Comparison of Teaching Among Professors Assessed as Implementing Higher Levels of Cognition in Their Classroom Discourse

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Abstract

A need exists for teachers in Colleges of Agriculture to demonstrate higher order cognitive activity in their classrooms. In a study conducted at the University of Idaho, five professors were assessed as consistently reaching higher cognitive levels in their classroom discourse. This article was written to share techniques, key phrases and principles of teaching employed by these professors.

Introduction

With increasing emphasis on students' ability to participate in critical analysis and problem solving, the need for instructors to demonstrate that type of higher order cognitive activity also increases. If instructors are not demonstrating their own ability to operate at the higher cognitive levels, it seems difficult to expect students to operate at those levels. How can professors know if they are demonstrating higher cognitive processes in the classroom?

The cognitive level of professors' classroom discourse can be assessed using the Florida Taxonomy of Cognitive Behavior (FTCB) (Webb, 1970). This instrument identifies specific verbal phrases within professors' discourse that are associated with cognitive behaviors in a hierarchy of thought. The instrument was based on Bloom's *Taxonomy of Educational Objectives: Cognitive Domain* (1956).

Using Bloom's Taxonomy and the FTCB, a study was conducted to assess cognitive levels of classroom discourse of 14 faculty members in the College of Agriculture at the University of Idaho (Whittington and Bowman, 1994). Five professors were assessed to consistently be reaching higher cognitive levels in their classroom discourse. What techniques, key phrases and principles of teaching were they using?

The Professors

Professor A

Techniques Utilized

This instructor asks students to participate as "partners" in class instruction on agricultural marketing, while providing guidance and immediate feedback on the material they present and the effectiveness of their explanations. Therefore, students individually decide on appropriate (usually personal) examples in which to illustrate the principles they are explaining. The principles themselves represent basic knowledge and concepts to be mastered in the course. Utilizing the students as "partners" draws on the ability of students to comprehend, apply, and synthesize the information into a form in which peers will grasp what they themselves have mastered. Additionally, this instructor freely takes student-offered examples of different types of agricultural products and develops tables on the chalkboard whereby production scenarios can be analyzed and classified within categories on the table.

Professor A incorporates creativity and "fun" into his class with the "get-to know-you" game—a game where students (one each class session) are asked to tell three lies and one truth about themselves. Classmates then ask questions, discuss their conjectures and request any specific clarification or related information in an effort to ultimately assist them in casting their vote on which item they think is the truth. This exercise employs humor to encourage students to analyze facts and get to know each other for future teamwork assignments and decision-making projects.

Key Phrases and Attitudes

The professor listens critically to students' questions and affirms their analyses of concepts. He encourages expression of students' opinions by asking them to "please comment." He shares his point of view, yet leaves room for other points of view and discussion of different interpretations.

Professor B

Techniques Utilized

This entomology instructor is masterful at using creative and innovative ways to visually stimulate learners thereby stimulating their thought processes. For example, to explain the function of flight muscles in flies, he adhered a fly's body onto two sticks so that he could simulate the contraction of the muscle and the motion of the wings. Moreover, to make this visual aid easily visible to all students, he used the overhead projector to enlarge the image as he explained the muscle contraction.

The flight muscle action was further described using a binder clip, an everyday item that students can use as a re-

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minder of the analogy. Additionally, examples of combining sound with sight included the use of video discs and simply tapping on the table top to illustrate the different patterns an insect uses when flashing its wings to attract other insects. Wall-sized video graphics were used to demonstrate, build suspense, and lead a discussion of the nervous system connecting the brain and the stomach of insects. Applications were made to the nervous system of humans.

Professor B incorporates many visual and functional analogies to illustrate major concepts. Students are asked to evaluate the accuracy of these analogies relative to their comprehension of concepts such as the actual functioning of insects' muscles. Finally, to add structure and organization to the material on each topic, he provides students with a main heading outline of the major points. The professor highly encourages students to read, think, and question throughout graphic illustrations.

Key Phrases and Attitudes

In general, this professor encourages students to utilize all senses in understanding the topic or concept being presented. Furthermore, students are caused to immerse themselves in the topic by comparing the actual behavior or outcome of that insect behavior with their own behavioral responses. The instructor then draws upon these comparisons to formulate hypotheses, as demonstrated by questions beginning, "What might the implications be for —."

He focuses on the idea of one concept building upon another. This "building block" approach is enhanced by outlines given in class which lend themselves as checklists for the professor and the students to verify the clarity of the presentation, with an underlying theme being, "What are your questions so far?"

Professor C

Techniques Utilized

This professor incorporates small group work in her family and consumer science class to motivate students to think through concepts and evaluate applications, even in a large class setting. Examples of specific methods included case studies for problem solving, and role playing scenarios for behavior theory application and analysis.

