institution upon completion of the program. Each participant gave consent to participate in this study. This case did not propose to represent all students in one year of the program but instead focused on the program as it is conducted within the university. The intention of the interviews was to capture the "lived experience," of participants and their reactions to engagement with technology, their instructor and other factors that affect their engagement (Corbin and Strauss, 2008). The process of interviewing provided opportunities for both formal, structured interactions with the participants and informal conversation (Rossman and Rallis, 2003). The interviews provided rich descriptions of the ways students

Table 1. a Priori Propositions				
Proposition	Supporting Literature	Research Question	Interview Questions	Observation Guide
Teachers decide to integrate technology based on their personal comfort level and accessibility to technology.	Computers can serve as a valuable and well-function-ing instructional tool for school and classrooms where teachers have convenient access, are adequately prepared, and have some freedom in the curriculum (Ertmer, 2005). Instructional tools can be defined as, "anything that encompasses all the materi-als and physical means an instructor uses to implement instruction and facilitate students' achievement of instructional objectives," (Doolittle, 2010).	How do teachers decide what and how much technology to integrate and what influences their decision to integrate technology?	Describe your definition of technology. Describe your definition of technology integration. How do you decide what technologies to integrate when you're designing your class? How comfortable are you with the technologies you integrate? Who do you ask for help when you're struggling with the technologies you use in your classes? Where do you go to view new technologies you might want to use in your field?	How does the professor interact with technology? What behaviors does he exhibit when he's teaching with technology? How do those behaviors differ when there is no technology involved? What is the nature of the learning environment? When the professor is interacting with students, does he refer to technology?
Integration of instructional technology affects a students' engagement level in a class and motivation during class time.	Engaged students are more likely to learn, to find experience rewarding, to graduate and pursue higher education (Marks, 2000). Students consider technology essential to their education and say that their learning is based on motivation and without teachers; their motivation would cease to exist. (D. Oblinger, Oblinger, J. , 2005).	How does technology integration influence student engagement and attention span?	Describe your definition of technology. How does this professor integrate technology? Based on the above answer, do you feel as though the technology helps or hinders the delivery of the course content and why? Do you find it helpful in learning course content? Why or why not? What factors help you stay engaged and motivated in this class? Whom do you ask when you need help with technology?	What do students do when technology is used during the class? What non-verbal or verbal cues do students use when the teacher discusses technology (related to a Scholar site if there is one)? What do students do when technology is not used during the class? What cues does the professor use to motivate students? (language related to grades, learning, etc....) What kind of response do students exhibit when the professor refers to an upcoming assessment or assignment?

engage in cognitive processes that could not be done through pure quantitative analysis (Rossman and Rallis, 2003). Observations, as defined by Rossman and Rallis (2003), included "formal, structured noting of events, activities and speech…and participant observation," (p. 172). These methods allowed the researcher to observe the flow of the classroom and the interaction taking place between the instructor and the students during class time. The researcher was able to observe the relationships that formed between the instructor and the students throughout the course of the semester to determine if these relationships had the potential to influence the students' engagement levels.

A case study was applied in an effort to understand the in-depth, real-life phenomenon over a period of time, to try and gather meaningful data that might not be achieved in one interview or isolated incident (Yin, 2009). Yin (2009) explains that case studies are used to, "contribute to our knowledge of individual, group, organizational, social, political and related phenomena," (p. 4). An additional strength of case studies, when compared to other research methods, is that a variety of evidence is provided through an array of techniques, such as interviews, observations, or document analysis (2009).

The associate's degree program was selected after the researcher met with the program director and learned about the level of technology integration utilized as part of the instruction in all program courses. Faculty members in the program were selected based on their willingness to participate and their desire to conduct research to gain feedback about their use of technology and teaching from their students. The Institutional Review Board approved the study protocol and all participants provided written informed consent prior to participation in the study. After receiving IRB approval (10-1084), participants were sought from within the program to volunteer to be videotaped during each course section meeting – twice a week – and to participate in four interviews throughout the semester. Cameras were set up before each class to record the class as a whole and web cams were attached to lap top computers to record individual participants who gave consent to participate. Video was collected from the students' computers once a week and stored for analysis. The instructor offered the option of extra credit or coffee cards from a local coffee shop for those students who participated and as a research team. We honored their request.

