

International Symposium Sponsored by International Farming Systems Research and Extension Association and CIRAD. Montpellier. France.

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Using Writing to Develop Critical Thinking Skills

Shelly J. Schmidt¹ Department of Food Science and Human Nutrition
University of Illinois, 905 South Goodwin Avenue, 367 Bevier Hall, Urbana, IL 61801

Abstract

Students entering today's workforce must solve complex, multidisciplinary problems, work successfully in teams, exhibit effective oral and written communication skills, and practice good interpersonal skills. In order to successfully prepare our students for the workplace, we must equip them not only with a solid foundation in subject matter knowledge, but also with critical thinking and effective communication skills. The good news is that thinking and writing are compatible, synergistic processes. As we teach our students how to write, we are teaching them how to think. This paper discusses how the principles and benefits of using writing can be integrated into both small and large college classrooms to develop students' critical thinking skills.

Introduction

Higher education is changing for the better. A paradigm shift is underway; college is no longer just an institution that exists *to provide instruction*, but one that exists *to produce learning* (Barr and Tagg, 1995; Iwaoka et al., 1996). Two powerful movements in higher education have

emerged in conjunction with this paradigm shift: the writing across the curriculum (WAC) movement and the critical thinking movement. These movements can be used in tandem to transform a passive classroom of knowledge assimilation into an active classroom of exploration, discovery, invention, and learning.

One of the driving forces of the aforementioned paradigm shift is the nature of the skills needed in today's workplace. Students entering the workforce must solve complex, multidisciplinary problems, work successfully in teams, exhibit effective oral and written communication skills, and practice good interpersonal skills. The education needed by these students extends far beyond acquisition of correct information (i.e., knowledge and facts). They need to be taught how to think critically and, in turn, effectively communicate to others what they know and believe.

In order to teach students how to think critically, we need to help them better understand the true nature of the knowledge they are striving to obtain (Bean, 1996). Most students view knowledge as acquisition of correct information. Hence, they view education as the acquisition of this correct information. In this light, problems have only one right answer. We need to teach our students that knowledge is not a collection of static correct answers, but rather it is, dynamic,

¹ Professor

dialogic, complex, contingent, often ambiguous, and situational. This latter view of knowledge helps students to see the true nature of life's problems: multifaceted with many different potential solutions, with each potential solution having an associated, and often long, list of costs and benefits.

The link between writing and critical thinking is based on the underlying assumption that writing is intimately connected with thinking. Moreover, if we present our students with important problems about which to write and create for them an environment that demands their best writing efforts, we are helping develop their intellectual and cognitive abilities (Bean, 1996). The process of writing helps us to formulate, clarify, expand, and deepen our thinking; or as Bean (1996) has expressed it: "When we make students struggle with their writing, we are making them struggle with thought itself."

If the connection between writing and thinking is so rich, we need to ask how can we use writing to develop the critical thinking skills of our students. The objective of this paper is to help answer this question by first discussing the principles and benefits of using writing in our classrooms as a tool for discovery and learning, and secondly, by sharing three practical changes I have made in my teaching to this end.

Using Writing as a Tool for Learning and Discovery

In order to develop the critical thinking skills of our students, we need to teach and use writing in our classrooms as a tool for discovery and learning and not just as a demonstration or end-product of learning (Griffin, 1983). In many classrooms, students are asked to write to prove what they have already learned and then instructors grade to approve or disapprove of what has or has not been learned (Griffin, 1983). This model of writing is referred to as the product-centered model by Hairston, (1982) and the prove-approve model by Griffin, (1983).

The WAC movement has transformed the nature and purpose of student writing. In the WAC model of writing, writing is viewed as both a process and a product. As Emig (1977) stated "Writing as a process-and-product possesses a cluster of attributes that correspond uniquely to certain powerful learning strategies." In addition, the process of writing intertwines in a reinforcing cycle the use of the brain, the hand, and the eye; it involves both hemispheres of the brain and thus integrates thought in the most basic sense; it helps us formulate, synthesize and connect ideas; it can be used to communicate to ourselves as well as to others and provides a means of receiving both immediate and long-term feedback. It is active, engaging and personal (Emig, 1977; Griffin, 1983). Thus, writing is a

natural, built-in tool perfectly suited to help teach students to develop and utilize the higher-level cognitive skills necessary for critical thinking. As aptly stated by Bean (1996) "Writing is both a process of doing critical thinking and a product communicating the results of critical thinking." The WAC model of writing is referred to as the process-centered model by Hairston (1982) and the problem-driven model by Bean (1996). An item-by-item comparison of the two models of student writing, the prove-approve model and problem-driven model, is given in Table 1. Using the problem-driven model of writing dramatically and positively affects all aspects of the writing process.

