

Raising Cognitive Levels of College Classroom Instruction

M. Susie Whittington and L. H. Newcomb

Introduction

Within the classroom walls professors are caretakers of a treasure that can strengthen agriculture and natural resources, but more importantly, can prepare students for life; professors can activate the human mind. If one believes that daily experiences in the environment shape and mold the intellect, then one must believe that professors and their teaching ability play an important role in nurturing the thinking ability of students (Whittington, 1991). The true value of teaching is manifested in enhancing the thinking process.

During the past decade, however, numerous government reports openly criticized the ability of the American education system to teach students to think. Examples included the 1982 Education Commission of the States report which stated, "the pattern is clear: the percentage of students achieving higher order thinking skills is declining" (Baron and Sternberg, 1987).

Academic Reformation

In response to this and similar reports, education at all levels is experiencing a reformation. A goal of the reformation is expansion and enrichment of the intellectual experience of every undergraduate. To accomplish the goal, educators are designing courses and programs for producing "educated persons", defined by Reagan et al. (1987), as the ability to write and speak, read and listen, and the ability to engage in careful, logical thinking and critical analysis.

According to the Strategic Plan for the College of Agriculture at The Ohio State University (Warmbrod et al., 1989), "educated persons" should complete an undergraduate curriculum emphasizing science and technology, and analysis and problem solving. However, simply adding science and technology and analysis and problem solving to the curriculum will not instill in students the primary characteristics of an "educated person"; how the total undergraduate curriculum is taught will make the difference (Whittington, 1991).

Faculty Members Make the Difference

Faculty members are a valuable resource in the total agricultural system (Chudzinski, 1988). Their teaching must be effective and innovative to stay current in meeting both the needs of agriculture and the needs of students. The strategic plan mentioned earlier, addresses, in the teaching

function of the mission of a college, teaching thought processes. The plan states that the mission of the teaching function is:

to develop the scientific and technical knowledge of students and practitioners, enhance their individual and collective capacity for enlightened thinking and problem solving, and encourage them to value and participate in the lifelong process of education (Warmbrod et al., 1989 p. 2).

The power to think and solve problems should be the student outcome desired by professors. Meyers (1986) wrote:

It is increasingly important that students master the thinking and reasoning skills they need to process and use the wealth of information that is readily at hand... (p. xiii).

American educators, however, have not been singled out as exemplary models for teaching thinking. Many agree with Halpern (1984) who wrote, "Traditionally, instruction in how to think has been a neglected component in American education" (p. ix).

Teaching Thinking in Agriculture

Has instruction in how to think been a neglected component in colleges of agriculture? Using *The Taxonomy of Educational Objectives: Cognitive Domain* (Bloom et al., 1956), Newcomb and Trefz (1987) conducted a study in 1986 which assessed the cognitive level of tests, quizzes and assignments written by faculty members in a College of Agriculture. Newcomb & Trefz (1987) found 85% of the course activities required students to use the two lowest cognitive levels. Pickford (1988), reported that 94% of in-class discourse occurred at the two lowest cognitive levels. Miller (1989) revealed that tests, quizzes and in-class discourse were occurring at the lower levels of cognition.

Are professors of agriculture and natural resources neglecting teaching students to think at higher cognitive levels? Based on previously mentioned research, the answer is yes. A better question, though, is, "Are professors content with their performance?"

In 1987 when Newcomb and Trefz asked professors if they were pleased with their cognitive level of testing, 86% said they desired to test at higher levels. In a study by Whittington (1991) 100% (n = 10) of the professors desired higher cognitive levels of in-class discourse and testing than the level at which they were assessed. Clearly professors are not content with their cognitive level of instruction, and ready for learning to teach at higher cognitive levels.

Whittington is an assistant professor in the Department of Agricultural and Extension Education, University of Idaho, Moscow, ID 83843. Newcomb is associate dean, College of Agriculture, The Ohio State University, Columbus, OH 43210.

Teaching at Higher Cognitive Levels

In classrooms, educators must exhibit and reinforce higher cognitive levels such that it becomes the routine rather than the exception. The problem, however, according to Miller (1989), is that professors are not aware that various types of teaching methods can yield thinking at various cognitive levels. Thus, comparing the cognitive level reached by students during lecture as opposed to demonstrations and case studies will prove to be enlightening.

