to see an advisor. A desired outcome of this system has been providing, in a large public institution, with over 30,000 undergraduate students, an advising system approaching the individualized attention given to students in much smaller institutions while minimizing the demand of staff time in the advising effort.

Certainly, computers can be used in several ways to improve the quality of academic advising. A recent article describes the development of software for use in a stand-alone PC, allowing students to design a curriculum than meets the student's goals (Lieberman, 1996). Our paper has presented an approach that uses the mainframe computer. The power of the system described here is that actual student transcript information is dynamically available for monitoring the academic progress of the student. It also has the flexibility of answering the "What if" question of how changing from one major to another will impact the time-to-graduation of a student. It provides the ability to reveal to a student a possible "found" major that results in an earlier graduation, and more closely meets the expectations and

goals of the student. The front-end effort of resources and staff time required to implement the UT system are now paying off in terms of a much-improved advising system.

Literature Cited

Bedeker, D. and J. Young. 1994. Advising in the 90s: assessing the quality of the advisor/advisee relationship. NACTA Jour. 38 (1):33-36.

Craig, D. D. 1998. Measuring university performance: universal tracking. University of Florida 4 (1):1-4.

Lieberman, Stanley J. 1996. Cyber Adviser: High-Tech, High-Touch Advising. T.H.E. Jour. November: 111-114.

Lombardi, J.V. and E.D. Capaldi. 1996. The Accountability handbook from the University of Florida

Martin, A. 1989. Course prerequisites and undergraduate student performance. NACTA Jour. 33 (1):38-43.

Radhakrishna, B. and S. Thompson. 1997. Academic advising in agricultural and extension education: an empirical study. NACTA Jour. 41 (1):48-50.

Increasing Opportunities for Students to Think in College Classrooms: A Faculty Intercession Program

M. Susie Whittington[1], The Pennsylvania State University
413 Agricultural Administration
University Park, PA 16802

Abstract

With increasing emphasis on students' ability to demonstrate critical thinking skills, the need for instructors to demonstrate that type of higher order cognitive activity also increases. However, studies of college professors reveal that a preponderance of oral presentations by teachers typically reflect thinking at the lower cognitive levels. Professors, though, have indicated a desire to change their teaching so that greater opportunities exist for students to develop thinking skills during classroom sessions.

Therefore, a nine-month faculty intercession program was designed and implemented to prepare professors to teach thinking skills in college of agriculture classrooms. At the end of the nine-month intercession, the frequency in which opportunities were given by professors for students to think at higher cognitive levels increased. This paper shares the rationale, readings, and workshop topics used to raise the cognitive level of selected college professors' classroom teaching.

Introduction

Since philosophers, psychologists, educational practitioners, and education reform leaders have come to agree on the importance of effective thinking to success in school and in life, critical thinking, analysis, and problem solving have become key elements in revisions of undergraduate curricula nationwide. In general, the goals of curricula reformation and higher education restructuring are to expand and enrich the intellectual experience of undergraduates and to better prepare students for functioning in a continually changing world.

Cognition Research in Higher Education

The American higher education system has been accused of failing to encourage students to think. Examples of this neglect were found by Miller (1990) in a study of college professors. Miller reported that a preponderance of oral presentations by teachers typically reflected thinking at lower cognitive levels. These findings supported earlier

[1] Assistant Professor

work by Fischer and Grant (1983) who reported that discourse in college courses was predominantly at the lowest cognitive levels, regardless of the kind of institution, course level, subject area, or length of topic or session. Whittington and Bowman (1994) in their study of 30 college of agriculture professors, reported that a high percentage of lower level discourse (verbal exchange at the knowledge and comprehension levels) was presented throughout class sessions varying in subject matter and course level. Data from the study showed that professors conducted discourse at the knowledge (42%), and comprehension (37%) levels 79% of the time. These findings were consistent with those of Pickford (1988) and Miller (1990) who reported that professors conducted 94% and 98%, respectively, of their discourse at the knowledge, comprehension, application, and analysis levels of cognition.

This tendency of college professors to deliver discourse at the lowest cognitive levels is unfortunate because instructors have an excellent opportunity to "teach-by-example" and provide structure for students to practice higher order cognitive activity. Therefore, an intercession was designed and implemented to enhance the cognitive level at which professors teach in college of agriculture classrooms. The purpose of the intercession was to provide a non-threatening, yet challenging forum in which faculty could begin to read, think about, and discuss teaching at higher cognitive levels.

What are the Cognitive Levels?

