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Diffusion of Instructional Technology in a College of Agriculture: Observations of Acceptance and Resistance

Jan G. Hogle¹, Department of Instructional Technology
The University of Georgia
Athens, GA 30602-7144
Gene M. Pesti²

Department of Poultry Science, The University of Georgia, 30602-2772
James M. King³

Department of Instructional Technology, The University of Georgia
Athens, GA 30602-7144

Abstract

This paper summarizes observations on three technology adoption projects: (a) a College-wide telecommunications capabilities study, (b) development of a departmental Web site, and (c) a multimedia lecture development and training project. It describes resistance to the adoption of technology in an academic department, with the belief that a problem must be understood before progress can be made to overcome it. Resistance among staff centers around defensive responses ("I already have too much work to do!") and anxiety from negative prior experience with technology changes ("There is no reward for learning something new"). Types of resistance among faculty include computer phobia, difficulty comprehending how the technology will be useful in the classroom, and

beliefs that any extra effort expended in teaching is wasted or at least unrewarded. We conclude that change efforts become possible when the group involved sees that technology is being adapted to them (rather than conversely), and when they have power to make decisions on their roles in the effort.

Introduction

Many educational researchers believe technology changes are inevitable in institutions of higher education (Oblinger, 1994; Cummings, 1995; DeSieno, 1995; Sargeant, 1997). From observations made at the University of Georgia Department of Poultry Science in the College of Agricultural and Environmental Sciences (CAES) it is clear that the faculty, staff, and administration of the College agree. Over the past two years, the College has experienced several

¹ Doctoral Candidate in Instructional Technology

² Professor of Poultry Science and Animal Nutrition

³ Professor of Instructional Technology

technology diffusion efforts in the belief that computers and the Internet will bring significant, if not drastic, changes to the department and to the College. Not everyone agrees on what these changes will mean. There is a range of thoughts regarding how they will be implemented and what impact they will have.

Rogers (1995) describes characteristics of potential adopters of innovations as ranging from eagerness to adopt on the left end of a bell curve to reluctance or refusal to adopt on the right end of the curve (Figure 1). Individuals are apt to adopt an innovation at different times during a change effort, according to their own social and psychological characteristics. These characteristics determine the potential user's willingness to accept and adapt to changes associated with the innovation, as well as affecting their attitudes toward other adopters who fall along different points of the curve. Rogers describes five categories of adopters: Innovators, Early Adopters, Early Majority, Late Majority, and Laggards. Attitudes in our department reflect Rogers' bell curve of adoption characteristics. The observations reported herein are from three planned technology diffusion projects conducted in the Department and College:

AgTel: The AgTel Telecommunications Capabilities Study was funded by a USDA-CSREES Agricultural Telecommunications Program grant. The AgTel project consisted of a College-wide survey and a Web site/handbook of resources for telecommunications in the CAES (Hogle, 1997). The survey gathered valuable feedback on how members of the College felt about the changes taking place in telecommunications and their attitudes toward technology needs. The survey included members of the College's administration, faculty, and staff.

Poultry Web site: This project included the design and implementation of a departmental Web site (Hogle and Pesti, 1997). Involvement included two secretaries who will eventually be asked to maintain the Web site, as well as faculty, technical staff, and students.

Multimedia: This Mobile Multimedia Project (Pesti and Plank, 1996), was designed to enhance lecture materials and encourage faculty to learn about and to incorporate multimedia in the development of introductory animal and plant agriculture courses. Involvement included faculty and staff.

This paper is a description of observations of acceptance and resistance to technology changes across all

