Acknowledgements

I would like to thank Dr. Gail Hawisher, the Director of the Center for Writing Studies at the University of Illinois, Urbana-Champaign Campus, for teaching me how to use writing to help my students learn more. I would also like to thank Mevanee S. Parmer, an invaluable friend and writing colleague, for our many enlightening discussions which have served to refine my ideas about writing and thinking.

Literature Cited

Anson, C. M. 1989. Response styles and ways of knowing. In: Anson, C. M. (ed.). Writing and Response: Theory, Practice and Research. Urbana, IL: National Council of Teachers of English.

Barr, R. B. and J. Tagg. 1995. From teaching to learning – a new paradigm for undergraduate education. Change 27(6):13-25.

Bean, J. C. 1996. Engaging Ideas: The Professor's Guide to Integrating Writing, Critical Thinking, and Active Learning in the Classroom. San Franciso, CA: Jossey-Bass Publishers.

Bean, J. C., D. Drenk, and F. D. Lee. 1982. Microtheme strategies for developing cognitive skills. In: Griffin, C. W. (ed.). New Directions for Teaching and Learning: Teaching Writing in All Disciplines. San Franciso, CA: Jossey-Bass Publishers.

Bloom, B. S., M. D. Englehart, E. J. Furst, W. H. Hill and D. R. Krathwohl. 1956. A Taxonomy of Educational Objectives: Handbook 1, The Cognitive Domain. New York, New York: David McKay Company.

Emig, Janet. 1977. Writing as a mode of learning. College Composition and Communication 28:122-128.

Griffin, C. W. 1983. Using writing to teach many disciplines. Improving College and University Teaching. 31:121-128.

Hairston, M. 1982. The winds of change: Thomas Kuhn and the revolution in the teaching of writing. College Composition and Communication 33(1):76-88.

Haswell, R. H. 1983. Minimal marking. College English 45(6):600-604.

Herrington, A. J. 1992. Assignment and response: Teaching with writing across the disciplines. In: Witte, S. W., N. Nakadate and R. D. Cherry (eds.). A Rhetoric of Doing Essays on Written Discourse in Honor of James L. Kinneavy. Carbondale, IL: SIU Press.

Iwaoka, W. T., P. Britten, and F. M. Dong. 1996. The changing face of food science education. Trends in Food Science & Technology 7:105-112.

Lees, E. O. 1979. Evaluating student writing. College Composition and Communication 30:370-374.

MacAllister, J. 1982. Responding to student writing. In: Griffin, C. W. (ed.). New Directions for Teaching and Learning: Teaching Writing in All Disciplines, no. 12. San Francisco, CA: Jossey-Bass.

Mallonee, B. C. and J. R. Breihan. 1985. Responding to student drafts: Interdisciplinary consensus. College Composition and Communication 36(2):213-231.

Sommers, N. 1982. Responding to student writing. College Composition and Communication 33(2):148-156.

Assessing the Adoption of Multimedia Technology in a College of Agriculture

Jan G. Hogle[1], Gene M. Pesti[2], James King[3]
University of Georgia, Athens, GA 30602

Abstract

To facilitate the use of instructional technology among faculty it is first necessary to understand the factors that encourage and inhibit its use. This paper describes the Concerns-Based Adoption Model (CBAM) as a method to assess technology adoption in a college of agriculture. CBAM methods were administered to faculty participants in a mobile computer/multimedia project to assess their levels of adoption, and to make recommendations on how to proceed with similar efforts on future projects. Most concerns revolved around three issues: time requirements, recognition (or lack of recognition) on the part of administration for their efforts, and competence. Recommendations include: encouragement of collaboration and peer modeling, building on projects over time, visible rewards for teaching efforts, and making equipment easier to use.

[1] Doctoral Candidate in Instructional Technology
[2] Professor of Poultry Science and Animal Nutrition
[3] Professor of Instructional Technology

Introduction

The University of Georgia College of Agricultural and Environmental Sciences (CAES) is advancing the use of technology throughout its programs, especially in the areas of distance education, telecommunications, and multimedia. To improve access to multimedia technologies, a project was designed to provide "mobile technology units" for teaching. The Mobile Multimedia Project was funded through a USDA Challenge grant. The project provided 1) a set of carts for transporting laptop computers, digital and video cameras, projection equipment, and VCRs, and 2) faculty training in the use of the equipment. The mobile classroom equipment was expected to provide several advantages, especially the option to move state-of-the-art equipment between rooms instead of limiting it to a single classroom. Additionally, the mobile units were less expensive and more versatile than equipping one classroom.

