An Analysis of the Teaching Competencies of Agricultural and Life Sciences Faculty

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Abstract

The teaching competencies of agricultural and life sciences faculty at the University of Florida were analyzed by comparing perceived levels of knowledge with perceived levels of relevance for specific competency areas. Faculty rated themselves as having the highest levels of knowledge of effective lecturing, clarity in teaching, graduate advising, teaching critical thinking, and creating the perfect course syllabus. Faculty rated themselves as having the lowest levels of knowledge of distance education basics, undergraduate advising, teaching large classes, cooperative learning, and better teaching through better testing. Faculty rated effective lecturing, teaching critical thinking, clarity in teaching, graduate advising, and questioning techniques as having the highest level of relevance to their teaching while competencies rated as having the lowest relevance were teaching in large classes, undergraduate advising, teaching in lab settings, distance education basics, and teaching in multicultural classrooms. Faculty rated their level of knowledge below the level of relevance for all but three items: undergraduate advising, teaching large classes, and teaching in lab settings. The greatest teaching needs were identified as the competencies of getting students engaged in learning, teaching critical thinking, effective lecturing, questioning techniques, and active learning strategies.

Introduction

Society is rapidly changing, creating challenges for the next generation that were unimaginable in the past (National Research Council, 2009). Agriculture is not isolated from these changes but rather is entwined in complicated issues such as climate change, energy, human health, and even national security. Recognizing agriculture's role, the National Research Council called for a transformation of agricultural education. In the Council's opinion, "failure to respond to the changes affecting agriculture and education will place many aspects of the nation's universities, agriculture systems, and society at risk" (National Research Council, 2009, p. 17). The Association of Public and Land-grant Universities (APLU) responded to this call for change in May of 2009 by issuing a strategic plan, Human Capacity Development: The Road to Global Competitiveness and Leadership in Food, Agriculture, Natural Resources, and Related Sciences (FANRRS), to guide university transformation. A recommendation from this strategic plan was to transform the curriculum and teaching in ways that reflect the changing needs of society. Specifically, APLU identified a need to "implement faculty development, informed by research, on cognition in the teaching/learning process" (APLU, 2009, p. 8). The need to implement research-based faculty development makes it essential to identify which teaching and learning topics are appropriate for the professional development of faculty in a college of agricultural and life sciences.

The APLU's call for faculty development in the teaching/learning process may require a change in how universities value teaching. Ernest Boyer (1990) noted an increased emphasis on faculty productivity in research and away from teaching in his landmark text Scholarship Reconsidered. However, Boyer also reported in a 1989 National Survey of Faculty by the Carnegie Foundation for the Advancement of Teaching that more than 60% of university faculty believe teaching effectiveness should be the primary criterion for promotion. Bass (1999) wrote that teaching can be done effectively or ineffectively but can always be done better. Even exemplary teachers' knowledge of effective teaching strategies is far from being fully developed (Hativa et al., 2001).

Faculty in higher education institutions are predominately hired for technical expertise (Adams, 2002; Boyer, 1990; Pals, 1988) and with little teaching experience (Adams, 2002; Austin, 2002; Pals, 1988; Wardlow and Johnson, 1999). Because of these objective ideologies, most faculty are hired into lecturer or tenure-track positions with little formal preparation for teaching, which is "… one of the most important activities of a college professor" (Bowman et al., 1996, as cited in Pals, 1988, p. 46). Rowland (1999, p. 303) contended it is an "anachronism" that those who are hired to teach in institutions of higher education are given no training to do so. Boyer (1990) argued "teaching is often viewed as a routine func-

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tion, tacked on, something almost anyone can do" (p.23).

Student evaluations of teaching have indicated even effective teachers still have room for improvement (Pals, 1988). The National Panel Report of the Association of American Colleges and Universities (AACU, 2002) reported effective university faculty are those who employ teaching practices to help all students achieve their goals. The report added that a range of teaching methods can be utilized to create powerful learning (AACU). Faculty have also recognized opportunities to improve their teaching (Pals). Given that teaching improvement ultimately falls on individual faculty, it is imperative to ascertain what faculty know about teaching. The AACU called for an analysis of the teaching needs of faculty in order to provide professional development focused on enhancing teaching and learning.

Bransford et al. (2000) postulated that practicing teachers (in this case hired lecturers and tenure-track faculty) learn about teaching through a variety of experiences. The theoretical framework for this study was supported by the idea that teachers learn through three distinct experiences: (a) their own practice, (b) interactions with other teachers, and (c) teaching enhancement programs (Bransford et al.). Higher education institutions have the most control over the offering of teaching enhancement programs.