Students were solicited during the first class session and presented with the purpose of the research, consent forms and given the opportunity to ask questions. The researcher and professors were both in attendance to answer questions. The only criterion for student selection was that they were enrolled as either a full- or part-time

Table 2. Observation Guide
The purpose of observations is to learn how an instructor engages students with technology and how students engagement and motivation
During class, the following constructs will be used to guide the researchers' observations.
How does the instructor keep students engaged and motivated using technology?
a. What technology does the faculty use in the classroom?
b. How does he engage students to begin class?
c. Does the faculty offer support or help for students who are having trouble using the technology?
d. What solutions does he offer?
e. What behaviors does he exhibit when he's teaching with technology?
f. What is the nature of the learning environment?
g. When the professor is interacting with students, does he refer to technology?
What are the students doing while the instructor is teaching the class?
a. How do students engage in the classroom learning process using technology?
b. How are students using technology and what effect is it having on their engagement and motivation?
c. What kind of response do students exhibit when the professor refers to an upcoming assessment or assignment?
d. What kinds of questions are students asking in class? (Something related to recall of information vs. mastery?)
e. What do students do when technology is used during the class?
f. What non-verbal or verbal cues do students use when the teacher discusses technology (related to a Scholar site if there is one)?
g. What do students do when technology is not used during the class?
h. What cues does the professor use to motivate students? (Language related to grades, learning, etc.…)
i. What cues are students giving that demonstrate they are learning?

student in the associate's degree program offered in the College of Agriculture and Life Sciences. The cameras were arranged to focus on and record only those students who gave consent. Students consented to be filmed and be interviewed. Students had the opportunity to decline if they chose.

The *a priori* proposition proposed in Table 1 was used by the researcher to the plan and develop the interview guide and observation protocol. Yin (2009) explains that propositions can, "reflect an important theoretical issue," or provide guidance in, "where to look for relevant evidence," (p. 28). Table 1 explains how the propositions are related to the participant interview guides and classroom observation protocol, as well as the supporting literature. The *a priori* propositions also provide linkages between the current literature, the research questions and the research practices.

Observations of the classroom took place over the course of six weeks. This time period allowed the lead researcher to follow the two classes of students and observe their interactions with each other, their peer group, their professor and the technology integrated into the course instruction and management. Observations took place each week during the classes and using the recorded video and observation guide in Table 2. The researcher kept a journal to record observations during the review of the classroom video and points to follow up on with the instructors and students during interviews.

Table 3. Interview Guide

First Interview-Before classes begin
Instructor Interview Guide

How long have you been using this technology?
What has changed?
How do you/your dept. make decisions regarding technology use?
What considerations weigh the heaviest or least?
What feedback do you get from students regarding these choices?
Whom do you ask for mentoring/help with a new piece of technology?
How much time do you spend learning new technologies?
How does this program make decisions on implementation?
Describe your definition of technology.
Describe your definition of technology integration.
How do you decide what technologies to integrate when you're designing your class?
How comfortable are you with the technologies you integrate?
Whom do you ask for help when you're struggling with the technologies you use in your classes?
Where do you go to view new technologies you might want to use in your field?
How would you define learning?
Do you view the technology you integrate as a tool to help your learning and understanding of the material? How?

First Interview
Student Interview Guide

Describe your definition of technology.
How does this professor integrate technology?
Based on the above answer, do you feel as though the technology helps or hinders the delivery of the course content and why?
Do you find it helpful in learning course content? Why or why not?
What factors help you stay engaged and motivated in this class?
Whom do you ask when you need help with technology?
How would you define learning?
Do you view the technology the professor integrates as a tool to help your learning and understanding of the material? How?
Why do you think the professor chooses to integrate this technology?
Are there other technologies or other ways of using this technology that you think the professor should be using or doing? Why or why not?
What do you think the professor's objectives are for this course?

Questions for Program Director

Can you tell me some of the history of the program and how it evolved into what it is today?
How do you/your dept. make decisions regarding technology use?