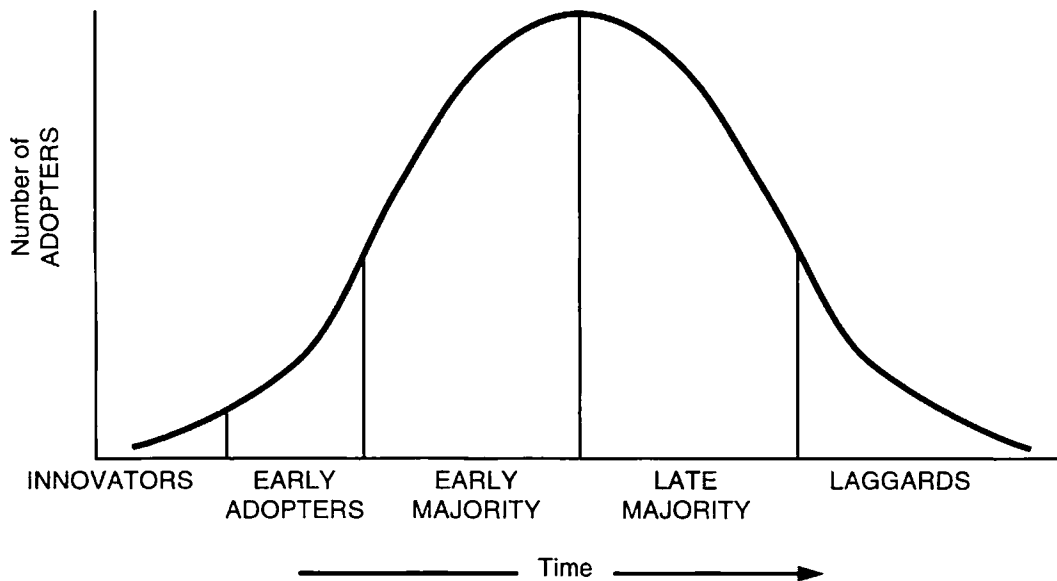


Figure 1. Rogers' adoption life cycle showing categories of individual innovativeness.

three projects.

Resistance To Technological Change: The Secretaries

The faculty development and technology diffusion literature predicts many changes facing higher education, as well as challenges in adopting and accepting those changes (Albright and Graf, 1992; Oblinger, 1994; DeSieno, 1995; Kershaw, 1996; Sargeant, 1997). In particular, numerous changes are expected as computers, email, and the World Wide Web become widely used across college campuses. How well those changes are made will depend upon factors at all levels of the University. Most predictions focus on how the administration must change, how the faculty must change, and how the students must change, but very little is said about what the staff will be facing. This, unfortunately, is consistent with the observed perceptions that staff members seem to have about their roles: that they are taken for granted, that they are not informed of major changes, and that major changes are not explained. It should not be surprising then, that the observed staff members reacted with suspicion and resistance to efforts to promote adoption of new technologies. Typical comments are:

“This is just more work, and I already have too much to do.”

This comment is usually the secretaries' first reaction to a new change, or to the rumor of new software or equipment. A related version of this response is, “This isn't going to make things easier, or better, or faster--it will mean that there will be that much more work to do.” There is much resistance to the idea of any change of routine and rarely is the introduction of a computer program or a new piece of equipment greeted with pleasure. Thus, any assurances that the change will bring benefits are summarily dismissed.

“Why? What's wrong with the way we have been doing it?”
or **“What do we need this for?”**

This response is met in two ways. Sometimes the faculty member requesting the change explains “why” his or her request is being made. This is usually unsuccessful; often the secretaries are unwilling to accept the explanation.

Rejection of the explanation is usually followed by various attempts to co-opt the individual through other members of the department. Often, someone is chosen to win over, or at least neutralize, the target person in hopes of attaining some cooperation in accepting the change. The person in this “assimilator” role must gradually earn respect from both faculty and staff to function as an effective liaison between them.

When explanation and co-option fails, those requesting the changes are frustrated to the point of just demanding that they be implemented. At times they simply bypass the first step and order the change to be implemented without discussion. As one might expect, either course leads the target of coercion to feel that they are not consulted

about changes that are made, confirming their original beliefs. Ironically, this self-fulfilling prophesy seems to give some individuals a great deal of satisfaction in itself.

“It's frustrating and takes longer to do the same thing...it doesn't save me any time.” and **“There is no reward for learning something new.”**

Many of the technology changes involve learning new software, changing to a different operating system, or requiring activities to learn something new about how to use computers. The most common reason for learning new software or the new procedures, or for acquiring new equipment, is to save time. However, the learning curve is often steep enough in the early stages of use that it is not readily apparent that any advantages will be realized. Sometimes there is a significant payoff which is not obvious to those using it directly.

Resistance To Technological Change: The Faculty

The Poultry Science faculty represent a broader range of attitudes toward change than the secretarial staff. While the secretaries are generally resistant to any technological change, their numbers are fewer and their power within the organization is significantly different from that of the faculty. The reaction of the faculty toward technology changes covers a spectrum of acceptance, reflecting Rogers' (1995) bell curve of adoption characteristics (Figure 1). Some fall easily within the innovators and early adopters categories who readily accept change, while others are slower to adopt or actively resist the change.

Of those in the early and late majority (and those who openly admit to being “technology laggards,”) these are typical comments:

“Why? What will this do for me?” and **“What's wrong with the way we have been doing it?”**

This is not much different from the secretarial staff who ask the same questions. However, in the case of the faculty, there are individuals who willingly accept technological changes. Generally, it is easier to see the potential for adoption when there are respected peers to look to for advice and assistance (Geoghegan, 1994; Rogers, 1995).