Facilitating the use of instructional technology among faculty requires an understanding of factors that encourage and inhibit its use. Providing equipment is only one factor affecting technology adoption; attitudes, time, training, and reward structures are also important. To assess the potential for faculty to implement and use multimedia technology in the development and delivery of their courses, an adoption study was conducted with Mobile Multimedia Project participants. This paper describes the Concerns-Based Adoption Model (CBAM) as a method to assess technology adoption (Hall, 1978; Hall et al., 1979). CBAM questionnaires were administered to faculty participants in the Mobile Multimedia Project to assess their respective levels of adoption, and to make recommendations on how to proceed with similar efforts on future projects. The CBAM assessment was conducted by the graduate assistant on the project.

The Concerns-Based Adoption Model

Action Research (AR) represents a growing field that attempts to recognize the practical requirements and limitations of educational research. AR has been described as an informal, qualitative, formative, subjective, interpretive, reflective, and experiential model of inquiry in which all individuals involved in the study are knowing and contributing participants (Hopkins, 1993). The AR framework is most often used to address an educational problem by formulating a plan, carrying out an intervention, evaluating the outcomes, and developing further strategies in an iterative fashion.

The CBAM is an example of an AR method. This model (Figure 1) is used as a diagnostic tool to assess where individual members of an organization are in the process of adopting an innovation. The CBAM proposes that the manager of a specified change can use diagnostic data to develop a prescription for intervention needed to facilitate the change effort. Diagnostic data is gathered by the change facilitator to 1) assess how the Innovation Configuration affects users of the innovation, 2) assess individuals' Stages of Concerns about an

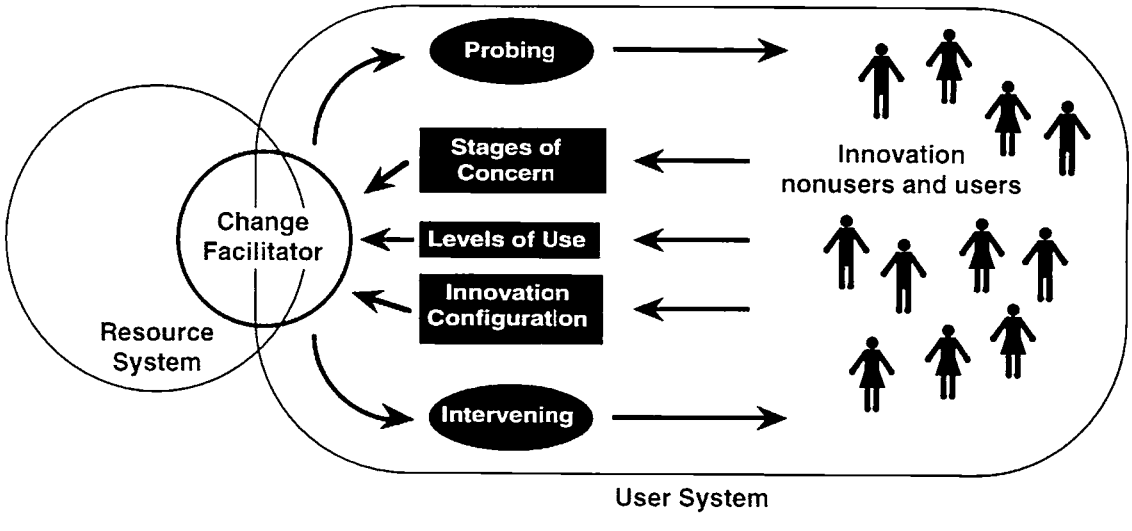

Figure 1. The Concerns-Based Adoption Model (1997)

innovation to 3) determine their current Levels of Use for the innovation. The model proposes that adoption efforts are not successful until individuals' concerns about the innovation are addressed (Hall, 1978; Hall et al., 1979).