What considerations weigh the heaviest or least?
What feedback do you get from faculty and students regarding these choices?
Who does faculty ask for mentoring/help with a new piece of technology?
How much time do you offer faculty for learning new technologies?
How does this program make decisions on implementation of new technology?
Describe your definition of technology.
Describe your definition of technology integration.
Describe the process a faculty would go through to get funding or support for new technology.
Where do you go to view new technologies you might want to use in this program?
How would you define learning?
Do you view the technology you integrate as a tool to help your learning and understanding of the material? How?

Second and Third Interview
Instructor Interview Guide

How do you think this course is progressing?
What do you see as the strengths of this course?
What do you see as areas that need to be improved?
What aspects of the technology do you think are going smoothly?
Which areas of the technology do you think need to be refined?
How comfortable are you with the technology you're using right now?
How are you gauging student's engagement during class?
What strategies do you implement to encourage student engagement and motivation for the course if you notice them faltering?

Second Interview
Student Interview Guide

How do you think this course if progressing?
What do you see as the strengths of this course?
What do you see as areas that need to be improved?
What aspects of the technology do you think are going smoothly?
Which areas of the technology do you think need to be refined?
How comfortable are you with the technology you're using right now?
How would you define your engagement in this class?
What keeps you motivated in this class?
What strategies do you use to study for this class?

A fourth interview can be administered if necessary and saturation has not occurred.

An interview guide (Table 3) helped the researcher recall and reflect on the curriculum material, the structure of its delivery and the technology used to deliver the lessons. Faculty and students were asked to participate in interviews at various points during the semester. The director of the program was also interviewed in order to allow him the opportunity to discuss the role of technology in the program and the technology integration expectations he has of the faculty who taught in this program.

Interviews with the participating students served as an opportunity to hear their perspective on a piece of video after it had been reviewed by the researcher. Students were asked questions regarding their behavior or lack of behaviors related to instructor engagement and the students' engagement during class. Interviews were semi-structured, meaning there was a general interview guide; however, at times what the participant said triggered another question or led to other areas of discussion. Semi-structured interviews helped increase the richness of the data and allow the researcher to ask more questions as the participants divulge information on their view of technology and their instructor (Corbin and Strauss, 2008). All participants were assigned gender neutral pseudonyms and are referred in the masculine form throughout this work.

The director of the program and the participating faculty provided the researchers with access to documents about the history of the academic program and course materials that were distributed to students during the data collection and observations. Documents on the history of the program were evaluated to inform the researcher of the expectations of the program for the students and for the faculty. Documents collected from the courses were evaluated for content and to identify where the instructors supported or required the integration of technology into the courses. Faculty provided the researcher's access to Scholar, the course management site, to access these materials and any other resources that the faculty have made available to the students.

Data Analysis

Analysis took place by observing video, utilizing Noldus Observer©, to help find themes in the video of participants and the lab instructor and the transcripts of the interviews with the participants and the lab instructor. Transcripts were coded and codes were merged into themes. Triangulation of data collection is important to help address the problem of construct validity (Yin, 2009). Multiple sources of data provided multiple measures of the phenomenon (Yin, 2009).

Video served as an important dimension in this case study. The video capture process was unobtrusive and allowed the researcher make observations, take notes and listen to the class (Patton, 2002). Videos were analyzed and coded for use of technology, how often the instructor and students discussed the use of technology and what conclusions both groups decided on in reference to the use of technology in and out of the classroom. Upon completing the class recording, video was viewed on the student computers to look at particular students' behaviors or non-behaviors using Noldus FaceReader© and Noldus Observer©. Video was coded based on facial expressions and non-verbal body language. What the observer was not seeing was just as important as what they were seeing and this helped the researcher form interview questions and code video based off of a non-response from participants. During the actual class session, the researcher observed the class, making notes in a journal of observations and general notes on the rapport of the instructor and tone of the class on that particular day.

Express Scribe© transcription software and Atlasti© coding software was used during the transcription and coding of the interviews with participants and the lab instructor. Observations from the researchers' journal were also transcribed and stored for further analysis. Memos were created during the transcription process in order to make note of any themes and reactions as they arose. Memos helped the researcher stop and analyze codes early in the research process to help be aware of common themes among the different pieces of data (Charmaz, 2006). Observations and transcripts were analyzed to determine any patterns, frequency of codes, or code combinations that would help develop a rich and full explanation in response to the research questions (Yin, 2009). All participants were assigned gender neutral pseudonyms and are referred in the masculine throughout this work.