For example, faculty have been slow to accept the idea that a departmental Web site was needed. Many of the teaching faculty are near retirement and are not computer-savvy individuals. Explanations of the benefits of a Web site have meant little to the majority of this group until relatively recently. Faculty have gradually allowed their photos and c.v.'s to be published on individual Web pages and some are beginning to use the Internet for research. Most new users were recruited by the encouragement of a few of their peers.

“I don’t see the reason for changing just to use the technology. Shouldn’t there be a reason to do this?”

Yes. There should be a good reason. Some things are better when done in a traditional manner. This response confuses some faculty. They are perfectly right to ask this question and they should ask this in order to learn to use technology most effectively. A key issue here is how to demonstrate to their satisfaction that there are real benefits to the new technology. Of course, an important question is, “who benefits?” In many cases it may be the students rather than the faculty.

“I don’t like wasting class time trying to get some machine to work.” or “I don’t like looking foolish in front of my students.”

Learning how to use new equipment and software can be intimidating. Many faculty have a real fear of looking foolish or incompetent in front of students. In one case, a professor set up equipment for displaying slides from his computer and it did not work as planned. He related that he became “somewhat panicked” and concerned that he was wasting precious lecture time. He admitted that he did not appreciate looking like he did not know what he was doing while a classroom of students looked on.

One professor noted, “I was really afraid of it at first, but now I realize it isn’t so hard. It can be done and the results look so nice. And once I make a set, I can re-use parts of it for other lectures. The hard part is getting started. It doesn’t take as much time after that—although it’s still not easy.”

“Won’t I just have to redo things that are already done?” and “I don’t have time to mess with it, and the secretaries don’t have time.”

This is a difficult question to answer and, as with most adoption questions, a concrete example is needed to demonstrate the benefits of technological change. Again, peers are very helpful in answering this question and influential in overcoming this resistance.

All of the faculty seem to have the same perceptions about using multimedia in instruction, developing Web pages, and using technology in general: They admit that it takes more time. On some projects the extra effort is just in the beginning, while on others extra effort is required through the end of the project. Regardless, those who accept the technology changes also accept the extra time and effort required.

In spite of concerns about time and effort, many faculty are beginning to feel it is valuable to them to participate in technology projects. One user observed, “It gives me satisfaction, even if it takes more time to do.” Comments such as those can influence non-users in a positive direction and get them wondering about their own possible involvement with multimedia or Web pages.

The most difficult part of the time factor to overcome is that faculty believe research and publication efforts are rewarded more than teaching efforts. The lack of reward for teaching is a common complaint and a serious issue if widespread adoption of new instructional technologies is desired.

The development of the introductory poultry course is an example of a progressive effort which has helped to involve more faculty in multimedia adoption. The introductory course is taught each quarter by different faculty. By encouraging faculty to build on previous efforts by adding lectures to an existing project, some of the intimidation is lessened. Since much of the initial work of developing lecture material is already done, the time commitments for participation are reduced, or at least the perceptions of the time commitment is reduced.

“I don’t like surprises.” or “It never works the way it’s supposed to.”

“What happened to all the symbols in my slide presentation? They were on the other machine when we wrote the slides but when we tried to use the slidemaker [different computer, different font set] the ‘s’ were all replaced by the letter F! And I have to be on a plane tomorrow!”

Surprises like this can be difficult to overcome, especially when it means missing a due date or being late for a class or seminar. It is hard for most people to continue to try a new technique or process if their first attempt was met with frustration or outright failure. Adequate technical support for people and equipment is vital to minimizing or simply avoiding these kinds of surprises (Sargeant, 1997). **“Teaching with technology is a way to compensate for bad teaching.”**

Perhaps teaching with technology is, for some, a way to compensate for bad teaching. However, in the case of the professor who made this statement, it appears to be a response used to avoid involvement with the Web site and the Mobile Multimedia Project. Technology is used by good and bad teachers. As with any tool, the important issue is not the fact that it is used, but *how* it is used.

Discussion

The secretarial staff and faculty have different attitudes about technology change efforts: none of the secretaries readily accept change, but the faculty have a range of attitudes for accepting change and few resist it outright. Some of these differences between the faculty and staff have to do with the smaller number of secretaries compared to faculty (3 vs. 24). There also appears to be a very different sense of empowerment with regard to activities involving changes (Kershaw, 1996; Watkins and Marsick, 1997). Most

faculty are empowered to make their own decisions to adopt or not to adopt an innovation or change. In contrast, the secretarial staff is usually told what they are to adopt. If they assert their own form of empowerment, by refusing to cooperate and being forced into compliance with requested changes, it ironically results in satisfaction in being dissatisfied. It should not be surprising that it is not often a successful venture to coerce someone into changing a routine or adopting something new (Rogers, 1995; Kershaw, 1996).