Teachers can learn from their own practice. Bransford et al. (2000) recognized the importance of teachers' personal experience. Dewey (1938) agreed the best educational lessons are often brought upon by personal experience and while personal experience may not be guided, it does produce change over time. In more purposive teacher development approaches, like peer review of teaching programs, teachers are prompted to reflect upon their current practices and their personal perceptions of the teaching experience (Chism, 1999). However, this singular experience may not always be enough to prompt change in behaviors or practices.

Teachers can learn from interacting with other teachers. Interactions with other instructors can vary from personal conversations about pedagogy to designed peer review processes. Either way, teachers better themselves by increasing interactions with other instructors (Bransford et al., 2000). In many higher education institutions, peer mentoring programs are a step to encourage dialogue about the different roles and expectations of faculty members. Peer mentors can provide guidance and advice in the area of instruction and in more formalized programs may also include observations of teaching practices in the classroom (Bransford et al.) In the broader sense, many professional associations can focus resources specific to instruction developed from teaching experts in the discipline (Bransford et al.).

Teachers can learn from teaching enhancement programs. Teaching enhancement programs are designed with a wide range of topical areas and are primarily constructed to meet the needs of faculty from individual institutions. There are three typical approaches to teaching enhancement programs: (a) learner-centered, (b) knowledge-centered, and (c) community-centered (Bransford et al., 2000). Most teacher enhancement programs will vary strategies focused on one or all three of these approaches. Regardless, teachers may learn the fundamentals of pedagogy, traditional standards of instruction, and the basics of teaching and learning principles while engaged in these programs. One particular resource which program administrators have relied upon is Chickering and Gamson's (1987) American Association of Higher Education (AAHE) publication on Seven Principles for Good Practice in Undergraduate Education.

Chickering and Gamson (1987) provided a framework of good practice for higher education institutions. In the bulletin, they described seven principles of good practices: (a) encourages student-faculty contact, (b) encourages cooperation among students, (c) encourages active learning, (d) gives prompt feedback, (e) emphasizes time on task, (f) communicates high expectations, and (g) respects diverse talents and ways of learning. Each principle illustrates specific behaviors instructors can adopt to better the educative experience of undergraduates and one can conclude graduate students, as well. While these principles are not necessarily prescriptive they do allow for a framework to gauge instructors comfort with teaching practices.

In 1988, Pals conducted a case study to determine faculty attitudes toward teaching improvement. This study focused on faculty in the College of Agriculture at the University of Idaho and found 35% of the faculty had five or less years of teaching experience. However, the study did indicate approximately 61% of the faculty had experience as college teaching assistants but the majority (almost 70%) of the faculty stated they did not have any formal experience or training prior to their hire. Pals' study also showed a majority of respondents thought professional development on strategies for teaching, electronic media, and curriculum development, and evaluation would be beneficial. Fewer than 30% of the faculty valued content covering theory of learning, educational psychology, and adult education. Faculty most frequently reported their greatest instructional needs were using a variety of classroom teaching methods, followed by developing exams, and developing visual aids. Pals reported the overall sentiment of faculty toward teaching enhancement was positive.

Wardlow and Johnson (1999) found faculty in the College of Agricultural, Food and Life Sciences at the University of Arkansas had an average of one-quarter time (or a one course/semester equivalent) dedicated to teaching. They found faculty considered themselves "good to excellent" in traditional teaching

activities such as "lecture, demonstration, preparing teaching materials, and motivating students" (Wardlow and Johnson, 1999, p. 53). However, lower scores were reported in the less traditional areas of "alternative teaching activities, using cooperative learning and case studies, and faculty peer observation" (Wardlow and Johnson, 1999, p. 53). Faculty reported a desire to learn more about "motivating students, encouraging critical thinking, using alternative teaching methods, and evaluating teaching and learning" (Wardlow and Johnson, 1999, p. 54). Lower interest levels were shown in the areas of lecture and demonstration.

One interesting conclusion drawn by Wardlow and Johnson (1999) was that self-perceived proficiency could not be used as an indicator of interest. They concluded there is a need for in-service training which focuses on felt need areas. Additionally, Wardlow and Johnson described a need for opportunities to be provided in teaching development for graduate students aspiring to be faculty. Finally, Wardlow and Johnson recommended selecting content for teaching enhancement programs focused specifically on "motivating students, encouraging critical thinking, using interactive technology in teaching, techniques to improve student reading and writing, alternat[ive] teaching methods, evaluating teaching, and evaluating student learning" (p. 55).