The process of coding the transcripts and documents was informed by the *a priori* propositions, participant statements and the researchers' observations of the phenomena (Constas, 1992). The preliminary codes were reviewed by the researchers throughout the process of analysis to *"differentiate one category/theme from another and to identify properties and dimensions specific to that category/theme"* (Corbin and Strauss, 2008, p. 73). Similar codes where then merged into one category (Glaser and Strauss, 1967/1995). Upon completing of the coding and category development, all quotes and codes within each category were reviewed to verify consistency within the category and accuracy of the category itself. Those quotes that were miscoded were reviewed and recoded. Once the categories and associated quotes were reviewed for their accuracy, the categories were integrated again into category themes. This paper reports the findings within one category theme and its associated sub-themes.

Results and Discussion

The purpose of this research is to examine the phenomenon regarding how much technology should be infused in a class and where technology use is most appropriate to assist students' with the curriculum they are learning. The major questions guiding this study were: 1) how do educators decide what and how much technology to integrate in their program? And 2) what influences educators' decision to integrate technology?

Theme: Technology Is Integrated and Diffused to Students Based on the Faculty's Program and Course Design Decisions

Sub-theme: Program. Technology use and integration is an expectation of the faculty when they are hired, as well as of the students when they accept admission into the program. The program director, Quinn, said, *"This program is one of the programs that really loves technology. The instructors are really comfortable with it and they have good skills applying technology."* Through monthly faculty meetings and informal conversations with each other, faculty members are expected to know how to use and implement technology on a daily basis. This communication framework for developing plans for the integration of new technology begins when an individual is hired to teach in the program and the direction of the planning integration comes from the faculty meetings, where open communication and feedback for an exchange of ideas are welcome. Suggestions for new technology or review of a current piece of technology are discussed during the meetings and faculty work together to make decisions regarding the program. Quinn tries to support the faculty decisions to add new technology tools with funds for purchases and professional time for training. As a part of the discussion to add a particular piece of technology to a course, Quinn did not want to "overload the students applying the technology." Once a piece of new technology is selected for implementation, the

program director works with the faculty to assess their needs on technology, whether the request is a new piece of software, additional training, or financial support to help offset the costs associated with integrating technology into the program. For example, a faculty member, Jessie, suggested that the i>clicker® could be a valuable tool for implementation. Quinn offered to support the faculty member if he invited a representative from the company to provide training to the faculty. Training was administered to the faculty in the fall of 2010 and Jessie began integrating them with his students in the spring of 2011 as a pilot, to see if other faculty members in the program wanted to implement them in future semesters.

Faculty are encouraged to seek help for integrating new technology resources from the university's Faculty Development Institute (FDI) to enhance their technology skill set and become familiar with new resources. To help save money, Quinn requires that each member of the faculty work through the FDI to earn a free computer by attending a series of professional development workshops. Each instructor completes training every three years to ensure that he or she receives an up-to-date computer. Quinn encourages his entire faculty to use FDI and also attend workshops they facilitate for faculty and staff in the program as part of their own professional growth. Quinn cites FDI as a major contributor to the success of the program, partnering with them to obtain grants and test new software. Quinn explains his rationale for using FDI as a main resource for the program:

"If it is expensive, I will find other resources, go to FDI see if there's budget there and a small grant that I can apply for. It means use the resources you have on your own and after that see what others have, but it's important to begin with a consensus among the faculty that yes, it's important, let's go for it. This is how we start."

The university moved from Blackboard© to Scholar© for the start of the 2010-2011 academic years and participation in the FDI training was making it a smooth transition. Faculty members were urged by Quinn to attend FDI workshops about Scholar© and he set the expectation that they would attend one or two workshops before their annual evaluations. Quinn worked to accommodate his faculty members' schedules and needs by organizing training times. Quinn completed all of the FDI courses so he could facilitate them and help faculty make the transition from Blackboard© to Scholar©. Practical training sessions were offered once a month with the faculty as a group after. Quinn recognized that if the faculty were comfortable and acclimated to Scholar©, teaching the students to use it would be less of a challenge. Faculty would be able to manage their courses, answer student questions and troubleshoot their own Scholar sites.

