Perceptions of Agriculture College Faculty Regarding Integration of Higher Level Thinking Skills in the Curriculum

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Most people will agree that graduating college students who are capable of critical thinking and problem solving is an important objective of the educational system. According to Ruggiero (1988), teaching students to think requires more than the mere possession of knowledge. He indicated that instruction at the university level should apply knowledge to problem situations within the academic discipline.

Statements are often made that students need to understand a certain amount of factual material before they can begin to consider the formulation of models or theories in their subject field. Therefore, the promotion of higher levels of thinking is often thought to be more appropriate in graduate or upper level undergraduate classes, thus allowing freshman and sophomore classes to focus on the accumulation and comprehension of basic facts and concepts.

If students in Colleges of Agriculture are to graduate and be competitive in a world in which technology is changing more and more rapidly, agricultural faculty members need to be able to provide their students the analytical skills that will enable them to solve problems, make decisions, and integrate new technology outside of the classroom.

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One of these analytical skills is that of critical thinking. To be able to evaluate and compare new technologies and developments in terms of the usefulness of their application to differing circumstances should be a mandated criteria that is included in every course taught in today's institutions of higher education. Colleges of Agriculture should not lag behind in promoting higher level thinking skills among their students. If students are expected to think at higher levels during their freshman and sophomore years in college, they will more easily synthesize and evaluate new material as well as be able to integrate thinking skills into other courses they take (Ruggiero, 1988).

The term "higher levels of thinking" as used in this article, is defined by Bloom (1956), as those higher mental processes involving application, analysis, synthesis, and evaluation of material. Knowledge and comprehension of information require no special cognitive contribution by the person engaged in the mental process, while higher levels of thinking require a much greater contribution (Rath, Wassermann, Jonas and Rothstein; 1986). Lower level thinking processes rely on memorizing declarative knowledge, while higher levels of thinking demand that information in long term memory be manipulated in some manner so as to change the form of the material to fit a stated criteria or a new problem situation.

The promotion of higher levels of thinking has been a focus in many universities across the country. The success of curriculum restructuring efforts to promote thinking skills among agricultural colleges is a subject that has not received enough attention. The quest to integrate higher levels of thinking in all colleges and universities should be the goal of every major institution.

Purpose of the Study

The primary purpose of this study was to determine the perception of agricultural college faculty in a large midwestern university about the importance of including higher level thinking skills in the course work provided to college students. College of Agricultural Science and Natural Resources (CASNR) faculty at the University of Nebraska-Lincoln were included because of the desire to obtain baseline information for use in developing an instructional improvement program in critical thinking.

Procedures

The following procedures were followed in conducting this study:

Participants: A random sample of 48 CASNR faculty at the University of Nebraska-Lincoln were included in the study. This represented 50 percent of all the faculty with at

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thorough working knowledge of specialty equipment found in their career profession. The OSU/ATI graduate should have a comprehensive understanding of their specialty area and industry and continue life-long learning and adapting into the future.

Summary

The survey of Ohio agricultural business and industry leaders and Institute advisory committee members provided direct input into the Institute's curriculum review process. Faculty awareness of the changing needs of industry was heightened. Specific business and industry priorities were made known to faculty which has been a catalyst for change. Survey results provided support for both course revision and new course development.

Literature Cited

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least a 50 percent teaching appointment in the college. The final response rate included 29 faculty members from the CASNR. Fourteen different academic departments were represented in the College of Agricultural Sciences and Natural Resources.

Survey Questionnaire: A survey questionnaire containing both a demographic section and a series of questions designed to measure faculty attitudes toward the integration of critical thinking practices in the classroom was developed. The section of the instrument specifically addressing critical thinking perceptions consisted of 27 questions broken down into two sub-scales which measured the following: (a) time spent promoting higher levels of thinking, and (b) the actual inclusion of higher levels of thinking in their teaching. Each subsection had a calculated SPSS-X Reliability Coefficient of .75 or higher.

Respondents were asked to indicate their level of agreement or disagreement on a four point, bi-polar scale. A "1" indicated the respondent strongly disagreed, a "2" indicated disagreement, a "3" indicated agreement, and a "4" indicated the respondent strongly agreed.

Findings and Discussion

It was observed that the CASNR faculty included in this study taught an average of 15.3 years at the university level. This would indicate a strong subject matter knowledge and experience base within the system and in curricular and instructional matters.

Table 1 provides information regarding the mean agreement ratings from College of Agricultural Science and Natural Resources faculty regarding integration of critical thinking skills in the curriculum.

Perception of agriculture faculty members:

Evidence of strong agreement for the need for integrating critical thinking skills in the curriculum was evident when the following responses were observed to have agreement ratings of 3.25 or greater:

- I sometimes sacrifice quantity of the material covered in class to ensure quality and understanding.
- It is more important that students solve problems than to memorize facts.
- The development of critical thinking skills is a part of the stated or unstated goals of the courses I teach.
- It is important to spend part of each class period showing the relationship of the subject under discussion to the larger whole.
- When evaluating students, I frequently require them to compare information.
- When teaching, I aim to develop students' thinking skills.

Specific findings for CASNR faculty that may have bearing on their ability to actually integrate critical thinking skills were their disagreement with the statements (2.25 or lower on the four point scale):

- I have time to rework courses to promote analytical thinking.
- There is adequate educational material in my field showing how to integrate critical thinking skills.

Table 1. Means and Standard Deviations for the Development of Higher Level Thinking in The Curriculum.