Since Wardlow and Johnson conducted their study in 1999, college of agriculture academic programs have grown in number, thus expanding opportunities and needs for college level educators to engage in professional development in the area of teaching and instruction. Additionally, there have also been significant changes in the educational technologies available to instructors since 1999. Given this scenario, continued assessment of faculty needs is imperative to the planning and development of teaching enhancement programs at higher education institutions which can lead to a transformation of agricultural education (National Research Council, 2009) through advances in curriculum and teaching (APLU, 2009).

Purpose and Objectives

The findings presented in this article are part of a larger study undertaken to understand the professional development needs of faculty in the College of Agricultural and Life sciences (CALS) at the University of Florida. Specifically, the objectives were to:

1. Describe CALS faculty's perceived levels of knowledge for selected teaching competencies.
2. Describe the perceived levels of relevance assigned by CALS faculty to selected teaching competencies, and
3. Compare knowledge and relevance levels for each teaching topic to determine training needs for CALS faculty.

Methods

This component of the quantitative study was descriptive in design. A census of teaching faculty within the College of Agricultural and Life sciences (CALS) at the University of Florida was conducted. CALS includes seventeen social and physical science departments such as agricultural education, community sciences, horticultural sciences, and wildlife ecology. CALS faculty are located at the primary campus, satellite campuses, and research centers throughout the state. Participants were identified from a list provided by the office of the Dean. There were 522 faculty with a formal teaching appointment.

An online questionnaire hosted by SurveyMonkey was used for data collection. The comprehensive instrument included three sections: (a) teaching competencies, (b) respondent preferences towards delivery of professional development activities, and (c) respondent background and demographic information. The findings in this study are based on responses from the first section of the questionnaire.

The Borich (1980) model of needs assessment was used to measure participants' perceptions of 23 teaching competencies. The 23 teaching competencies were identified through an analysis and synthesis of unpublished instruments used previously by the Teaching Resource Center at the University of Florida (n.d.) using a constant–comparative method (Glaser and Strauss, 1967). Participants used a five-point scale (1 = Low Knowledge/Relevance; 5 = High Knowledge/Relevance) to rate their level of current knowledge for each competency and the degree to which the competency was or was not relevant to their job. Previous research (e.g., Edwards and Briers, 1999) supported the use of a Borich model to study teaching competencies. This study is limited by the use of self-reported levels of knowledge.

An initial draft of the instrument was developed and distributed to an expert panel of educators not directly affiliated with this project to check for content and face validity. Based on feedback from the panel, several items were modified. A second version of the instrument was sent back to the panel and was approved with no changes. The researchers believed the 23 scaled items were independent concepts and thus decided reliability analysis using internal consistency would be inappropriate. Thus, a test-retest procedure was used which yielded an overall coefficient of stability of .84.

Data were collected using the Tailored Design Method (Dillman et al., 2009). A personalized pre-notice was sent by e-mail in January 2009. A notice was e-mailed two days after the pre-notice; two reminders to non-respondents were e-mailed at one week intervals. The accessible population was reduced from 522 to 489 possible participants due to invalid e-mail addresses (n = 7) and the self-exclusion of possible participants (n = 26) who had permanently opted out of Survey Monkey in the past. Nineteen participants opted out of this study. A final

response rate of 46.80% (n = 220) was achieved. There were 32 responses removed due to missing or incomplete data, reducing the number of usable responses to 188.

Non-response error was addressed by comparing respondents to the population on known demographic characteristics using the chi-square test. A significant difference ($p < .01$) existed for the characteristic of "professorial rank." Therefore, it is inappropriate to generalize the results of this study beyond the respondents (Miller and Smith, 1983). Significantly fewer professors responded than would have been expected based on their proportion in the population. The disproportionately low response from professors may have been due to the negative effect of tenured status on participation in professional development (Caffarella and Zinn, 1999).

Data were analyzed using descriptive statistics and the ranking procedure described by Edwards and Briers (1999). A discrepancy score was obtained for each participant by subtracting his/her perceived level of knowledge from the perceived level of relevance for a specific teaching competency. Each discrepancy score was then multiplied by the mean importance level for that topic, resulting in a weighted discrepancy score for each participant. The weighted discrepancy scores were summed and divided by the total number of usable observations to yield a mean weighted discrepancy score for the competency. Using this process, mean weighted discrepancy scores could range from 20 to -20. Positive scores indicate a need for professional development. The mean weighted discrepancy scores for all the competencies were ranked to determine the priorities of professional development needs for CALS teaching faculty.