Sub-theme: Faculty. The program administrator spends time training faculty to be comfortable with the technology, supporting them with funds and helping them complete trainings through the Faculty Development Institute (FDI). FDI represents this institution's attempt to focus on the knowledge and skills required by faculty in order to meet today's students' needs for fluency in using information technology (Oblinger and Oblinger, 2005). The program administrator makes sure faculty know that technology use will be an expectation when they are hired and is clear in conveying his desire to integrate technology and its necessity to help students learn it before they graduate. By integrating their pedagogical, content and technological knowledge into their curriculum, the program has evolved into a partnership between the technology and the content. The two have continually evolved and been driven by newer content-related ideas or by new technologies. Students see this as an asset to have and even if they are not heavy technology users in their day-to-day responsibilities after graduation, they see it as a lifelong skill.

Jessie joined the faculty part-time in 2000 and became full time faculty in 2005. When he began teaching in the program, there was no technology or computer requirement. Since then, the technology requirement was set in place and Jessie has noticed that students have a greater comfort level with the technology when they arrive in the program as freshman. Jessie identified himself as an early adopter of technology:

"I'm probably more the early adopter kind of person than the other ones in the group, so if it works here and they have to have it, I'm sure somebody else will be trying it in their classes and I'll expand it to a couple of classes in mine, once I figure out, sort of get a handle on this....just try it and go, try and make it go, it seems like a really neat idea we can do a lot of things with it, let's give it a shot. I'm probably more inclined to that than other ones in the program."

Jessie views technology integration as something that makes his life easier, whether it's his teaching or application in the agriculture industry. He considers multiple sources before choosing a technology, including professional development conferences, speaking with colleagues and talking to FDI staff. Jessie said that word of mouth is sometimes his most powerful indicator so, if he "hears people say things often and read about something coming in" to the agriculture industry he will usually use an Internet search engine first to find out more information about a resource, then continue to ask questions through contact with a company, conversations with Quinn and finally the faculty of the program.

Jessie continues to adopt and adjust to technology in his classroom. For example, when Jessie introduced

the use of i>clickers® in the spring of 2011, he worked to make adjustments to his material and incorporate opportunities for students to give feedback on their content knowledge so he can assess areas they in which they may need review or more information. Jessie was first exposed to the i>clicker® from an FDI training sessions where other faculty from biology and chemistry were integrating them into their courses. Jessie presented the idea to the rest of the faculty and received support to begin using them in his course. Jessie recognized that using PowerPoint© did not allow for much movement within a large classroom that was at capacity with students and wanted to incorporate something else as a way to gain students' attention and engage them in the material.

Emerson joined the faculty in 2007. Prior to being hired as an instructor, Emerson began his own business, which he still operates. Emerson cited his use of Microsoft Word and Excel as the primary applications of technology in his business. As a result, there was an adjustment period for him when he began working for the program and he felt behind when he started. Over time, he said he felt better acclimated, more comfortable and more willing to do more with technology. Through his teaching and feedback from students, Emerson admitted that he has moved away from traditional PowerPoint© slides for student distribution and has moved to other instructional strategies to deliver content.

"In most of my classes I'll utilize things like study questions, review questions, study guides, example problems, class notes as word documents. If I have a power point it's probably something that's probably about three years old now because I haven't done a new one in a while and I haven't looked back with any regret on that. So that's been one big shift for me, saying 'wait a minute,' if I'm presenting information, I don't have to use this format and I'm probably better off using something like that."

Emerson does not view himself as an early adopter of technology. He defines himself as "practical" and "apprehensive" when discussing his technology use and adoption. Emerson views technology from a utilization standpoint and wants to know he is using it for practical purposes. He explains:

"Yes, I'm very practically minded, so if I don't think technology is useful I don't do it just for the whiz bang of it; I don't do it just because it might look cool or might have some sort of appearance. It has to have a practical utilization for me to do that. How I use it is what I can do to transmit the information I have to the students."

Emerson recognizes that not all of his students love technology. He understands that students need to be familiar with computers and other technologies before they graduate from the program, so he works to introduce them to email, Microsoft Excel spreadsheets and skills in online etiquette, such as sending a professional email. Emerson feels comfortable with the other faculty and sees the faculty meetings as an opportunity to discuss what they would like to start or stop doing in terms of teaching, curriculum and technology. Emerson said that, "Quinn takes the lead on that (technology) to a certain extent and Jessie has been innovative on the i>clicker®." He is not opposed to using technology if he can find it to be useful to his students and help fulfill a need for them.