As I began implementing the problem-driven model of writing in my courses, based on the Instructor and Course Evaluation System (ICES) feedback I received from my students, I found that the students learned the subject matter better and improved their writing and thinking skills. Three changes in my approach to writing which had the most impact on my students were: 1) changing my role in the writing process from judge to coach, 2) changing the purpose and type of writing assignments I require my students to do, and 3) changing the method and timing of the feedback (responding) I give to my students on their writing assignments. The details and effects of these changes are integrated as examples in the sections below. The examples used are from two Food Science and Human Nutrition (FSHN) courses that I teach. FSHN 101 - Introduction to Food Science and Human Nutrition (3 hours credit), is an introductory lecture course with an average enrollment of 175 student per semester, 74% of which are non-majors. It has an average student distribution of 35% freshman, 30% sophomore, 18% juniors and 16% seniors. FSHN 330 - Experimental Foods (5 hours credit), is a lecture and laboratory course for upper level undergraduate majors and first year graduate students with an average enrollment of 18 student per semester. FSHN 330 has been approved as a University of Illinois, Urbana-Champaign Campus, Composition II course since January 1993.

Becoming an active participant in the writing process

One important aspect of becoming an effective writing coach is to learn to intervene in the writing process (Griffin, 1983). If we view writing as a test of what the student already knows, then we will not intervene in the writing process. If we view writing as a means of learning, however, then we can intervene at any point in the writing process because we are teaching the students as they write. We are teaching them not only more "facts and figures" (knowledge) about the subject matter, but we are also

Table 1. Comparison of the two models of student writing, the prove-approve model and the problem-driven model which is based on the writing across the curriculum (WAC) movement.

Aspect	Prove-Approve Model	Problem-Driven Model
Overall view of writing	End-product of learning; students write to prove and instructors grade to approve or disapprove of what has already been learned; writing is a linear process.	Tool for discovery and learning; students writing to develop, modify and refine their thinking and produce a finished product; writing is a non-linear (recursive) process.
Role of Instructor	Judge; discipline authority; does not intervene in the writing process	Coach; discipline expert; intervenes in the writing process
Role of Writer	Often not specified; usually student is viewed as writing to prove knowledge gained	Specified; often student is viewed as an authority and at other times as a writer, who like the instructor, grapples with a particular rhetorical situation
Students Working Together	Often undesirable; may be perceived as cheating	Desirable; extends learning and promotes synergy; builds discourse communities
Assignment: Goal	To demonstrate that the course material has been learned	Opportunity for learning course material; to help students improve their writing skills; to demonstrate learning
Assignment: Type	Traditional (term papers, book reports, essays, laboratory reports), often lengthy; designed to demonstrate acquired knowledge	Vary in voice (professional and personal) type, format and length (sometimes long but divided into parts); designed to focus on development of cognitive skills
Assignment: Focus	Topics are often specified; conventions of the discipline are usually not emphasized	Problems are discipline specific; student are intentionally exposed to the conventions and genres of the discipline
Assignment: Timetable	Assignment is done without intervention; final draft is turned in for evaluation on a specified due date	Revising and reviewing of multiple drafts is done before the final draft is turned in for evaluation
Audience	Assumed that the student is writing for the instructor	Specified and varied depending on assignment type
Responding: Purpose	Evaluation (or grading); sometimes done to justify the grade given	Opportunity to help students improve their writing by using the instructors' comments to revise their drafts; evaluation
Responding: Methods	Done only by the instructor, assignments are usually graded	Can be done by self (student)-, peer-, instructor, and writing-center personnel; not always graded; non-graded assignments viewed as tools for learning and practice for future graded assignments
Responding: Timing	Given after writing is done; too late for students to learn from or use for revision	Given throughout the writing process; timely and useful for making revisions
Level of Revision	Proofreading and editing	Substantive, conceptual revision, as well as proofreading and editing
Criteria used for Evaluation	Often general in nature - are the major "parts" there or not; focuses mainly on subject matter content	Specific in nature and included in the assignment instructions; focuses on content, format and writing skills