A component of the cognitive movement which has been studied extensively is defined by Bloom (1956) as "higher order thinking". Bloom argued that accomplishing higher order thinking required analysis or understanding of the new situation, a background of knowledge of methods which could be readily utilized, and some facility in discerning the appropriate relations between previous experience and the new situation. Thus, his hierarchy of thought progresses as follows: knowledge, comprehension, application, analysis, synthesis, and evaluation. Knowledge and comprehension are considered lower level cognitive activities while application, analysis, synthesis, and evaluation are considered higher order cognitive activities. According to Brookfield (1987), mastering the higher order thinking of which Bloom speaks is one of the most significant activities of life.

The Faculty Intercession Program
Faculty Involvement

Participants in the intercession were faculty members in a college of agriculture who held a teaching appointment and who were teaching at least one undergraduate course. "Good teachers" as evidenced by interest in improving teaching, exit interview comments by students, attendance at teaching seminars, and student evaluations of teaching were nominated by their department chairs to participate. From the list of nominees, 30 faculty members, whose teaching schedules could be coordinated, who were teaching freshman through senior level courses, and who represented all eight departments/schools in the college, volunteered to participate.

Starting the Process

Participating faculty were brought together for a two-hour "awareness" workshop to share and discuss research results from studies of cognitive processes in college classrooms. Participants also brainstormed ideas and techniques for teaching at higher cognitive levels. Discussion generated during the workshop afforded participants opportunities to consider higher level teaching. Faculty were encouraged to suggest reasons for discrepancies in cognitive levels reached between various instructors and different institutions in the studies. At the conclusion of the awareness workshop, participating faculty members were randomly placed into one of three levels of intercession (10 faculty per treatment level): Awareness, Resources or Development.

Descriptions of Levels of Intercession
Awareness Intercession - Participants attended the two-hour workshop.
Resources Intercession - Participants in the "resources" group committed to reading, on a monthly basis for nine months (September-May) materials targeted at enhancing cognitive level of teaching. Specifically, the materials read by this group of professors included: Teaching for critical thinking (Chaffee, 1994); What happened to thinking? (Parker, 1993); Thought and knowledge (Halpern, 1984--selected chapters were divided into two readings); Critical thinking: How to prepare students for a rapidly changing world (Paul, 1993a--selected chapters were divided into two readings); Discussion-method teaching: How to make it work (Welty, 1989); Methods of teaching agriculture: Learning as problem solving (Newcomb, et al., 1986, Chapter 4); and, The Students Are...(Anonymous).

Participants in "resources" were mailed a form each month on which they were requested to express a possible application of the monthly reading material to their current or future teaching. The qualitative data gathered from these responses generated common themes: transforming students, focusing on the process of solving problems, encouraging students to reason and think independently, encouraging students to apply principles and concepts to their own experience, questioning the effectiveness of

teaching or modeling critical thinking at the University level, focusing on the teacher as a model critical thinker, facing difficulties and barriers in teaching critical thinking, and covering subject matter or material versus developing reflection and understanding. Selected excerpts from these comments are listed below:

Transforming students.
Although I believe in what I am doing and believe it is part of a curriculum based on critical pedagogy, I had no idea I was in such agreement with people in the critical thinking movement. . . . My ultimate goal is to transform students and prepare them to be able to answer the question.

Focusing on the process of solving problems.
"In Immunology, I present many experimental designs and experimental results to illustrate a particular principle until the students can predict the outcome of an experiment before they see the results."

Focusing on the teacher as a model critical thinker.
"I am changing the focus [of the course] . . . so the lecture is more problem oriented in order to increase the students' critical thinking skills. By 'walking' them through the thinking process in class, I hope to improve their thinking abilities."

"One specific addition I plan to make in my Immunology lectures is to 'THINK OUT LOUD' so the students can better understand the relationships that I see. . . .to provide a structured way to approach interpretation of data."

Development Intercession - Participants selecting "development" volunteered to work intensively in a small group with other faculty members, one hour each month for nine months (September-May) to explore teaching that reaches higher cognitive levels. These participants were afforded a greater opportunity to interact and discuss theories and techniques for higher cognitive level instruction than professors in the "awareness" or "resources" intercessions. Discussions focused on the following specific monthly topics in the form of workshops.

Workshop 1.What has been learned from the research? (detailed previously as "Awareness").

Workshop 2.Writing objectives across the levels of cognition.
The focus of Workshop 2 was writing instructional objectives across all levels of cognition. Results included instructional objectives written by faculty members that described an objective for their course written at the analysis, synthesis, and evaluation levels of cognition. In-depth discussions were encouraged related to teaching "differently" depending on the level at which the objectives are written.

Workshop 3.An introduction to learning styles.

