course to freshman. NACTA Jour. 41(1):42.
Krantz, Jr., R. G. 1991. Capstone learning experience. Proceedings, North Central Regional Teaching Symposium. Madison, WI: The University of Wisconsin, College of Agriculture and Life Sciences. pp.12.
Laney, J. D. 1988. Can economic concepts be learned and remembered: A comparison of elementary students. Jour. of Educational Research 82 (2):99.
Petritz, D. C., S. P. Erickson, and J. H. Armstrong. 1982. The Cattle and Beef Industry in the United States: Buying, Selling, Pricing. Lafayette, IN: Purdue Univ. Cooperative Extension Service CES Paper 93.
Radhakrishna, R. B. and T. H. Bruening. 1994. Pennsylvania study: Employee and student perceptions of skills and experiences needed for careers in agribusiness. NACTA Jour. 38 (1):15.
Stoll, W. F. 1988. Real food industry product development problems provide learning opportunities. NACTA Jour. 32 (1):7.

Examining The Academic Challenges Provided By College Of Agriculture Professors

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Abstract

This paper deals with the variety and frequency of academic challenges professors require as a part of the curriculum in three-credit semester courses. Fourteen professors and faculty from a College of Agricultural Sciences allowed their course academic challenges (i.e. midterms, tests, quizzes, and assignments) to be thoroughly inventoried and categorized.

The study examined class size, course level, subject matter, and the type and quantity of academic challenges provided by professors. Midterms, written finals and written reports were the most common provided by 78%, 71%, and 57% of the professors, respectively. While there were no significant relationships found between the types of academic challenges provided and the differences in course level, class size, and subject matter, the authors describe what was noticed.

Questions are presented for additional discussion and future research. Additionally, several proactive methods to increase the effectiveness of academic challenges are explored.

Introduction

Teachers have the formidable task of educating students in preparation for problems and situations that are unknown and unpredictable. One way to accomplish this is to help students develop thinking skills that can be applied to numerous future situations. The teacher's ability to demonstrate and model critical thinking and problem solving skills during class sessions is an important factor in teaching these skills (Whittington and Newcomb, 1993). Additionally, orally modeling these behaviors has been shown to actively facilitate the development of the students' cognitive growth and academic skills (Cross and Angelo, 1988). The National Center for Postsecondary Teaching, Learning and Assessment reported that "students" classroom experiences have the most impact on creating intellectual "curiosity" (Ratcliff, 1995, p. 8.).

Course assignments and homework (academic challenges) provided by professors can be vital to the learning process if students take an active role in accepting these challenges (Doyle and Barber, 1990; Meyers, 1986). Effective use of academic challenges increases student achievement (Foyle and Baily, 1985; Ziegler 1986). Academic challenges also provide opportunities for students to "learn" the content material of their classes while challenging students to explore and use the content as a means to developing their critical thinking skills. Academic challenges can contribute both to enhancing students' progression through the thought processes and to developing their critical thinking skills (Cooper, 1989; Terenzini, et al., 1995). Because academic challenges can impact student learning, it is

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important to examine the types of academic challenges that are being used in undergraduate agricultural education.

The purpose of this paper was to examine the different types of academic challenges provided by higher education teachers as part of the undergraduate teaching/learning process. The objective was to determine what types of academic challenges professors provided students and whether a relationship existed between the frequency of the academic challenges being provided and the class size, course level, or subject matter.

Overview

Fourteen faculty members from ten departments/ schools within the College of Agricultural Sciences (horticulture, entomology, agronomy, dairy science, animal and veterinary science, forestry, soils, environmental resource management, agricultural economics, and plant pathology), participated in this project. Faculty members were initially nominated for participation by their department chairperson, though final participation in the project was voluntary.

Each participant provided copies of the academic challenges used in his/her course (i.e. midterms, tests, quizzes, assignments). Courses varied in content, class size (12 to 344 students), and course level (freshman to senior levels). The authors examined all academic challenges from each course and grouped them by type. The resulting groups were: midterms, finals (oral or written), quizzes, presentations, activities, reports, lab reports, lab tests, and problem sets. Presentations, reports, and problem sets were also separated into the sub-categories "group work" or "individual work".

Written finals, midterms, lab tests, and quizzes were types of academic challenges that were often taken individually and in a test-like classroom setting, as opposed to oral finals and oral presentations which were verbal in nature and either performed individually or in groups. Written reports and lab reports were typically designed to be completed individually. Activities included projects such as: critiques of group presentations, peer reviews, journal entries, plant identification exercises, on-going profit/loss accounts, field trip reports, and questionnaire or survey development and/or collection. These were individually performed and primarily written, as opposed to verbal.

Problem sets were typically mathematical in nature and encompassed a wide variety of tasks, including: computer labs and assignments, mathematical agronomy and animal science challenges, and case studies with a mathematical basis. Most often the problem sets were completed individually and in a written manner.

Results

While participants taught courses in several content areas, course content did not appear to influence the number or the variety of academic challenges provided. The total number of academic challenges provided per course ranged from 3 to 32, with a mean of 14.4. The mean number of different types of academic challenges provided within each course was 4.9 (Table 1).

Although the variety included group and individual work, in both written and oral form, the most frequent type of academic challenge was the paper and pencil midterm. The majority of professors (78%, n=11) used at least one midterm examination in their course, typically combined with other academic challenges. Written finals were given by 71% (n=10) of the professors and one professor used an oral final. Half of the professors used quizzes.