helping them learn to organize, analyze, synthesize, and even question these “facts and figures” and to communicate them in a way that demonstrates that they understand how they work. In addition, we can teach our students the particular skills they must master to communicate all of this in the conventions and methodologies of our discipline.

Intervening in the writing process can be done using a variety of methods: holding student conferences to discuss various aspects of their writing at various stages in the writing process (i.e., ideas, outlines, rough drafts); analyzing in-class selected (good and poor) anonymous writing examples; providing students with step-by-step guidelines to help them analyze a text, solve a problem or evaluate a case study; sharing with the students the evaluation criteria you will use to evaluate their papers; providing feedback and direction to rough drafts, without grading them; responding to progress reports in which the students report how their thinking has developed and/or changed because of what they are learning as they write their papers; designing and implementing a peer review system; providing students with well-written papers as examples of good writing. Intervening in the writing process allows us to teach our students more intentionally and effectively the content, concepts, cognitive processes, and communication practices of our discipline.

I use a variety of writing intervention methods for the laboratory report assignments my students do in FSHN 330. The students write a total of seven laboratory reports. Five of the laboratory reports follow the traditional laboratory report format: abstract, introduction, materials and methods, results and discussion, conclusions, tables, figures, and references. For the other two laboratory reports the students are given the following scenario: they are employed as a food scientist in the research and development department of a large food company and they are to write their laboratory report as a two page memo to their busy boss, emphasizing significant findings and recommendations for items requiring action. For the first laboratory report of each type (traditional and memo formats) several intervention methods are used: 1) the students are given detailed, step-by-step instructions, specific format instructions (Journal of Food Science instructions for authors for the traditional format), and evaluation criteria for each report type; 2) a well-written example laboratory report of each type is placed on reserve in the library for each student to review; 3) the students turn in a rough draft of their laboratory reports which are critiqued, but not graded; and 4) when the rough draft is handed back, the students are given the opportunity to schedule an appointment with the instructor or the laboratory teaching assistant to discuss the responses on their drafts, before the final laboratory report is due for grading. By implementing these intervention methods, I have observed a dramatic improvement in both the content and writing quality of my

students' final laboratory reports. I have also observed a great increase in both the quality and quantity of interactions I have with my students.

Designing and initiating writing assignments that promote inquiry

As I began to develop my writing-for-learning philosophy, I asked myself why *do* I make my students write anyway. Before participating in the WAC movement, I required my students to write to demonstrate what they had already learned. What I was missing was the concept that writing was a process by which discovery and learning could take place. Adopting this process view of writing dramatically changed my perspective on designing and initiating writing assignments in my classroom (Griffin, 1983).

A traditional writing assignment in a discipline-specific course often consists of requiring students to write about a topic (assigned or self-selected) related to the subject matter covered in the course. The length, format, and due date requirements are spelled out. Then on the specified due date each student is expected to turn in a well-researched, well-written paper reporting all that they have learned about their topic. Most often this approach to writing assignments results in feelings of failure for many of the students, long hours of unproductive paper grading by the instructor, and an overall sense of disappointment by student and instructor over what was not really taught or learned. The students are writing with little or no input from the instructor, and the instructor is evaluating the writing for the purpose of judging (grading) what the students have learned.

Two major changes to this traditional approach to writing assignments are needed. First, the writing assignment needs to be structured so that the students are given a specific situational context for writing; that is, the students are given an issue or a problem to write about, not just a topic (Herrington, 1992). Writing about an issue or problem helps engage the students with the course material, promotes inquiry, and stimulates critical thinking, whereas writing about a topic often keeps the student at the level of a reporter of information. Secondly, the writing assignment needs to be divided into parts or stages and should include a mechanism to give feedback to the students throughout the writing process. To expect a perfect final draft from our students without giving them specific instructions, evaluation criteria, and regular feedback is very unrealistic. Our students are just learning how to solve problems and communicate in our disciplines; what they need from us is a great deal of direction, assistance and encouragement, not just evaluation.