According to CBAM, individuals involved with a change process go through certain Stages of Concern (SoC) which are characterized by specific questions, anxieties, or uncertainties about the particular innovation (Table 1). There are seven SoC for a given innovation. The stages characterize levels of use on a continuum from non-users at one extreme to skilled and experienced users trying to overhaul the innovation at the other extreme. Stage 2 of the model describes personal concerns. These are particularly critical for successful adoption, as the new user focuses on his or her ability to meet the demands of using the innovation. In Stage 3, the user focuses on management concerns related to tasks and processes required for using the innovation. At later stages, the user shifts to concerns about impact of the innovation on others in the organization, and methods for refining the innovation for greater benefits.

To assess the SoC in individuals, the CBAM employs interviews and questionnaires (Hord, 1987). SoC questionnaires result in graphed profiles that reveal trends within and between groups of users and nonusers. These graphs may consist of individual profiles, or they may be averaged for a group. Profiles resulting from the SoC questionnaires are analyzed to find inefficient and unsuccessful adoption of changes and to identify alienation which can result when expectations about changes are not met or delivered.

The CBAM innovation model may be used by change facilitators in education to study and describe how

Table 1. The Stages of Concern and characteristics of each stage, from the Concerns-Based Adoption Model (Hall, 1979).

Level of Use	Stage of Concern	Expression of Concern
Impact Concerns — Advanced to refining users	6 Refocusing	Exploration of more universal benefits from the innovation
	5 Collaboration	Collaboration with others regarding the innovation
	4 Impact/consequences	Concern for impact of the innovation on employees in his/her immediate sphere of influence
Task Concerns — Early to advanced users	3 Management	Concern for processes and tasks of using the innovation, and best use of information and resources.
Self Concerns — Nonusers to beginning users	2 Personal	Uncertain about demands of the innovation, personal ability to meet those demands, and his/her role in reward structure of the organization.
	1 Information	General awareness of the innovation and interest in learning more about it.
	0 Awareness	Little concern or involvement with the innovation.

organizations and individuals adopt changes. This model assumes that change: (a) is a process, not an event, (b) must happen to individuals within an organization before the organization can change, (c) is a highly personal experience, and (d) entails developmental growth in feelings and skills. The CBAM also assumes that intervention to assist an adoption effort must consider people first, and the innovation second (Hall, 1978; Hord, 1987).

The CBAM model views personal concerns as a legitimate and central part of the change process, and assumes that concerns cannot be manipulated. The model proposes that attempts to manipulate people often fail, but assisting people with information and support relevant to each stage of the model can be helpful to facilitate the change process (Hall et al., 1979; Hall and Hord, 1987; Hord, 1987).

Data Collection and Analysis

Qualitative research methods often use smaller sample sizes than are required for quantitative methods. Since qualitative research is not based on statistical analyses, a sample size less than 10 is common and can be valid and reliable (Merriam, 1995). Based on the sample size of this study (n = 5) and CBAM's focus on individual stages of concern, individual profiles were analyzed rather than the average of a group.

Five faculty users completed the Stages of Concern (SoC) Questionnaire (Hall et al., 1979; Hord, 1987) and were then interviewed regarding their concerns about using the multimedia equipment and learning how to prepare lectures with the software. Participants were from the Departments of Poultry Science and Crop and Soil Sciences. Each participant used some form of technology in their teaching, usually as presentation software such as Microsoft PowerPoint on a laptop computer connected to Proxima projection units. Most used some form of the Internet, World Wide Web, or other computer-mediated communication in their classrooms. Most also used some form of video demonstrations, overhead video projection, and computer software.

Questionnaire Results

Graphs of the SoC questionnaire responses show peaks where users report the most concerns. These peaks reflect the individuals' stages of concerns, and indicate the individuals' level of use of the innovation (Table 1). The profile of a new user will generally show peaks (concerns) in the leftmost stages. As a user becomes more experienced with the innovation, his or her concerns peak further to the right along the graph.

Figures 2 and 3 illustrate the SoC questionnaire responses for five faculty users. U1 and U2 on the SoC graph represent responses of the two project investigators.