Figure 1 utilizes activities listed in the Florida Taxonomy of Cognitive Behavior to raise faculty awareness regarding cognitive levels reached by students when professors use various teaching techniques. Lecture, demonstration and case study are the three techniques which are displayed. However, a similar analysis could be developed for additional teaching techniques such as role play, independent study, experiments, and field trips.

As noted in Figure 1, students are given more opportunities to reach higher cognitive levels when techniques other than traditional lecture are utilized. For example, at the creating level, "follows questioning that combines pieces of information into new form" is listed. As can be seen in Figure 1, students utilize this particular activity when learning via demonstration and case study, but not during lecture. Of course, there are exceptions, but the exceptions are produced by instructors who are thoughtful and creative in planning classroom delivery.

Planning

Teaching at higher cognitive levels requires thoughtful and creative planning. Three research projects (Pickford, 1988; Miller, 1989; Whittington, 1991) intensively studied 17 professors teaching various subject matter in courses ranging from the freshman through senior level. Teaching at higher cognitive levels was more the exception than the rule. Thus, faculty members must begin to schedule time each week to plan lessons that will challenge students at higher cognitive levels.

Instructors can utilize the principles of teaching and learning (Newcomb, McCracken, and Warmbrod, 1986), the primary and secondary principles of interest (Lancelot, 1929), and the categories on the Florida Taxonomy of Cognitive Behavior (FTCB), (Webb, 1970) evaluation instrument as lesson planning tools. Here is an example. Once the subject matter to be taught is thoroughly outlined in the lesson plan, the instructor must write directions for presenting the outline; directions that "bring the content to life", and thus, enhance learning for students.

By using principles of teaching and learning such as "To maximize learning, students should 'inquire into' rather than 'be instructed in' the subject matter", and "Students are motivated when they attempt tasks that fall in a range of challenge such that success is perceived to be possible but not certain", instructors will think about planning creatively. Professors will be encouraged to write lead questions such as "What if...?", "Which option would you choose?" and "Can you justify your response?". Professors will also be excited to create and plan student interaction activities

that challenge students to maximize thought processes, thus reaching the higher levels of cognition.

Along with the principle of teaching and learning that states "Learning activities should be provided that take into account the wants, needs, interests, and aspirations of students", instructors who use the primary and secondary principles of interest, as a tool for planning, will find that love of nature, curiosity, competition, humanity, humor, novelty, and thinking create interest. This knowledge should enhance instructors' desire to plan interest-capturing activities that lead students from the remembering level through the evaluating levels of cognition.

In addition, instructors will find, according to the categories on the FTCB, that students who are "identifying something by name", "giving steps in a process", "translating verbalization into graphic form", or "giving reasons why", are operating at the lower levels of cognition. However, students engaged in "distinguishing fact from opinion", "showing interaction or relation of elements", "detecting errors in thinking", "producing a plan", "designing an apparatus", "formulating hypotheses" or "evaluating something from criteria or evidence", are operating at the analysis, synthesis and evaluating levels (the three highest levels of cognition). Using these categories, professors can ask themselves, "What are my students doing at this point in my lesson?", "What does asking this question cause my students to think about?" or "What can I plan that will encourage students to actively pull together the previous subject matter from this lesson plan?".

Practice

Try it out! Rehearse the plan before presenting it to the class. Then, enjoy classroom opportunities to lead students through the hierarchical levels of cognition. As educators practice more, the process will become easier to model and thus less frustrating for students to grasp.