After attending my first WAC workshop, I went back to my office and immediately began to radically alter the research project assignment I had my students to do in FSHN 330. Before reconstruction, the research project assignment proceeded as follows: I introduced the assignment during one class period, held one project conference with the students to discuss their project proposals, had minimal intentional (scheduled) intervention during the project (6 weeks), and then required the students to turn in their final project reports (usually about 40 to 50 pages in length) during the last class period. Needless to say, I was often very disappointed in the content and written quality of the project reports I received. One of the major lessons I learned during the WAC workshop was the importance of dividing large assignments into smaller, more manageable parts, and giving feedback to the students

on each of the parts (multiple drafts). So I began reconstructing the assignment. I divided the one large research project assignment into six interrelated parts. In addition, individual project conferences during the research project (scheduled during laboratory project time), revise-and-review steps, and two oral presentations (project proposal and final project report) were incorporated into the assignment structure. These changes in the assignment resulted in major improvements in both the overall flow of the research process and the quality of the final project reports.

Thinking of writing as a tool for learning allows us to broaden the types of writing assignments we can ask our student to do. The three main types of writing assignments and examples of each type are listed in Table 2.

Table 2. Types of writing assignments and examples of each type (adapted from Bean, 1996).

Types of Writing Assignments	Examples
Exploratory writing (also called expressive writing), usually not graded	journal writing (learning logs), free-writes, e-mails, informal notes and letters, diaries, idea maps, microthemes, concept maps, labeled sketches
Expository writing (also called thesis-governed academic writing), usually graded	literature reviews, technical proposals, laboratory reports, academic papers (discipline-based journal articles), research reports, microthemes
Assignments that create other ways of "seeing", usually graded	microthemes, popular press or lay audience articles, outlines, dialogues, formal letters, memos, short stories, poems, parables, interviews, plays, dramatic scripts; autobiographies

The first type of writing assignment, exploratory writing, is informal, messy writing. The objective of exploratory writing is to allow students to brainstorm on paper without being concerned about using correct language mechanics. The intention of exploratory writing is to use the process of writing to help students generate, explore, question, and clarify their ideas, thoughts, and feelings. Exploratory writing is not very useful for improving writing mechanics, because the writing generated is not always refined. Exploratory writing is not usually graded, but may be used as a preliminary step in a formal writing assignment. The other two types of writing assignments in Table 2 are formal types of writing. The end objective of formal writing assignments is to produce a final polished draft that communicates accurately, clearly and succinctly the ideas of the author to a specified audience.

In developing either informal or formal types of writing assignments, I must be able to answer the question "What do I want my students to learn from this writing assignment?" In turn, I need to explicitly articulate this underlying learning objective to my students. Griffin (1983)

used Bloom's Taxonomy of educational objectives (knowledge, comprehension, application, analysis, synthesis, and evaluation) to define the various types and levels of learning we can ask our student to demonstrate in our writing assignments (Bloom et al. 1956). Designing our writing assignments with these educational objectives in mind will greatly help us organize and clarify what we are asking our students to do in the writing assignments we give them. For example, we can design a lower-order writing assignment that asks our students to demonstrate their knowledge of a topic (a lower-order cognitive skill) or we can design a higher-order writing assignment that requires them to evaluate the ideas they read about in the assigned readings or hear about during class discussions (a higher-order cognitive skill).

Varying the types of writing assignments we ask our students to do also helps us meet the diverse needs of our students. Using various types of writing assignments and audiences will engage different kinds of learners. One of my favorite types of writing assignments that can be molded to accommodate a wide variety of writing assignment types and objectives and can be informal or formal, is the microtheme