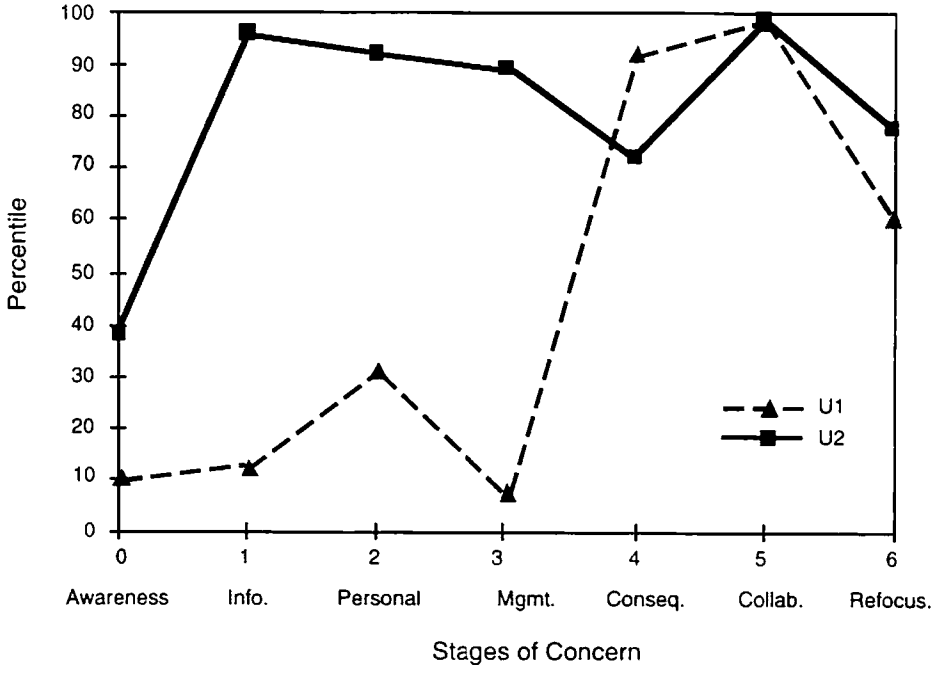

Figure 2. Stages of Concern Profiles, U1, U2

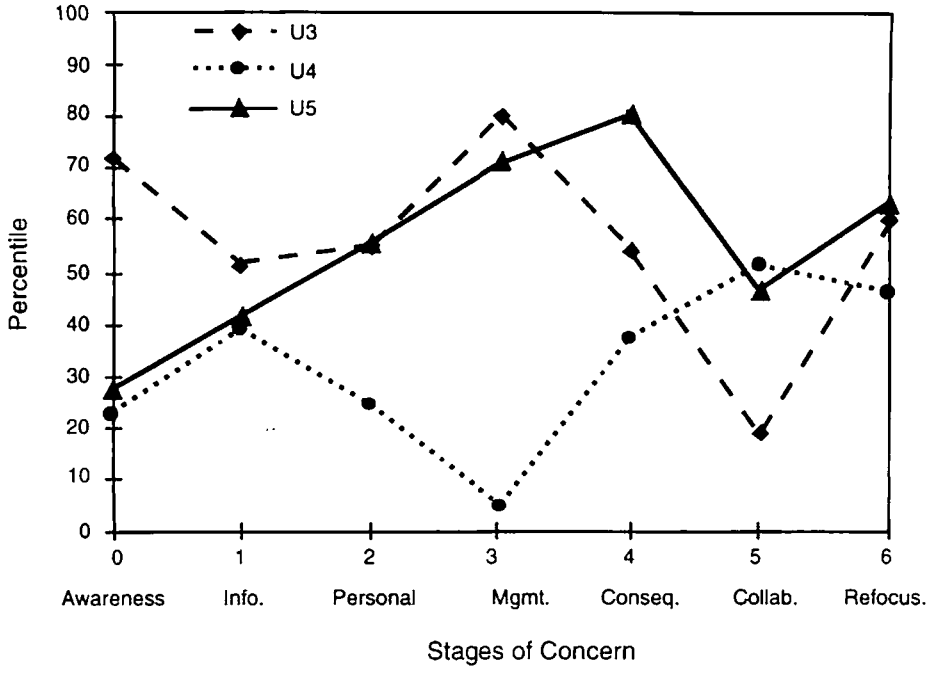

Figure 3. Stages of Concern Profiles, U3, U4, U5

U3, U4, and U5 are faculty at various levels of adoption.

The SoC profile for U1 illustrates an almost archetypal experienced user, with peaks (concerns) primarily at Stages 4, 5, and 6. U1 apparently has few concerns at the informational, personal, or management levels (Stages 0-3). He has some concerns about refocusing and perhaps redesigning the project (Stage 6), but his primary focus is with consequences of the project and collaborations with new users (Stages 4 and 5).