In one case study exercise, the students were given the same case involving an ethical dilemma which called for evaluation and judgment to decide the best course of action. Every student wrote their own conclusion and recommendation with a justification. Responses were shared with the class. A general poll was then taken as to the preferred course of action.

In a role play that applied and analyzed different communication models within families, students were divided into groups and given the same scenario but used different communication models to act it out. The discussion was then summarized by the professor who highlighted key points and drew conclusions from the students.

In another role playing exercise, volunteers acted-out the scenario in front of the class. The situations were the same but the roles changed, based on different parent/child interactions from various parenting models. Following the acting scene, the class as a whole discussed the various scenarios including identification of each person's function within the behavior model. All dramatic activities were directly incorporated into lecture and discussion.

The instructor was observed as using student input and additionally small group work to construct a chart where comparisons were made between several major developmental theories. The class was divided into groups, each group distilled information on a particular theory, then decided appropriate details to assign within categories on the chart.

Key Phrases and Attitudes

Certain key approaches contribute to the successful use of discussion by this professor. The first approach involves the class formulating their own hypotheses regarding student responses and opinions and a defense of those hypotheses. Next, the instructor listens critically to students' responses and carefully offers interim summaries by bringing out key points. She uses appropriate "wait time" (pauses which allow students time to think), asks for questions, draws conclusions and recommendations, then adds closure to the discussion with phrases like, "Excellent work. Let's move on."

Finally, the students freely participate in discussion because an environment of trust exists. This environment evolved largely through personal experiences shared by the instructor and related through course materials. Trust is also created since the instructor demonstrates that she does not have all the answers; in other words, that certain things are opinion, not fact, with phrases like, "That would be my opinion" and "How I like to use this is —."

Professor D

Techniques Utilized

This family and consumer science instructor makes a point of knowing the students' backgrounds and areas of interest. She accomplishes this in part through topics they choose for their major project. By knowing their topic, and thus some of their personal interests, she can encourage sharing of various perspectives regarding the discussion at hand, "Rachel, explain the relationship of child abuse (Rachel's topic) to this issues model?". The instructor assigns an "issues paper" and ultimately a "poster session" on their chosen topics. The students become researchers to gain in-depth information on their topic of interest. Their findings and insights are shared with the

class using large group and small group discussions, small group problem solving and peer evaluations throughout the semester. The hosted poster session, which capstones the course, is open to the community.

Rather than giving students answers or information directly, Professor D leads them through the development of a concept by continuing to draw out information through ques-

tions like, "Why?" or "How?" and "What happens when —?" or "Do you know where we are going with all of this?"

She also asks students to fill-in spaces on a timeline formulated on the chalkboard. The students offer certain steps while she organizes them on the timeline, all-the-while encouraging students to explain why they offered the chosen order. Finally, she applies those steps to a practical situation by leading students through an example using the timeline.

Key Phrases and Attitudes

The professor opens discussion to many points of view, "Some people think that —" and offers her own perspective as opinion, not fact, "What I think is interesting is —".

Professor E

Techniques Utilized

This professor introduces concepts in her microbiology class from a historical perspective to illustrate the ups and downs of the scientific method in the formulation of what is accepted as proven knowledge. Students actually walk through steps to a discovery, or compare historical experiments to find differences in hypotheses and methods.

The professor progresses through an experiment with statements like, "Investigators knew 'this' (point A) but didn't know 'this' (point B)." As a result, students practice drawing conclusions from experimental results or observations and detecting errors that led to failure of certain experiments. The instructor takes a complex set of information and logically organizes it to show the interrelationships of various experiments. To emphasize the importance of learning and discovery as a continual process, Professor E uses examples of several experiments over time and demonstrates that different conclusions could have been drawn.

Key Phrases and Attitudes

This instructor emphasizes the importance of inquiry — "Do you have questions you can verbalize aloud because I know that will help your classmates—don't be shy", "Talk this over among yourselves" and "Don't wait to study it and don't be afraid to ask about it." The professor encourages the evaluation of proposed methods or processes by asking, "How many think 'this' would work? Why?" Genuine enthusiasm for the subject and the process of discovery permeates the course as she talks about "very exciting" experiments or the "definitive experiment." Continued evaluation of hypotheses are encouraged and expected when she explains that something is "still not direct evidence" of a fact. Continued research and learning are continuously promoted and encouraged.

Common Threads

All these professors demonstrate high regard for their students. They establish a clear channel of communication not only from teacher to student, but also just as importantly, from student to teacher and from student to student. The channels of communication are maintained, in part, by creating an environment of trust within the classroom. This environment encourages students to share their ideas and opinions, and to ask questions while realizing that more than one "right way" exists when considering various points of view and new hypotheses.