Results and Discussion

The first objective was to describe CALS faculty's perceived levels of knowledge for selected teaching competencies. The second objective was to describe the perceived levels of relevance assigned by CALS faculty to selected teaching competencies. The findings for both objectives are presented jointly in Table 1.

Table 1. Competency Ratings: Perceived Levels of Knowledge and Relevance

	Knowledge		Relevance	
Competency	*M*	*SD*	*M*	*SD*
Effective lecturing	3.64	.97	4.17	1.10
Clarity in teaching	3.56	1.03	4.02	1.24
Graduate advising	3.50	1.04	4.02	1.23
Teaching critical thinking	3.41	1.04	4.05	1.22
Creating the perfect course syllabus	3.33	1.21	3.36	1.38
Using student evaluations to improve teaching	3.31	1.25	3.43	1.41
Using technology in teaching	3.27	1.11	3.54	1.31
Questioning techniques	3.26	1.04	3.83	1.24
Effective teaching fundamentals	3.20	1.05	3.74	1.36
Peer evaluation	3.17	1.17	3.29	1.34
Learning styles of students and faculty	3.13	1.05	3.62	1.27
Academic dishonesty	3.10	1.16	3.50	1.27
Active learning strategies	3.10	1.10	3.68	1.32
Getting students engaged in learning	3.10	1.02	3.79	1.31
Teaching in lab settings	2.92	1.36	2.75	1.67
Teaching in multicultural classrooms	2.86	1.21	2.99	1.45
Using Web-based technologies for managing courses	2.84	1.29	3.28	1.41
Better teaching through better testing	2.81	1.11	3.37	1.45
Cooperative learning	2.80	1.09	3.21	1.39
Teaching large classes	2.66	1.19	2.55	1.58
Undergraduate advising	2.58	1.32	2.58	1.31
Distance education basics	2.29	1.28	2.78	1.63

Note. Scale: 1 = *Low*; 5 = *High*.

Faculty perceived themselves to be moderately knowledgeable about all the selected teaching competencies. They were most knowledgeable about "Effective lecturing" (M = 3.64, SD = .97). Faculty were least knowledgeable about "Distance education basics" (M = 2.29, SD = 1.28).

Faculty perceived four competencies to have high levels of relevance, while the remaining competencies were moderately relevant. The highly relevant competencies were "Effective lecturing" (M = 4.17, SD = 1.10), "Teaching critical thinking" (M = 4.05, SD = 1.22), "Clarity in teaching" (M = 4.02, SD = 1.24), and "Graduate advising" (M = 4.02, SD = 1.23). Faculty perceived "Teaching large classes" (M = 2.55, SD = 1.58) and "Undergraduate advising" (M = 2.58, SD = 1.31) to be the least relevant competencies.

Mean weighted discrepancy scores (MWDS) were calculated for each of the competencies for the third objective. A positive MWDS indicates training is needed while a negative MWDS indicates no training is necessary. The range of possible MWDS scores was -25 to 25.

Table 2. MWDS for Selected Teaching Competencies

Competency	MWDS
Getting students engaged in learning	2.70
Teaching critical thinking	2.60
Effective lecturing	2.20
Questioning techniques	2.19
Active learning strategies	2.14
Graduate advising	2.09
Effective teaching fundamentals	2.08
Better teaching through better testing	1.90
Learning styles of students and faculty	1.80
Clarity in teaching	1.78
Academic dishonesty	1.42
Using Web-based technologies for managing courses	1.39
Distance education basics	1.37
Cooperative learning	1.31
Using experiential learning	1.15
Using technology in teaching	.91
Using student evaluations to improve teaching	.47
Teaching in multicultural classrooms	.44
Peer evaluation	.43
Creating the perfect course syllabus	.09
Undergraduate advising	.00
Teaching large classes	-.29
Teaching in lab settings	-.46

The MWDS for the selected teaching competencies are presented in Table 2. Positive MWDS were obtained for twenty competencies. The highest MWDS were for "Getting students engaged in learning" (MWDS = 2.70) and "Teaching critical thinking" (MWDS = 2.60). The three competencies with negative MWDS were: "Undergraduate advising" (MWDS = .00), "Teaching large classes" (MWDS = -.29) and "Teaching in lab settings" (MWDS = -.46).

Using the research objectives as a guide, the following conclusions were drawn from the findings. The competency areas in which faculty rated themselves as having the highest levels of knowledge were effective lecturing, clarity in teaching, graduate advising, teaching critical thinking, and creating the perfect course syllabus. The competency areas in which faculty rated themselves as having the lowest levels of knowledge were distance education basics, undergraduate advising, teaching large classes, cooperative learning, and better teaching through better testing.