(see Table 2). The microtheme is a mini-essay, a short, in- or out-of-class writing assignment, that ranges from a few sentences to a few pages in length. The microtheme can be used for a variety of purposes: to generate class discussion, to develop specific cognitive skills, to summarize lecture highlights, to capture student questions, or to serve as a mid-class active learning tool. Depending on how we use the microtheme, it can be graded or not graded. I use a variety of microtheme assignments in both FSHN 101 and FSHN 330. In FSHN 330, I often use the microtheme to generate class discussion. For example, before the lecture on sensory evaluation, I pose the following microtheme question to my students and ask them to take five minutes and write down their responses: "You are at your favorite shopping mall. As you pass through the center of the mall a well dressed woman approaches you and asks you if you have time to answer a few questions. She informs you that if you answer the questions you will receive a certificate for \$5.00 off any mall purchase. After answering the questions she takes you over to a table where three products are displayed and labeled as Product A, Product B and Product C. You are asked to taste each product only once and fill out a short questionnaire. After you finish she thanks you and hands you a \$5.00 certificate. Discuss the factors that may influence your responses on the sensory questionnaire." The scenario outlined in the microtheme question is filled with issues for the students to write about and discuss. The ideas generated by the students during the microtheme discussion time are very valuable in helping them understand the subsequent lecture material. In addition, the microtheme writing and discussion activities cause the students to become active classroom participants.

Bean et al. (1982) summarized three advantages of microthemes: they require a large amount of thinking time and a small amount of text; they maximize student learning, while minimizing instructor grading time (thus they can be used for both large and small classes); and they provide a window (snap-shot) into the student's thinking process. Bean et al. (1982) discuss four microthemes strategies that can be used to develop specific cognitive skills: 1) summary-writing, 2) thesis-support, 3) data-provided, and 4) quandary-posing microthemes.

Designing effective, high-quality writing assignments is time-intensive, but, in the long run, it saves time. Unfortunately, there are no short cuts to designing effective assignments and no end to improving them after each semester reveals another necessary modification. Outlined below are five guidelines to aid in the design of effective writing assignments.

1. Design and initiate the assignment to promote inquiry by giving the students an issue or problem to solve, not just a

topic to write about. Make sure to include the learning objective(s) underlying the writing assignment. Allow class time to introduce the assignment and answer any questions.

2. Prepare a carefully composed handout for each assignment. Be sure to include a detailed description of the assignment, the role of the writer, the intended audience, the required format, the assignment timetable, and the evaluation criteria that will be used to evaluate the rough and final drafts. Remember, having too many details is better than having too few.

3. Divide a large assignment into logical steps and include appropriate types of feedback (i.e., review and revise opportunities) and specify who will give the feedback (e.g., self, peer, teaching assistant, instructor, in-class, or campus writing-center personnel). Respond, in some way, to all writing assignments and make sure the responses are positive and constructive.

4. Share with the students example approaches to the assignment and well-written example papers (if available) from previous classes.

5. Make sure the writing assignment is part of the class and is not construed by the students as just an unrelated, busy-work assignment.

Responding to student writing for the purpose of improvement

Responding to student writing is a difficult task. What may make responding easier is to view it as a means of providing feedback to the students so that they can improve their writing, rather than as a means of justifying the grade we want to mark on their paper. To make our comments more meaningful, we should make more comments *during* the writing process on outlines and rough drafts, rather than *after* the writing process is over, that is only on the final draft. Evaluation (giving a grade) should be reserved for the end of the writing process. Responding to students' drafts during the writing process can give students the feedback, direction, and motivation they need to revise their writing, without the instructor or students worrying about what grade they will give or receive. This review and revise process allows students to use the instructors comments to substantially improve their writing and, thus, their thinking.

What type of comments should we make to help students revise their writing? Griffin (1983) divides the types of responses into three categories: 1) formal features - clarify an idea, organize more effectively, eliminate grammar problems and spelling errors, 2) content features - a concept

is incorrectly defined or used, an analysis is incorrect or not complete, and 3) rhetorical features - the writing should accomplish the rhetorical effect it was intended to produce, i.e., to persuade, to appreciate, to inform. Students need all of these response types and they need them throughout the writing process, especially in the early stages of writing in which thinking and writing are almost a one-in-the-same process. There is a growing body of literature devoted to the subject of responding to student writing (Lees, 1979; MacAllister, 1982; Sommers, 1982; Haswell, 1983; Mallonee and Breihan, 1985; Anson, 1989; Herrington, 1992; Bean, 1996).