The profile for U2 is high in nearly every area. U2 is an experienced user. He is also the principal investigator on the project, and has broad-based concerns about the project's administration, about how his time is used, and how to collaborate and involve others in the project. U2's profile indicates concerns that are greater in several areas not seen in the graph of the co-investigator, U1. U2's levels of informational and personal concerns (Stages 1-2) are higher than expected for an advanced user. These high scores may reflect his considerations about the informational and personal obstacles beginning users face when joining the project.

Figure 3 shows the profiles for U3, U4, and U5. U3 has a profile that indicates he is a relatively new user of the multimedia equipment, but he is actually an experienced user in many of the multimedia techniques. The peak at Stage 3 combined with a peak at Stage 0 indicates a new user with little concern or involvement with the innovation. His profile also shows concerns in the area of refocusing the innovation (Stage 6). U3 voiced some resistance to, and disinterest in, the Mobile Multimedia Project as it is currently being implemented. His dissent is reflected in his profile, which peaks in areas showing little involvement, management concerns, and thoughts about refocusing the project.

U4 is a relatively new user with concerns in several areas. His highest level of concern is in the area of collaboration (Stage 5). This may reflect his interest in sharing his recent revelations that "this isn't so hard after all!" and wishing to share his new confidence with other faculty. His high level of concern with refocusing (Stage 6) may reflect his ongoing discussions with project investigator U2 about how to use the equipment and software most effectively in a course they are co-teaching. U4's levels of informational and personal concerns (Stages 1 and 2) are moderate. His comments indicated that he is building a great deal of confidence in his use of the equipment. He has few concerns, if any, related to management or efficiency of use (Stages 3 and 4).

U5 is an experienced user with numerous forms of multimedia. This is reflected by his low concerns at Stages 0-2. He is confident and capable with the equipment, materials and software. He has some moderate concerns about refocusing the project (Stage 6), and this is probably a reflection of his confidence and experience. He has a broad interest in this project, and many of his comments revealed

concerns related to learning effects and effectiveness in the classroom.

Interview Results

Most of the comments in the interviews revolved around three issues: time requirements, recognition (or lack of recognition) on the part of administration for faculty efforts, and competence. Concerns about time requirements were stated by everyone. Most viewed the time commitment as a serious detractor to becoming involved with the project. Time required to develop materials, to manage the project, and to learn how to use the equipment and the software are all topics that came up repeatedly throughout the interviews.

One participant stated, "It's frustrating and takes longer to do the same thing...it doesn't save ME time."

Related to these concerns over the time requirements was the idea that the additional time and effort would not be recognized by the department head during performance reviews. Several comments were made in this regard:

"I can improve my teaching all I want, or as little as I want, and it won't make any difference when it comes time for my review."

"All they [the administration] care about, all they reward, is research and published papers. How is effort on this project going to help me?"

"The only thing that they [the administration] look at as far as teaching is the student evaluations. And those don't mean very much. They aren't going to look at my time on developing lectures or PowerPoint slides."

A third major concern was the intimidation of learning how to use new equipment and software. These users do not like surprises, and have a real fear of looking foolish or incompetent in front of students. In one case, a user set up his equipment for displaying slides from his computer and it did not work as planned. He stated later that he did not appreciate looking as if he did not know what he was doing while a classroom of students looked on.

In spite of their concerns about time and effort, the users surveyed felt it was indeed valuable for them to participate in the project. User U5 observed, "It gives me satisfaction, even if it takes more time to do."

U4 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."

Concerns of the project investigators varied. Both expressed concerns in the areas of collaboration and management of the project. They have given a lot of thought to encouraging more participation with the equipment use and lecture development. Related to this are basic equipment concerns, such as what they would do if they did get more involvement and enough equipment wasn't available to meet demand.

Several users noted one major factor preventing others from participating: The equipment is not readily intuitive for novice users. Ease of use is an important consideration since many potential users do not consider themselves technically inclined (Evans and Leppmann, 1967; Cummings, 1995; Albright, 1996). This was very evident among those interviewed and it appears that many more faculty would use the equipment if it could be used as easily as an overhead projector. Although the equipment has become much easier to use, and considerable thought was applied to making the equipment as painless to use as possible, it is still not as simple as "plug and play." This apparently is a major discouragement to non-users.