These instructors all take a personal interest in their students. In other words, they make an effort to understand why each student is in their class and how the subject matter applies to the student's life. A personal interest in the students provides aspiration on the part of the instructor to give students immediate feedback and constructive correction to better foster learning.

Principles of Teaching — Key Points

"Students think, reason, and contemplate when they 'inquire into' a subject"

While detailed investigation of specific areas of interest to the student occur in "out of class" assignments, class time itself provides the opportunity for the instructor to model effective inquiry procedures. The instructors may plant questions for group discussion or draw out a line of inquiry to lead to the crystallization of an idea. The importance here is demonstrating aloud the thinking process for students during lecture and encouraging students' questions and interactions.

"Students learn what they practice"

If students are only asked to function at the memorization level of cognition, they do not receive "practice" in processing information. For example, when students are "partners" in the class instruction, they practice analysis and synthesis. The instructor functions as a mentor to highlight key points, summarize information, and draw closure. The student has the primary role in processing and presenting material.

Instructors can encourage and provide opportunities for students to function at analysis, synthesis or evaluation levels. Whether in subject matter presentation or role playing scenarios, the student can test and evaluate certain models. Furthermore, students practice critical thinking and self-expression in the analysis and evaluation of case studies, while the instructor facilitates or acts as a catalyst for the learning process.

"Present a major concept 3-5 different ways"

To account for the variability or range of learning styles with which learners are comfortable, at a minimum, these instructors employed a variety of techniques in their lectures and discussions that made use of illustrations, both verbal and diagrammatic. Additionally, they effectively utilized visual analogies, role playing, and case studies.

"Fresh, novel, and stimulating experience is rewarding"

This idea refers to the creativity of the student as well as the instructor. Generating tables, charts, and timelines demonstrate the professor's creative ability to organize student input during class discussion. These unique creations also require students to apply information in a new framework. Other opportunities to provide novel experiences result from new uses of conventional media as well as incorporating new media techniques to enhance students' abilities to use all their senses in the learning process. Furthermore, exercises that applied "true to life" situations to basic theories and concepts fostered student and instructor creativity.

Genuine enthusiasm and mastery of one's subject matter appeared to be linked to creativity. The rare combination of confidence in the technical area coupled with sincere energy and love for teaching was key to incorporating new and exciting techniques in the classroom.

Conclusions

Instructors are successful in giving students the opportunity to raise their cognitive level in the classroom when they view teaching as an exciting opportunity to share information, fuel student learning, and deepen their own thinking. When students achieve higher cognitive levels of thought in the classroom, not only do students benefit, but instructors as well.

True, instructors will be challenged, but considering the far-reaching rewards in life-long learning, instructors will welcome the opportunity to incorporate new techniques, new key phrases, and principles of teaching into their classrooms.

References

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

Webb, J.N. (1970). The Florida Taxonomy of Cognitive Behavior. A. Simon and E.G. Boyer, (Eds), *Mirrors for behavior: An anthology of classroom observation instruments.* Philadelphia: Research for Better Schools. 1 (6).

Whittington, M.S. & Bowman, G.L.T. (1994). Cognitive Level of Instruction Among Fall Semester College of Agriculture Faculty. *Proceedings of the 13th Annual Western Region Agricultural Education Research Meeting,* Honolulu, HA.

INSTRUCTIONAL MEDIA

REVIEWS

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From Farm to Food

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From Farm to Food is a videotape and instructional packet of activities and projects to be incorporated into the lessons designed to study food and where it comes from. The videotape is intended to be shown in segments rather than all at once. It focuses on the top contributions of food made by Pennsylvania Agriculture. It was designed for elementary students but may serve older clientel as well.

Review Summary

The videotape was described as good in concept. Concern was expressed about some of the production aspects including the children's voices on the tape and the page layout of the printed material.

The graph presented below describes the average rating of the reviewers.

	Excellent	Good	Fair	Poor
Picture Quality			X	
Sound Quality				X
Editing		X		
Content		X		
Currentness		X		
Organization		X		
Accuracy	X			
Vocabulatory		X		
Interest			X	
Technical Quality				
Overall (Avg. of Reviewers)			X	

Summary Remarks

Content Panel Member

Materials are well-organized and present information about the new food pyramid in an interesting manner. Narration is provided by young students which adds to the usability with elementary classes or 4-H members. Many references to Pennsylvania would limit the applicability of the information to that state.

Robert Birkenholz
Associate Professor
University of Missouri-Columbia

Content Panel Member

Well done, most useful for young students who are studying foods, nutrition or agriculture.

Robert Lawder
College of Southern Idaho

Availability

Contact the authors.