Sub-theme: Students. Student feedback helps shape decision-making within the program. Feedback from the students serves as a valuable tool and faculty garner feedback in a number of ways such as a question on a test, through informal conversations, or from end of semester feedback forms. Current students in the program feel comfortable with the faculty and consider their positive relationships with them due, in part, to the technology that they are asked to use as a part of their course work. Faculty members consider technology a key in the student's success after they graduate and enter the workforce or continue their education. Students who enter the program come with the mindset that they are in the program to complete it, be successful and enter the workforce.

Kris, a first year student in the program understands why the program asks him to integrate technology: *"because they know that right now in our society technology is taking over and they want us to be ready for the future. To possibly start my own business or start working for a business and we know how to do things correctly so that way we don't get in trouble with our taxes or anything like that."*

Quinn notes that only about ten percent of the graduates decide to enter the four year program at the university or transfer to another university to seek a bachelor's degree. Students who enter this program are looking to return to a family business or enter an agriculture-related field upon graduation. Teaching students how to think independently and solve problems, such as those associated with adapting to new technology begins during the first days students are on campus. Students spend the first day of classes immersed in learning how to function at the university and begin using the laptop computers they were asked to purchase as part of the program. Quinn teaches all freshmen in a computer applications class on the first day of fall classes. The entire faculty is on hand as Quinn leads the new students in accessing university accounts, using the course management system, downloading and installing programs and troubleshooting their own

technology problems. Students can always ask Quinn or any of the faculty questions; however, Quinn is trying to emphasize to the students the importance of being able to solve technology problems for life after graduation. Quinn explains his rationale for structuring the first day of class:

"I'm at the point where I feel that the students will be responsible when they purchase their computers. They need to be able to maintain their computers and know how to handle it if they have problems. I think we are delegating the responsibilities to them because this is what is going to happen after two years in the program. There's not a faculty available to fix their computer. They have to know, if they have issues, how to fix them."

Students say that this is a helpful way to begin the program. Jamie considered the training helpful because he did not have a computer background before coming to college and had relied on his parents to help him. *"If it didn't plug into the wall, it was broken. Coming here made me more independent and made me think, 'oh, I can do this."*

Students consider Quinn to be an expert on technology and nearly all of the participants cited him as the "expert" that they turned to first if they were having trouble with their computers. Some attributed this to the fact that Quinn taught their introductory computer applications course, while others considered his helpful nature and willingness to take time with them individually. Rory, a first year student enrolled in the program said he would go to Quinn because he was willing to help anybody and he liked the one-on-one help he received. Students found the entire faculty to be helpful and available for them if they needed it, saying they could ask "pretty much anyone" and "if one (faculty) wasn't available, another is."

Graduates of the program were contacted for their feedback regarding how the use of technology they learned in the program now that had graduated and entered the workforce or continued their education. Quinn tries to seek feedback from graduates every three or four years. In 2010, graduates were contacted to seek information regarding the long-term application of the functions of the tablet computers they were required to purchase as part of their enrollment in the program. Quinn said, "I was concerned, with the economic situation, that the tablet pc prices were higher than a regular laptop." Graduates responded to a survey about their tablet computers and Quinn found that while graduates liked them during their studies in the program, they were expensive and not being utilized to their full capacity following graduation. Quinn and the faculty made the informed decision to no longer require tablet computers and moved to the same laptop requirement that the rest

of the university had set for the incoming students in the fall of 2010. This saved the students approximately $500 when they purchased a computer.

Second year students, who began in the fall of 2009, had mixed feelings on their tablet computers. Ashton said, *"I love being able to have the tablet because I could do assignments with my pen; it was convenient. I'm kind of glad that the program made us buy it because that way I had to get it and now I have a nice computer that I can have forever. I think it was a good investment and I've gotten my money's worth out of it."* Taylor felt that the tablet computer "got more in the way because of the electronic part with the electronic writing." He felt it was easier to write things on paper.