Discussion

Most of the faculty in the Poultry Science and Crop and Soil Science departments at the University of Georgia are aware that the multimedia equipment is available, and there appears to be a growing interest as more lectures and seminars are produced using multimedia. There is still some concern about the difficulty and complexity of the process. However, as new users become familiar with the equipment (i.e., U4) they appear to be affecting the attitudes of non-users in a positive direction.

Faculty are quick to note that training in the use of multimedia equipment and software is essential, and that extra time is necessary for development of multimedia for instruction. However, the advantages of multimedia use among faculty are difficult for most potential users to imagine; concrete, realistic models of how courses might be developed and enhanced have been demonstrated to be very valuable in recruiting new users (Hall and Hord, 1987; Hord, 1987).

Faculty participation in the Mobile Multimedia Project is still limited. Most of the current users would probably fall within the "Early Adopter" category, as defined by Rogers (Rogers, 1995). As illustrated in Figure 4, Rogers describes characteristics of potential adopters 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. 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.

There is growing interest among faculty who

probably fall within the category of "Early Majority." U4 is certainly more representative of the Early Majority group than the other users interviewed (Figure 4). He reports that initially he was intimidated by lack of knowledge and fear of appearing foolish. However, after attending a training course for using PowerPoint, he felt a sense of empowerment that boosted his confidence and willingness to participate in the Mobile Multimedia Project.

Since one of the goals of the project is to encourage adoption, Rogers' Early Majority is an important group to reach. The Early Majority provides interconnectedness between Early Adopters and the later adopters, and this makes them an important link in the adoption of innovations.

The behavior of U4 is evidence of his key position in the potential of this project attaining "critical mass"

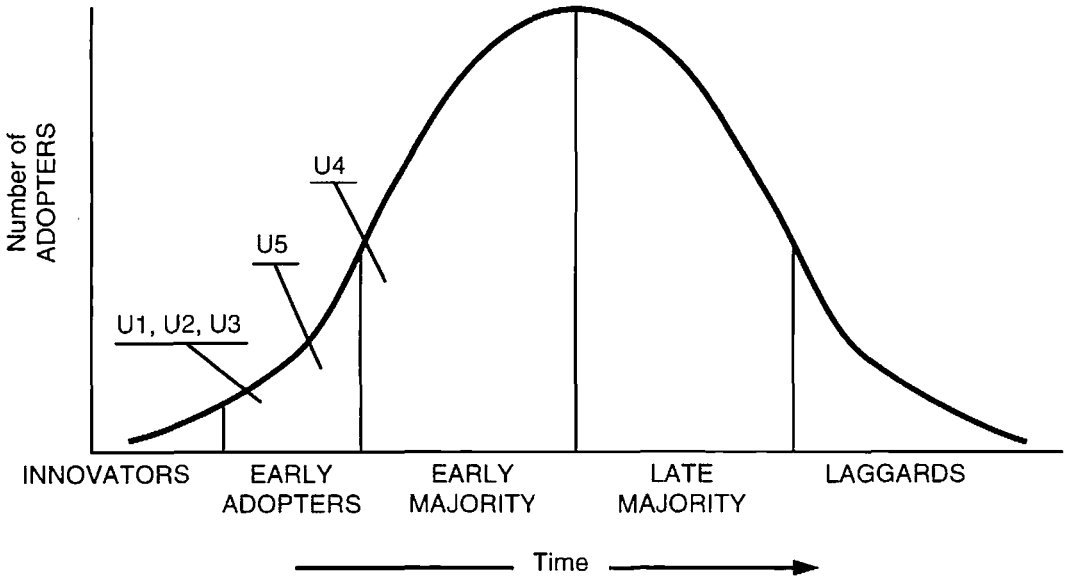

Figure 4. Rogers' adoption life cycle showing categories of individual innovativeness and position of users U1, U2, U3, U4, and U5.

among the faculty. It is clear from observations over the past year that cautious adopters are more interested in the opinions and experiences of U4 than the earlier users. As one reluctant professor stated, "They [U1, U2, U3] go for anything that comes along, as long as it's the latest thing. And they do that all the time, so it isn't hard for them. But if [U4] can do this, maybe it isn't beyond us...those of us who are the [laughs] 'technically impaired.'"