Workshop 3 dealt with the concept of learning styles and the relationship of the learning style theory to teaching style and reaching various cognitive levels in the classroom. Results included professors' definitions of a learning style, awareness of their own learning style as measured by the Group Embedded Figures Test (Witkin, 1971), and professors' interpretations of the relationship of learning styles to their own teaching practices.

Workshop 4.Learners' styles met through problem-solving teaching.

Workshop 4 continued with the theme of learning and teaching styles, however, problem-solving teaching was presented as an approach for reaching all cognitive levels in a classroom of students possessing a variety of learning styles. Results included faculty members' descriptions of present and future problem-solving techniques for their courses.

Workshop 5.Sharing your best-kept secret.

Workshop 5 was a collection of participants' thoughts plus their applications of techniques for teaching across the levels of cognition. The workshop centered on an informal discussion among faculty of techniques and principles they have found effective in reaching higher cognitive levels during classroom discourse. Results included faculty members' descriptions of their individual techniques and the way in which these techniques challenged students across the cognitive levels. Participants also discussed modifying each professor's technique in order for the idea to be utilized across various disciplines.

Workshop 6.Questioning techniques that reach higher cognitive levels.

The focus of Workshop 6 was the discussion-method technique and the use of questioning strategies for reaching higher cognitive levels. Results included actually involving faculty members in the experience of a discussion technique (led by a colleague) and reflections on the application of that technique to their own classes. Emphasis was placed on encouraging students to develop their thinking skills at the creating and evaluating levels.

Workshop 7.Documenting your teaching effectiveness.

Workshop 7 was a formal presentation by a guest lecturer, Dr. L. H. Newcomb from The Ohio State University, on techniques faculty members can use to document their teaching effectiveness. Demonstrating excellence in teaching performance by challenging students beyond the lower levels of cognition was stressed. Results included a videotape of the presentation for future use by faculty. Results also included interacting with the presenter on difficulties and barriers faced to receiving recognition for good teaching and being rewarded for teaching at higher cognitive levels.

Workshop 8. Barriers to teaching at higher cognitive levels.

Workshop 8 dealt with particular barriers that faculty face in reaching higher cognitive levels in their classroom teaching. Discussion focused on brainstorming potential solutions to breaking-down barriers to higher cognitive teaching. Table 1 is a summary of excerpts gathered from participants' written comments concerning barriers to and suggestions for reaching higher cognitive levels in college classrooms.

Workshop 9. Benefits to teaching at higher cognitive levels.

Workshop 9 focused on benefits faculty and students gain from reaching higher cognitive levels in college classrooms. Results included faculty brainstorming benefits to learners and ideas for achieving their goals.

Benefits of the Intercession Program

With little or no formal education in teaching, many professors are unaware of teaching students across levels of cognition and techniques available for enhancing thinking in their college classrooms. Yet, professors desire to change (Newcomb and Trefz, 1987). Thus, educating professors regarding their cognitive level of instruction is necessary if change is to occur.

The faculty intercession program described in this article, implemented at any of the three intercession levels (Awareness, Resources, or Development) will make a difference in the cognitive level at which discourse is delivered in college classrooms. Beginning with only the 2-hour "awareness" workshop is a start. In-and-of-itself, the workshop design will introduce faculty to the concept of improving teaching by moving students to higher levels of cognitive thought during the classroom situation. In accordance with Rogers (1995), the first phase of integrating a new technique is "awareness"; simply being aware of teaching at higher

cognitive levels will make a positive difference in challenging professors to raise the cognitive level at which they teach in college classrooms.

Faculty individually or as a unit can choose to engage in the "resources" level of the faculty intercession program. The in-depth readings will move faculty beyond the "awareness" phase and will engage them in Roger's "interest" and "evaluation" phases (phases 2 and 3) of the integration model. Neither the "awareness" nor the "resources" intercessions require a great deal of faculty time (which they often do not have), and yet both will contribute to enhanced classroom learning by increasing the cognitive level at which students operate during class.

Finally, faculty can enhance their cognitive level of teaching by committing to the "development" level of the faculty intercession program. Reaching phase 4 of Roger's integration model, "trial", is the value of the "development" level; meeting face to face, monthly, for one hour, with other faculty, and applying the workshop topics outlined earlier will take faculty to new heights in the integration model. Armed with the teaching enhancement tools provided through these workshops, faculty are confident enough to reach the final phases, "adoption" and "integration", in Roger's integration model.