Most faculty and staff have heard the claims that technology use in the classroom has the potential for enriching the curriculum, for helping students reason and learn, and for applying pedagogy more effectively (DeSieno, 1995; Farrington, 1997). However, most faculty in this department have difficulty imagining how they personally can effect these changes in their classrooms.

For most faculty and staff, facilitation in adopting new technology, or new methods, is dependent upon several factors. First, simply telling someone about the potential benefits of a change effort is not enough. Benefits must not only be demonstrated, but they must also be presented as real, concrete, and compelling examples (Cummings, 1995; Collis, 1996). The benefits, if any, must obviously contribute in some way beyond the methods currently being used, or must offset the extra time or effort required for their use in some other way. It is especially helpful in facilitating a change effort if there are competent, credible peers available who can contribute advice, assistance, and psychological support for potential users (DeLong, 1997). Peers seem to be far more valuable in facilitating change efforts than technical support personnel or individuals that fall into Rogers' (1995) innovator group. Support personnel and innovators, no matter what their competence level, usually are outside the existing "culture" or peer group and must work harder for credibility than would be required of a member of the peer group.

The groups which Rogers refers to as the early and late majority often view the advice of support personnel and innovators with suspicion (Geoghegan, 1994; Rogers, 1995). It appears to the majority groups that support personnel and innovators accept too readily anything new that comes along, and that these changes are easier for the "technically inclined." Adequate technical support is critical. However, change efforts such as the multimedia project which rely heavily on peer group support appear to be successful in building peer support and developmental scaffolding, as well as relieving some of the intimidation felt by early and non-users.

Other barriers to adoption of change efforts include faculty conservatism and commitment to traditional teaching methods (Albright and Graf, 1992; Hazen, 1992). These are

reinforced by faculty beliefs that research and publishing efforts are more likely to be rewarded than teaching efforts. It doesn't help that technology can be frustrating to use and often requires a steep learning curve. The lack of knowledge about technology, how to use it, and how to apply it is intimidating and prevents many potential users from even getting started (Hazen, 1992).

Conclusions

It is too early to tell how many faculty or staff will participate in the multimedia project, how many will eventually allow their c.v.'s to be published on the departmental Web site, or how many will come to think of technology as a tool in teaching instead of a barrier. It does appear that the faculty are more accepting of technological change than the secretarial staff. One of the most important lessons gained from this study can be summed up by a comment from McLellan (1996): "Being digital means adapting technology to humans, not the other way around."

If a group involved in a change effort senses that they are being adapted to technology, there will be staunch resistance, as evidenced by the Poultry Science secretarial staff. If a group involved in a change effort can see concrete evidence that technology is being adapted to them and they have the power to make decisions regarding their role in that effort, as with many of the faculty, the change effort becomes a possibility.

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An Initial Evaluation of Factors Affecting Students' Preparedness for Economic Learning

Deborah E. Bridges, Dept. of Economics, University of Nebraska at Kearney
Kearney NE 68849-4570

Kenneth L. Casavant, Dept. of Agricultural Economics,
Washington State University, Pullman, WA 99164-6210

Abstract

There is continuing interest in factors influencing students' success in economics courses at the college level - success that will depend, in part, on their preparedness for economic learning. In this study factors contributing to the preparedness of students for economic learning were investigated. We hypothesized that gender, maturity of the student, and previous economics study in high school all play a role. Students' preparedness was measured using the score received on a standardized test of economic knowledge administered at the beginning of the semester. Results suggest that although gender and maturity play a very minimal role in the level of preparedness, the most important factor is previous economics study in high school.

Introduction

A recurrent theme in the literature is interest in the factors influencing students' performance in economics courses, particularly in introductory economic courses. Various studies have examined the relationship between performance in introductory courses and gender and/or if the student had economics in high school. Use of standardized tests of economic knowledge have facilitated these investigations, allowing researchers to examine the variables that influence the stock and flow of economic knowledge. First differentiated by Siegfried (1979), the stock of knowledge refers to the amount of understanding at a specific point of time, whereas the flow of economic knowledge represents the level of knowledge gained over a period of time, and is referred to as learning. This differentiation is important in terms of identifying the