The faculty is willing to try any piece of technology and software or take the advice of the agriculture industry to expose students to something new before they enter the workforce. The program administrator said he worked closely with the industry and communicated with past graduates about their feelings about technology integration and how it had been helpful for their ability to obtain and keep a job post-graduation. The faculty works to diffuse instructional technology by addressing the multitude of factors that influence the adoption of innovations to better explain, predict and account for the factors that will impede or facilitate the diffusion of technology to the students (Surry, 1997).

One example of the partnership with industry was illustrated when Quinn shared that the students enrolled in the landscape program would begin earning training and accreditation for a new piece of software. Working with the landscape instructor, he would be funded to attend the training and certification and diffuse the software to the students during the course. This would allow the students to learn the software and receive an additional certification upon completion of the program, hopefully giving them an edge in the job market. The program will be tested for two years and be evaluated based on the students' ability to improve their landscaping skills set and employability. At the end of the two year trial, the faculty and program administrator will make a joint decision to decide whether or not to continue allocating funds to the accreditation. If the program is not successful, funding will be stopped. The program administrator is not afraid to start or stop a program if there is consensus from all of the stakeholders and Quinn shared that the priority of the program is the student and how it will be beneficial for future employment.

Program recommendations. Technology and technology integration should not be viewed as a convenient way to educate students or a default when educators run out of time during class. Students want to integrate technology as a way to help them acquire

a better job, prepare them to be more competitive for internships and increase the skill set they take with them after college. Based on the findings in this study, there are a variety of improvements that could be made to enhance the appeal and rigor of technology integration in the higher education classroom. As educators, there are recommended strategies that would create more effective learning experiences for students. Students wanted to see more variety in accounting and management software, with more time spent on learning how to manage a business from the financial standpoint.

Through student feedback and analysis of video, it is recommended that the course management tool, Scholar©, be organized by individual faculty to help streamline the site for students. Each faculty member had different active options in Scholar© for students and this made it confusing. Students take courses from each of the faculty multiple times in their two years of education, enabling them to get to know their teaching style and their preferences with technology. Faculty should capitalize on this and work to streamline their technological offerings so students will know what to expect when they open Scholar© pages from the same faculty. Students noted that some faculty used one particular aspect of the course management site, but failed to keep it updated while other faculty had their site so overpopulated with resources that it was difficult for students to find the ones they needed to keep up with the course. Student feedback revealed that there was no consistency among the courses taught by each faculty member, making it difficult to find any common organizational pattern and causing confusion for the students.

It is recommended that faculty begin utilizing the Scholar© chat function both in and out of class to engage students who were less likely to answer a question verbally. This would help engage all of the learners through multiple contexts and make students less likely to browse the Internet for fun during class time. The chat function can be used to offer online office hours so students may ask questions at their convenience. Chat office hours could be implemented regularly or before major deadlines to help faculty reduce the number of individual emails if they receive from students.

The forum or discussion board function may also serve to be a valuable asset to the program. Faculty can ask questions before class to gauge what kind of pre-existing knowledge students possess and to deliver a pre-test to prepare for upcoming material. Forums can be a good place to discuss questions that the majority of the class may have or ask them to think about and discuss topics that are not on the syllabus, but still relevant to the material. Examples could include current events, ethical issues, or trends within the industry that is being studied.

Summary

The purpose of this triangulation qualitative case study was to investigate the phenomenon of technology integration in a post-secondary educational setting and how the faculty of the academic program made technology decisions, and adopted new technology. College-aged students enrolled in an Associate's Degree program served as the case study group. Over the course of the case study, participants engaged in the use of a variety of learning technologies. While some participants had more prior experience than others, for many, this program provided full immersion, from both the faculty and student perspective, in using technology on a daily basis.

Triangulation of qualitative methods connected data derived from classroom observations, coded data from Noldus Observer©, qualitative interviews and document analysis. As the program has evolved since its first class in 1987, the leadership has helped guide the program through changes in program offerings, courses, and technology changes. Universities are making sizable investments in technology to improve learning in order to make students work ready; however, faculty are either simply not using the technology or not using it effectively (Kershaw, 1996). The program has been successful at adapting to meet the technology needs that the agriculture industry requires for students to successfully gain future employment. As reported in other studies, the faculty have managed the change effectively to be successful in integrating technology (1996). The agriculture industry looks to the program to hire new graduates with the knowledge that they will be well prepared to work in that field.