Summary

A growing area of interest for psychologists and educators is that of cognitive processing in college classrooms. The cognitive level at which professors teach, the higher cognitive activities in which students engage in class, and the professor's knowledge related to classroom cognitive processing are all a part of and an influence on the cognitive development of students. There are numerous articles on cognitive levels of teaching and learning that professors should be using as resources, and there are equally as many workshop topics designed to assist faculty with development in the area of teaching at higher cognitive levels. This faculty intercession program is proposed as a starting point from which professors can add a deeper cognitive dimension to their college teaching.

Literature Cited

Anonymous. 1985. Class handout in Agricultural Education by Professor J. Knight: The Ohio State University.

Bloom, B.S., M.D. Engelhart, E.J. Furst, W.H. Hill, and D.R. Krathwohl. 1956. Taxonomy of Education Objectives Book 1: Cognitive Domain. New York: David McKay Company, Inc.

Brookfield, S. D. 1987. Developing Critical Thinkers. San Francisco: Jossey-Bass Publishers.

Chaffee, J. 1994. Teaching for Critical Thinking. Educational vision: The magazine for critical thinking 2(1): 24-25.

Fischer, C.G. and G.E. Grant. 1983. Intellectual levels in college

classrooms. In: Ellner, C.L. and C.P. Barnes (eds.). Studies in college teaching. Lexington, MA: D.C. Heath & Co.

Halpern, D.F. 1984. Thought and knowledge. Hillsdale, NJ: Lawrence Erlbaum Associates.

Hechinger, F.M. 1987. Thinking critically. New York Times, p. 27.

Meyers, C. 1986. Teaching students to think critically. San Francisco: Jossey-Bass.

Miller, C. 1990. Cognitive levels of instruction and student performance in college of agriculture courses. Proc. 17th Annu. National Agricultural Education Research Meeting, Cincinnatti, OH.

Newcomb, L.H., J.D. McCracken, and J.R. Warmbrod. 1986. Methods of teaching agriculture. Danville, IL: Interstate Publishers, Inc.

Newcomb, L.H. and M.K. Trefz. 1987. Levels of cognition of student tests and assignments in the College of Agriculture at The Ohio State University. Proc. 41st Central Region Annu. Research Conference in Agricultural Education, Chicago, IL.

Parker, R. 1993. What happened to thinking? NACTA Jour. 37(1):4-7.

Paul, R.W. 1993a. Critical thinking: How to prepare students for a rapidly changing world. Santa Rosa, CA: The Foundation for Critical Thinking.

Paul, R.W. 1993b. "Five stages in teaching and learning" and "Implications, implications, implications". Critical Thinking 1(2): 26-27. Center for Critical Thinking, Sonoma State University, CA.

Pickford, J.C. 1988. Selected Student and Professor Variables Related to Cognitive Achievement in College of Agriculture Courses. MS Thesis. The Ohio State Univ.

Rogers, E.M. 1995. Diffusion of Innovations (4th Ed.). New York: Free Press.

Welty, W.M. 1989. Discussion method teaching: How to make it work. Change,1-13.

Whittington, M.S. and G.L.T Bowman. 1994. Assessment of Cognitive Level of Instruction Aspiration and Attitude Toward Higher Level Instruction. Proc. 21st Annu. National Agricultural Education Research Meeting, Dallas, TX.

Witkin, H.A., P.K. Oltman, E. Raskin, and S.A. Karp, 1971. Group Embedded Figures Test manual. Consulting Psychologist Press, Inc.: Palo Alto, CA.

Table 1. Barriers To And Suggested Solutions For Reaching Higher Cognitive Levels

Barriers to Reaching Higher Cognitive Levels	Possible Solutions to Overcoming Barriers
Lack of creativity on part of instructor	Instructor must make concerted effort to observe other teachers and employ a wide range of teaching approaches
Lack of commitment to reading and self-education on part of students	Reward and encourage (i.e. through grades) reading and independent work
Students are seldom challenged to higher cognitive levels until capstone courses	Need to encourage higher cognitive learning in introductory courses
Not easy on students or faculty to bring about higher cognitive thought (limits on faculty time and education, --students sometimes do not care)	Need to rethink curricula and courses across the university and identify feasible and desired cognitive levels reached across departments
A "fact" model of teaching, limits that which is thought possible.	Lectures by role models— their view of what works in the classroom, i.e., presentation by "Outstanding Teacher" award winners
Lack of curriculum materials that move teacher out of "talk and chalk" mode	Attend teaching workshops to gather new ideas
Some students are just tired from working jobs.	Include more student writing and interactive activity in the classroom (create active learners)
Some students want rote learning or a simple straight-forward answer that is always right.	Role model problem-solving out loud in class before giving problem-solving assignments
Students wonder why they should know certain points	Show relevance of subjects to students' lives and have students apply examples