Professors required individual written reports more frequently (57%, n=8) than lab reports, individual problem sets, individual presentations, or group presentations (n=4 for each). Six professors incorporated at least one academic challenge based on collaborative group work (group presentations, problem sets, and/or reports) and two professors provided lab tests.

Although there were no significant relationships found between the types of academic challenges provided and the differences in course level, class size, and subject matter, the use of reports and midterms appeared to vary depending on course level and class size. As the course level increased, the number of midterms and individual reports used by professors decreased. With respect to class size, the opposite occurred; As class size increased, the variety of academic challenges decreased and the number of midterms and individual reports increased. It is important to note however, that the small sample size may not adequately or accurately represent any actual trend.

Discussion

Although the relationship of academic challenges to students' achievement, cognitive growth, and critical thinking skills is not fully understood, academic challenges are frequently an integral part of many curricula. There is a great variability in how many and what types of academic challenges are offered. This examination of the types of academic challenges used by fourteen professors, raised many questions that calls for additional research. The answers to these questions may significantly impact the way in which professors think about teaching:

- What difference is made in students' thinking and learning by using a variety of academic challenges?
- Are we as educators providing students the opportunity to think at higher levels of cognition

Table 1. Number and Type of Academic Challenges by Course

		Course														
Type of AC		A	B	C	D	E	F	G	H	I	J	K	L	M	N	Total
Activity	0	2	0	0	1	6	1	0	1	0	0	2	0	1	7	
Lab Report		0	0	10	12	0	0	0	0	0	0	10	0	8	0	4
Lab Test		0	5	0	1	0	0	0	0	0	0	0	0	0	0	2
Presentation - Group		0	0	0	1	1	0	0	0	0	0	0	1	1	0	4
Individual		0	2	0	0	4	0	3	0	0	0	0	0	1	0	4
Problem Sets - Group		0	0	0	0	0	0	0	3	0	0	0	0	0	0	1
Individual		0	14	5	0	0	15	0	10	0	0	0	0	0	0	4
Report - Group		1	0	0	1	6	0	0	2	0	0	0	2	1	0	6
Individual		0	1	0	0	1	1	2	0	0	1	2	0	2	1	8
Quiz		3	5	0	0	0	2	3	0	2	0	2	0	0	11	7
Midterm Exam		2	2	2	1	2	2	1	0	0	1	1	0	3	1	11
Final - Oral	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	
Written		1	1	1	1	0	1	1	0	1	1	0	0	1	1	10
Total AC used in the course	7	32	18	17	16	27	11	15	4	3	15	5	17	15	202	
Types of AC used in the course	4	8	4	6	7	6	6	3	3	3	4	3	7	5		

via the academic challenges we select for students?

- Are there certain types of academic challenges which should be required to better facilitate the development of students' ability to think critically?
- Is there an appropriate variety of academic challenges that should be offered in order to accommodate the students' various learning styles?
- Is there an appropriate number and variety of academic challenges that should be required in accordance to the course level in college of agriculture classes?
- What contribution to the teaching and learning process is a particular academic challenge providing, and can we as educators justify its use?

Effectively challenging students to develop and use higher order thinking skills may require not only purposefully designed academic challenges, but also timing and sequencing of the challenges. Such challenges should engage students in reinforcing their content learning and developing their critical thinking skills. Requiring students to analyze or evaluate aspects of the content, prompting them to generate supported opinions and judgments, leading them to make connections between and among concepts, and/or having students explore alternative or competing views to the topic at hand are examples of academic challenges in which educators can focus.

Summary

This study examined the academic challenges provided students by College of Agricultural Sciences professors and as a result raised several questions. While these and many other questions are being examined by Whittington, Terenzini, Ratcliff, and others, educators can still be proactive by consciously examining the academic challenges they choose to use instead of relying on the academic challenges that they are familiar with from their own years as a learner. Providing a variety of thought-engaging, creative, and well-designed academic challenges is a beginning point for moving College of Agriculture professors toward developing thinking skills in students.

Literature Cited

Cooper, Harris. 1989. Synthesis of research on homework. Educational Leadership 47 (2):85-91.

Cross, K.P.and T.A. Angelo. 1988. Classroom assessment techniques: A handbook for faculty: Board of Reagents of the University of Michigan for the National Center for Research to Improve Postsecondary Teaching and Learning.

Doyle, M.E. and B.S. Barber. 1990. Homework as a learning experience. What research says to the teacher. Washington, D.C.: National Education Association.

Foyle, H.C. and G.D. Baily. 1985. Homework in the classroom: Can it make a difference in student achievement? Paper read at the 40th annual conference of the Association for Supervision and Curriculum Development, March 25, Chicago.

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

Ratcliff, James L. 1995. Realizing the potential: Improving postsecondary teaching, learning and assessment. University Park, PA: The Pennsylvania State Univer sity, The National Center on Postsecondary Teaching, Learning and Assessment.

Terenzini, P.T., L. Springer, E.T. Pascarella, and A. Nora. 1995. Influences affecting the development of students' critical thinking skills. Research in Higher Education, 36 (1):23-39.

Whittington, M.S. and L.H. Newcomb. 1993. Aspired cognitive level of instruction, assessed cognitive level of instruction and attitude toward teaching at higher cognitive levels. Journal of Agricultural Education 32 (2):55-62.

Ziegler, Suzanne. 1986. Homework. Ontario: Toronto Board of Education.