Faculty in this study rated the following competency areas as having the highest relevance to their teaching: effective lecturing, teaching critical thinking, clarity in teaching, graduate advising, and questioning techniques. The competencies which were rated as having the lowest relevance were teaching in large classes, undergraduate advising, teaching in lab settings, distance education basics, and teaching in multicultural classrooms.

Faculty rated their level of knowledge below the level of relevance for all but three items: undergraduate advising, teaching large classes, and teaching in lab settings. The largest mean weighted discrepancy scores (MWDS) were found for the competencies of getting students engaged in learning, teaching critical thinking, effective lecturing, questioning techniques, and active learning strategies.

Interestingly, the five topics with the largest MWDS are somewhat connected. Engaging students can occur through effective lecturing, good questioning techniques, and using active learning strategies. All these things together have the potential to develop student critical thinking abilities. Although engaging students had the highest MWDS, perhaps subconsciously faculty realize that effective lecturing, good questioning, and active learning are strategies that will engage learners.

Mentoring graduate students was very relevant to faculty, whereas advising undergraduate students was not. This likely implies that many faculty work extensively with graduate students, but do not advise undergraduate students. This is consistent with the work of Myers and Dyer (2005), who reported faculty value advising graduate students more than they value advising undergraduate students.

Interestingly faculty rated their knowledge of effective lecturing as high, while rating their knowledge of teaching large classes as low. This would imply faculty recognize teaching a large class is more comprehensive than just delivering effective lectures. The majority of faculty reported teaching large classes was not relevant to their job. It would be worthwhile to conduct follow-up research using naturalistic methods with faculty who teach large classes to gain a better understanding of the intricacies related to teaching large classes.

The least relevant topics were teaching in lab settings, distance education basics, and teaching in multicultural classrooms. This stands in direct contradiction to APLU (2009) strategic plan that: (a) identified a need for involving undergraduates in authentic research, (b) increased distance education, and (c) noted that the demographic makeup of students in colleges of food and agricultural sciences is not representative of the general population. An

examination of the course catalog revealed a plethora of lab classes are offered throughout CALS. Perhaps laboratory instruction is primarily the responsibility of graduate students. It would be valuable to conduct a follow-up study to determine who is teaching laboratory classes and what their specific needs are for professional development, particularly if they are graduate students. CALS also delivers a substantial number of distance education courses. If "distance education basics" has low relevance, then who is teaching the distance education courses? Perhaps only a small number of faculty teach distance education courses. If this is the case, then these faculty may have very specific professional development needs that were not revealed in an assessment of the whole faculty. The irrelevance of "teaching in a multicultural classroom" is worth mentioning. Perhaps classes in CALS are culturally homogeneous or possibly CALS faculty do not perceive teaching a class of diverse learners requires specific strategies. A follow-up investigation would be valuable in examining this issue.

Examining the findings of this study holistically provides an interesting observation. As noted earlier, the possible range for MWDS was from 25 to -25. The observed MWDS ranged from 2.70 (getting students engaged in learning) to -.46 (teaching in lab settings). This would imply that as a whole, CALS faculty perceive themselves as relatively competent in their current roles as teachers. It is important to note these results were based on aggregated data for all CALS faculty. It would be interesting to see if there were differences between faculty based on experience, percentage teaching appointment, and other categorical variables. Further research is recommended to examine this question. If differences are found, professional development could be tailored to meet the needs of specific groups of faculty.

Additionally, given the call for a transformation of education in agriculture (APLU, 2009; National Research Council, 2009), the expectations of CALS faculty for effective teaching that meets the needs of tomorrow's students in a changing world may be substantially different than today's expectations. This study should be replicated periodically to see how needs change, particularly if a major curricular change is implemented.

Finally, all the findings from this study apply to the agricultural and life sciences faculty at the University of Florida. It would be beneficial to replicate this study in colleges of agricultural and life sciences of differing sizes throughout the United States, and perhaps beyond. How do faculty at the University of Florida compare with their colleagues? Could professional development activities be created and delivered at a national level? If national trends emerge, could (or should) the academe encourage integrating teaching and learning competencies in to doctoral programs of all agricultural and life science disciplines?

Summary

Based on the conclusions in this study, it is recommended that professional development activities be developed and delivered to address: (a) getting students engaged in learning, (b) teaching critical thinking, (c) effective lecturing, (d) questioning techniques, and (e) active learning strategies. These activities could be developed as a cohesive series, or as independent workshops. This needs assessment should be periodically replicated to see if faculty needs change, possibly due to the professional development activities or other factors.

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