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Contents

Explaining Student Performance in an Undergraduate Agricultural Economics Classroom

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Abstract

Large service courses have become commonplace at land-grant universities. These courses present unique challenges for advisors and instructors. Students possess a wide range of academic abilities, experience with coursework, and other factors that affect their performance; the disparity between strong- and weak-performing students is often pronounced in traditional agriculture-related programs. Predicting student performance a priori can aid advisor decisions and instructor course design, ultimately improving student success rates. The objective of this study is to evaluate the use of registrar data to predict student performance in a large, agriculture-related service course. We use registrar data for 307 students enrolled in Farm and Agribusiness Management over four semesters at Oklahoma State University to parameterize models that predict course performance. Cumulative university grade point average (GPA), major, gender, and performance in prerequisites are significant predictors of student performance, while race, residency status, transfer status, and high school GPA are not. We find significant interaction effects between gender and major, ACT math score, and cumulative GPA; between major and university GPA, grade in agricultural economics prerequisite, and grade in math prerequisite; and between university GPA and prerequisites. University GPA dominates the effects, but agricultural economics students outperform other majors, and grades in the prerequisites notably influence student performance.

Introduction

Student success and performance continues to be a growing concern within American higher education (Seidman, 2005), with implications for the strength and viability of the American Economy (U.S. Department of Education, 2006; Kuh, 2006; Kuh et al., 2007). As academic units struggle to provide consistent course offerings with fewer teaching resources, class sizes have grown tremendously. The high costs associated with low student success rates make prediction of student success important to the admissions and advising process (Glennen et al., 1996). In this context, it is increasingly important for advisors and instructors to identify student needs and abilities before encountering problems to reduce the frequency of course retakes, improve the learning environment for student peers, reduce the demand on instructors' time, and generally alleviate problems that arise when students are not prepared for coursework.

Students arrive at college with vastly different levels of proficiency and preparedness for coursework. The problem is typically pronounced in land-grant universities and for departments that teach traditional agricultural courses (e.g., agricultural economics, animal science, and agricultural education) that often attract poorer and less-well-educated students from rural areas. Students in these degree programs take several multidisciplinary service courses, which usually have very large class rolls. The effect of class size may be even more evident in service courses with a diverse mix of students from various majors, backgrounds, and preparedness for the coursework. The problem manifests in bi-modal grade distributions and large variances in student performance within the same course, which complicate course design, instruction, and advising.

Farm and Agribusiness Management (FAM) is a traditional undergraduate service course that is rooted in economics, but also integrates knowledge and principles from agronomy, animal science, and other agriculture-related majors. In courses with much smaller enrollment, student diversity might lead to a fuller understanding of the material through direct student participation and group exercises. However, the typically large enrollment in FAM encourages a more streamlined approach to instruction and evaluation, including multiple-choice exam questions, PowerPoint lectures, and relatively little time allocated to the individual needs of each student. This teaching style may not fit well with some students' preferred learning styles.

Instructors and administrators are concerned with student success as an important measure of learning and instructor/unit effectiveness (Barkley and Forst, 2004), and administrators are concerned with the high costs associated with poor student retention (U.S. Department of Education, 2006; Kuh et al., 2007; Dyer et al., 1996; Glennen et al., 1996). Consistently poor student performance has negative implications on unit teaching budgets and instructor promotion/retention. To prevent unnecessary waste

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of scarce resources (e.g., instructors' time and classroom space), it is imperative that advisors and instructors correctly predict student success prior to enrollment to improve student success rates in large service courses.

Predictors of Student Performance

Student performance can be difficult to predict given the complex interaction of socioeconomic characteristics, experiences, cognitive abilities, personality, learning style, and other factors. Researchers have applied a wide variety of approaches to this problem by examining factors such as student social networks and sociological, organizational, psychological, cultural, and economic perspectives (Kuh, 2006), or differences in learning styles (e.g., Cano 1999; Rudd et al., 2000). These studies report results that are valuable to understanding conceptual student motivations, but may be methodologically difficult to apply in the individual classroom. However, student information is readily available from university registrar offices, including grades from previous coursework, high school grade point average (GPA), scores from standardized aptitude tests, and basic demographic information. According to prior studies, this type of background data often possesses significant explanatory power when predicting student performance.