Current research suggests that instructor comments need to have the following characteristics: 1) understandable to the student; 2) complete (not cryptic); 3) text-specific, not interchangeable, "rubber stamped from text to text", comments (Sommers, 1982); 4) suited to the level of the draft being responded to (focusing on developmental revisions in the initial drafts, saving editorial revisions for later drafts); 5) thoughtful and positive; 6) an extension of the teacher's voice; 7) scaled to help students distinguish between high-order and lower-order issues with the text; and 8) encourage not only cosmetic, but more importantly, conceptual revisions. Our comments must extend far beyond pointing out needed editorial (i.e., punctuation, grammar, spelling, diction, and mechanics) revisions of the words and sentences composing the text. Rather, our comments need to motivate and guide our students, helping to engage them in the process of genuine developmental revision and rethinking (i.e., ideas, organization, logic, meaning of the text) of their text as a whole.

Responses can take a variety of forms. The traditional form is written comments on the hard copy of the student's text. Currently, several word-processing packages include an on-line reviewing feature that allows comments to be made on the electronic copy of the text. Other forms of response include the use of a response checklist (Mallonee and Breihan, 1985) and oral feedback (either in person or tape recorded, one-on-one or as a group). The form the response takes, however, is secondary; the important point is that students get the feedback they need to help them improve their writing *before* they finish their final drafts.

The concept of responding to student writing often raises what I call "the great white fear" of paper-grading overload. Asking instructors to respond to student writing in the draft stages does seem like it would create a lot more work, but there are four factors to consider that can actually be used together to help manage and/or simplify the work load.

First, in the problem-driven model of the writing, the instructor is not the only one that can or should respond to the students' writing. In addition to instructor-evaluation, three other methods of responding should be considered:

self-evaluation, peer-evaluation, and campus writing center personnel-evaluation (if available). These methods give the students the feedback they need to help them revise their writing without requiring too much time of the instructor. To get the most out of these methods, it is important for the instructor to give some guidance and oversight as to how these evaluations should be carried out. I use peer-evaluation in my large lecture course (FSHN 101) for the two page popular press assignment. In this assignment students are asked to select a food or nutritional popular press article which they analyze and critique for authorial credentials and information reliability. After the students have written a draft of their paper, they are responsible for finding a partner in class to peer-evaluate it using a pre-designed peer-evaluation form that has specific questions to which both the reviewer and the writer respond. The students are then required to turn in the completed peer-evaluation form for credit. Both reviewer and writer are given points for doing and having a peer review done (each of these activities is approximately 16% of the popular press assignment grade). Secondly, the writing assignments we design for our students do not have to be lengthy. In fact, effective writing assignments can be as short as a few pages or even as short as a few sentences. For example, the FSHN 101 popular press assignment, described above, is only two pages in length, but requires the students to do a great deal of thinking. Thirdly, we can place the major responsibility for editing language mechanics on the students (Bean, 1996). This idea stems from Haswell's philosophy of "minimal marking" where the instructor places an X in the margin next to the line that contains an error (Haswell, 1983). It is then up to the student to locate and correct the error, making the students responsible for editing their own writing. Fourthly, each revision of the paper should result in an improved final draft; thus responding to the final draft should take much less time and effort from the instructor.

Conclusions

We need to prepare our students with the knowledge and skills that will help them succeed in today's workplace. Writing and critical thinking are two primary and synergistic skills that we can teach our students. The design and initiation of writing assignment, the intervention methods we build into the assignment structure, and the responses we give to our students during the writing process are critical steps in helping to teach our students these important skills. In both large and small classes, I have found that requiring my students to write more helped them learn more, improved their writing skills, and enhanced their critical thinking skills. My involvement in the WAC movement has transformed my everyday teaching practices. I hope they can help transform yours too.

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 Mevance S. Parmer, an invaluable friend and writing colleague, for our many enlightening discussions which have served to refine my ideas about writing and thinking.

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Assessing the Adoption of Multimedia Technology in a College of Agriculture

Jan G. Hogle¹, Gene M. Pesti², James King³
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.

¹ Doctoral Candidate in Instructional Technology

² Professor of Poultry Science and Animal Nutrition

³ Professor of Instructional Technology

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.