Literature Cited

Antonacci, D.M. 2002. Integrating technology into instruction in higher education. University of Missouri-Kansas City. Unpublished doctoral dissertation. Retrieved from http://www.associations. missouristate.edu/highered-web/attachments/IS-TechnologyIntegrationinHigherEducation.pdf.

Bennett, J. and L. Bennett. 2003. A review of factors that influence the diffusion of innovation when structuring a faculty training program. The Internet and Higher Education 6(1): 53-63. DOI: 10.1016/s1096-7516(02)00161-6

Charmaz, K. 2006. Constructing grounded theory. Thousand Oaks, CA: Sage Publications, Inc.

Constas, M.A. 1992. Qualitative analysis as a public event: The documentation of category development procedures. American Educational Research Jour. 29(2): 253-266.

Corbin, J. and A. Strauss. 2008. Basics of qualitative research. Thousand Oaks, CA: Sage Publications, Inc.

Doolittle, P.E. 2010. Designing instruction for student learning. Blacksburg: Virginia Polytechnic Institute and State University

Ertmer, P.A. 2005. Teacher pedagogical beliefs: The final frontier in our quest for technology integration? Educational Technology Research and Development 53: 25-39.

Hirumi, A. 2002. A framework for analyzing, designing and sequencing planned elearning interactions. Quarterly Review of Distance Education 3(2): 141.

Howe, N. and W. Strauss. 2003. Millennials go to college. Paper presented at the American Association of Collegiate Registrars and Admissions Officers. Washington, DC.

Jones, S. and M. Madden. 2002. The internet goes to college: How students are living in the future with today's technology. Washington, DC: Pew Internet & American Life Project.

Kershaw, A. 1996. People, planning, and process: The acceptance of technological innovation in post-secondary organizations. Educational Technology 36(5): 44-48.

Kotrlik, J., D. Redmann and B. Douglas. 2003. Technology integration by agriscience teachers in the teaching/learning process. Jour. of Agriculture Education 44(3): 12.

Larson, L., T. Miller and M. Ribble. 2010. 5 considerations for digital age leaders: What principals and district administrators need to know about tech integration today. Learning and Leading with Technology 37(4): 12-15.

Lynch, D., G.C. Altschuler and P. McClure. 2002. Professors should embrace technology in courses... and colleges must create technology plans. [Article]. Chronicle of Higher Education 48(19): B15.

Marks. 2000. Student engagement in instructional activity: Patterns in the elementary, middle and high school years. American Educational Research Jour. 37(1): 31.

Mayes, R., H. Ku, C. Akarasriworn, J. Luebeck and Ö. Korkmaz. 2011. Themes and strategies for transformative online education: A review of literature and practice. Quarterly Review of Distance Education, 12(3): 151-166.

McEuen, S. 2001. How fluent with information technology are our students? EDUCAUSE Quarterly 24(4): 8-17.

Oblinger, D., J. Oblinger (Ed.). 2005. Educating the net generation. Boulder, CO: EDUCAUSE.

Patton, M. 2002. Qualitative research and evaluation methods (3 ed.). Thousand Oaks, CA: Sage Publications, Inc.

Rao, P.V. and L.M. Rao 1999, March. Strategies that support instructional technology. Syllabus: 22-24.

Redman, D. and J. Kotrlik. 2004. Analysis of technology integration in the teaching-learning process in selected career and technical education programs. Jour. of Vocational Education Research 29(1).

Rogers, E. 2003. Diffusion of innovations (Vol. 4). New York: A Division of Simon and Schuster, Inc.

Rossman, G. and S. Rallis. 2003. Learning in the field: An introduction to qualitative research (Second ed. ed.). Thousand Oaks, CA: Sage Publications, Inc.

Surry, D. 1997. Diffusion theory and instructional technology. Paper presented at the Association for Educational Communications and Technology: Albuquerque, NM.

Yin, R.K. 2009. Case study research design and methods (4th ed. Vol. 5). Thousand Oaks, CA: Sage Publications, Inc.

NACTA
north american colleges and teachers of agriculture
connect | develop | achieve