Question	Agreement Ratings
1. The ability to create models or theories is important regardless of the level of instruction	M 3.03 SD .98
2. I sometimes sacrifice the quantity of the material covered in class to ensure quality understanding	M 3.25 SD .70
3. It is more important for students to solve problems than to memorize facts	M 3.50 SD .84
4. Students are competent when they understand all the individual facts of the subject relating to the subject matter	M 2.40 SD .70
5. Students are competent when they can formulate facts into a coherent model or formula	M 3.14 SD .58
6. The development of critical thinking skills is part of the stated or unstated goals of the courses teach	M 3.55 SD .59
7. I have enough time to rework my courses to promote analytical skills in my students	M 2.00 SD .76
8. The subject matter I teach concerns itself with the understanding of specific facts	M 2.62 SD .73
9. I am familiar with the methods of promoting higher levels of thinking in students	M 2.93 SD .66
10. I primarily use the lecture method in the courses I teach	M 2.52 SD .75
11. It is important to spend part of each class period showing the relationship of the subject under discussion to a larger whole	M 3.28 SD .46
12. When evaluating students, I frequently require them to:	
a. Interpret information	M 3.24 SD .51
b. Compare information	M 3.24 SD .44
c. Define information	M 3.03 SD .68
d. Restate lecture or class material	M 2.69 SD .60
13. When teaching I aim to develop students':	
a. Social skills	M 2.00 SD .96
b. Technical skills	M 3.35 SD .55
c. Creative skills	M 3.14 SD .64
d. Thinking skills	M 3.62 SD .49
14. I require students to elaborate on the steps they took in arriving at a solution	M 2.79 SD .68
15. I frequently allow students to brainstorm for ideas instead of presenting all the facts in a lecture format	M 2.72 SD .80
16. I plan learning experiences that are appropriate to the students' current level of knowledge and skills	M 2.72 SD .80
17. I plan learning experiences that are above the current intellectual level of the students	M 2.54 SD .58
18. During examinations, students have the opportunity to guess at answers	M 2.42 SD .90
19. There is adequate educational material in my field showing how to integrate the development of critical thinking and course content	M 2.35 SD .90
20. I spend adequate time reorganizing course content to enhance the students' ability to think critically about the subject matter	M 2.28 SD .70
21. I spend adequate time reworking the curriculum to convey the changes relevant to the field	M 2.79 SD .73
22. Scale measuring time committed to facilitate higher level thinking skills among students	M 2.36 SD .59
23. Scale measuring inclusion of higher level thinking skills in teaching practices	M 3.06 SD .34

Note: M=Mean calculated from a scale where 1=strongly disagree, 2=disagree, 3=agree, and 4=strongly agree, SD = Standard Deviation.

- I spend time reorganizing course content to enhance students' ability to think critically.
- I am committed to facilitating higher level thinking skills among students.

Agriculture faculty were in general agreement with the following statements which were considered to be evidence of a possible lack of resources and commitment to actually integrating critical thinking skills in the curriculum:

- The subject matter I teach concerns itself with understanding the specific facts, and
- I primarily use the lecture method in the classes I teach.

When measuring time committed to integration of critical thinking skills, it was determined that faculty in the College of Agricultural Sciences and Natural Resources tend not to commit time to integration of critical thinking skills into the curriculum.

When measuring actual inclusion of critical thinking skills, it was determined that faculty in the Agriculture College were in agreement that some critical thinking skills should be integrated into the curriculum.

Conclusions

The following conclusions were drawn from this study:

Conclusion: It was concluded that, in general, CASNR faculty still believed in the importance of critical thinking skills instruction, as was witnessed by agreement on 14 of 29 statements on the importance of critical thinking skills. However, CASNR faculty may not be aware of the process needed to integrate critical thinking skill instruction in their curriculum because of their scientific, technical preparation rather than receiving the pedagogical skills and educational concepts needed to actually identify and integrate higher levels of thinking into the curriculum.

Conclusion: Agriculture faculty believe they have little time available to rework courses and curriculum for the enhancement of critical thinking skills, and to reorganize courses to address changes happening in their subject matter field.

Conclusion: Agriculture faculty expressed that instructional materials designed to assist them in integrating higher level thinking skills were not available to them.

Conclusion: The resources and support system needed to effectively integrate higher level thinking in the UNL College of Agricultural Sciences and Natural Resources are not in place at this time. However, such support will need to be provided before any substantial progress can be made in imbedding critical thinking into the Colleges' instructional programs.

Recommendations

Based on the conclusions to this study, the following recommendations are suggested:

1. Faculty in the College of Agricultural Sciences and Natural Resources (CASNR) should be provided assistance in reorganizing and restructuring classes, courses, and curriculum to integrate higher thinking levels into the instructional program.

2. Instructional materials should be identified and made available to CASNR faculty that will assist them in integrating higher levels of thinking into the curriculum.

3. Faculty members should be made aware of the importance of integrating higher level thinking skills at all instructional levels, including lower level undergraduate courses, upper level undergraduate courses and graduate level courses.

4. A quality in-service education program should be made available to faculty members to assist them in integrating higher level thinking content, methodology, and applications for their instructional programs.

5. Academic departments in CASNR should develop comprehensive programs to imbed critical thinking skills into all courses in their curriculum. It may be a total departmental effort that will be necessary to finally get individual faculty members committed to including quality critical thinking activities in the curriculum.

6. Partnerships between recognized "experts" in the Teachers College and faculty members in CASNR should be encouraged with the express purpose of increasing both the quality and quantity of instruction in higher order thinking skills in the agriculture curriculum.

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