Evaluate

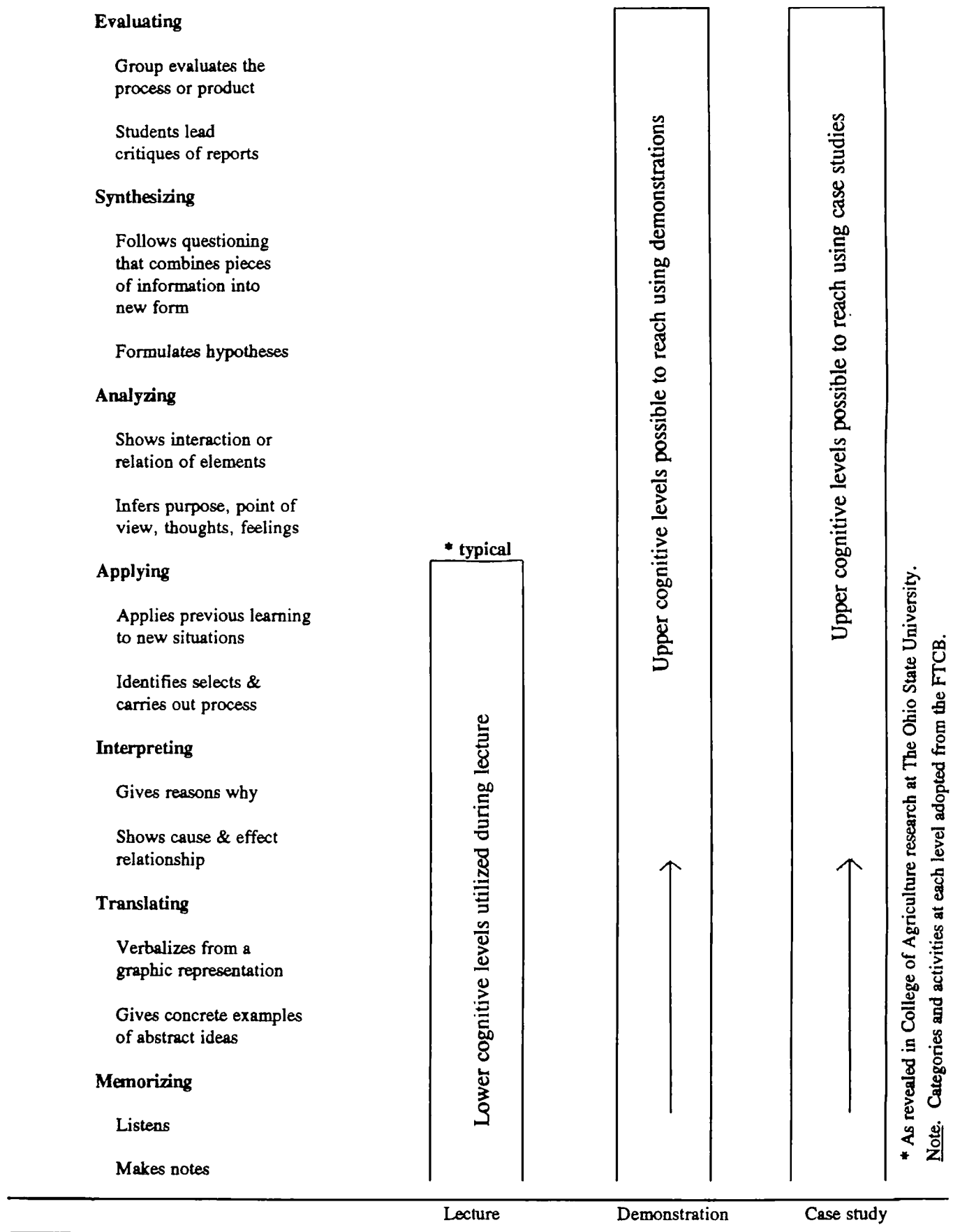
Faculty members must take time to evaluate their performance regarding teaching at higher cognitive levels. Videotaping several class sessions and performing self-critiques using the FTCB can be enlightening and fun. Then ask yourself: How do I feel? Did I clearly provide opportunities for utilizing higher level thought processes? Did it work? How did students react? Were students excited about the challenge? After all, the ultimate goal is for students to develop higher level thinking skills to use throughout life.

Summary

National reports have called for educators to produce "educated persons" -- people empowered with the ability to think. College of agriculture and natural resources professors, however, have not been found to be challenging students at the higher levels of cognition. Gratefully, there is evidence that professors are not satisfied with teaching at the lower cognitive levels.

Professors are ready to examine their teaching and make conscientious changes that will bring about higher level thinking. By raising levels of awareness regarding cognitive levels of instruction, purposefully planning for instruction

Figure 1. Cognitive Levels Reached by Students When Learning Via Selected Teaching Techniques.



* As revealed in College of Agriculture research at The Ohio State University.
Note. Categories and activities at each level adopted from the FTCB.