Concrete examples also appear to be important in interesting the majority in the use of an innovation. Many faculty need to see "real" applications of how the equipment and software can be used in the development of a course before they can imagine how they or others might use the equipment(Evans and Leppmann, 1967; Cummings, 1995; Albright, 1996). In an interview prior to the CBAM assessment, the department chairman stated that he wanted to support the project when it first began. However, he admitted he did not see the need for or the practicality of using the new computer based equipment over traditional chalkboard or overhead transparencies. He stated that he had a dramatic change of perspective after seeing the equipment demonstrated in a real lecture situation. He now feels "very much the opposite" and sees a wider realm of possibilities for its application in courses taught in the department.

Multimedia lectures from the introductory poultry course developed this past quarter are "real" examples of use. Since this introductory course is taught throughout the year by different professors, the challenge now is to encourage the next quarter's instructors to add to the lectures produced this quarter.

Summary and Recommendations

It is clear that the efforts to engage the participation of more faculty in multimedia development are dependent on factors at several levels: with the administration, at the team or collaborative level, and at the individual level. At the administrative level, it is essential that teaching efforts be rewarded. This concern was voiced by everyone interviewed. Research and publications are perceived to be more valued than teaching efforts. The administration of the College of Agriculture states that it encourages and values the integration of new technologies into teaching. If this is true, the value placed on these efforts must be made more obvious.

In addition to rewarding teaching, steps must also be taken to provide technical support and adequate training in the use of multimedia software and hardware. Some of this training is available on campus, although participation in technology training classes appears to be limited by lack of evidence that it leads to any reward.

At the group or team level, collaboration is necessary to encourage participation and experimentation. An attitude of collaboration instead of competition seems most helpful, especially when faculty admit to intimidation with projects such as this one before they even begin.

One effort that seemed helpful in recruiting more faculty technology users was the development of the introductory poultry course. This course is taught each quarter by different faculty. By encouraging the addition to a project that has already started, and building upon those previous efforts, some of the intimidation is lessened. Since much of the initial work of starting the development is already done, this may also reduce the time commitments required, or at least the perceptions of the commitment required.

Encouragement by peers is also important, as illustrated by U4, who may be instrumental in recruiting several faculty who until recently were very reluctant to participate. U4 is not shy about admitting he was fearful about working on this project. However, he was able to learn to use the equipment fairly quickly and was surprised that it wasn't as hard as he thought it would be. As a result, he is making his success known to non-users and sparking their interest.

Finally, one aspect of the project that still requires some work is in optimizing the ease of use of the equipment. While a great deal of thought and effort has already gone into the idea of making the mobile units "plug and play," the equipment is still not very intuitive for novice users. For many people, this is a very important factor in participation and adoption.

Note: For more information about working with the Concerns-Based Adoption Model contact: The Southwest Educational Development Laboratory (SEDL), Publications Department, 211 E. Seventh St., Austin, Texas 78701. SEDL is online at: http://www.sedl.org/pubs/catalog/items/cbam.html

Literature Cited

Albright, M. J. 1996. Instructional technology and higher education: Rewards, rights, and responsibilities. Southern Regional Faculty and Instructional Development Consortium, Baton Rouge, LA February 5, 1996. ERIC No.: ED392412.

Cummings, L. E. 1995. Educational technology--A faculty resistance view. Part I: Incentives and understanding. Educational Technology Review(4):13-18.

Evans, R. I. and P. K. Leppmann 1967. Resistance to innovation in higher education; a social psychological exploration focused on television and the establishment. San Francisco: Jossey-Bass.

Hall, G. E. 1978. The study of teachers' concerns and consequent implications for staff development. Staff Development Newsletter. Available: Professional Development Associates, PO Box 4303, Austin, Texas 78765.

Hall, G. E., A. A. George, and W. L. Rutherford 1979. Measuring stages of concern about the innovation: A manual for the use of the SoC Questionnaire. Austin: Research and Development Center for Teacher Education, University of Texas at Austin.

Hall, G. E. and S. M. Hord 1987. Change in schools: Facilitating the process. New York, NY: State University of New York Press.

Hopkins, D. 1993. A teacher's guide to classroom research. Philadelphia: Open University Press.

Hord, S. 1987. Evaluating educational innovation. London: Croom Helm.

Merriam, S. B. 1995. What can you tell from an n of 1?: Issues of validity and reliability in qualitative research. PAACE Journal of Lifelong Learning 4(51-60).

Rogers, E. M. 1995. Diffusion of innovations. New York, NY: The Free Press.