Registrar Data

Numerous studies have confirmed that prior academic achievement as measured by GPA is a statistically significant factor in explaining student success in the classroom (Aleamoni, 1977; Martin, 1989; Barkley and Forst, 2004; Nolan and Ahmadi, 2007). For example, cumulative GPA has been found to be a significant factor in classroom performance in undergraduate agricultural economics courses at Purdue University, Washington State University, University of Idaho, and Ohio State University (Martin 1989; Devadoss and Foltz, 1996). Standardized test scores (e.g., SAT and ACT) are also significant predictors of coursework performance. SAT performance, particularly on the mathematics section, is a significant predictor of success in economics coursework (Ballard and Johnson, 2004). However, standardized tests typically provide less explanatory power of classroom performance than high school grades (Astin, 1971; Weitzman, 1982; Barkley and Forst, 2004; Baron and Norman, 1992). Also, SAT performance as a predictor may be overstated when considering the high correlation between socioeconomic characteristics and SAT scores (Rothstein, 2004). As a determinant of academic performance, standardized tests are weakened by gender and racial bias, including the potential for students to be "coached" into higher scores (Crouse and Trusheim, 1991).

Studies on the effects of gender and age on student success report mixed results, depending on course content (e.g., Anderson et al., 1994; Bridges and Casavant, 2002; Zoglmann et al., 2004). Females typically score slightly higher in reading-based courses, whereas males tend to perform better in science and mathematics (Van Harlingen, 1995) and economics courses (Jensen and Owen, 2001; Ballard and Johnson, 2004). In the context of agriculture, however, gender has typically been found to be insignificant in determining academic performance (Devadoss and Foltz, 1996; Barkely and Forst, 2004), although instructor gender biases and instructor-student interactions likely play a critical role in determining student performance (Lipe, 1989; Mutchler et al., 1987). Age has received relatively less attention in the literature. Some studies have found that younger students tend to perform significantly better than older students (Astin, 1971; Dockweiler and Willis, 1984; Koh and Koh, 1999), whereas other studies report no effect of age on performance (Bartlett et al., 1993; Devadoss and Foltz, 1996; Barkley and Forst, 2004).

Studies on the effects of academic major and prior coursework related to the major on student success also report mixed results. Astin (1971) and Barkley and Forst (2004) find that academic major explains a statistically significant amount of variation in classroom performance. Likewise, Mousel et al. (2006) find that major, class (e.g., sophomore), and experience with rural life (e.g., farming) are statistically significant predictors of student performance in an introductory forage crops management course. Nolan and Ahmadi (2007) look at first-year student success in agricultural economics coursework in Australia from 1991 to 2004, and find that both major and grades in related prior coursework are statistically significant predictors of student marks. Martin et al. (2006) find that prior science coursework is the only statistically significant predictor of student success in an introductory animal behavior course, while 22 other variables have very little effect. However, other studies find little evidence of a significant relationship between student performance and either prior coursework or academic major. Martin (1989) uses student success in prerequisites as a predictor of overall student success in an agricultural price analysis course and finds that most prerequisites (all, except for calculus) have no statistically significant impacts. Likewise, Davis et al. (2006) find that prior coursework (e.g. high school chemistry) is not a significant indicator of student performance, but academic major is a significant indicator, as is SAT score, high school rank, and gender.

In summary, prior research finds that while student success can be explained empirically, the factors which formulate into success appear to vary widely from one setting to the next. Hence, the purpose of this paper is to add to this body of literature by investigating factors that explain academic performance in a large undergraduate service course,

Farm and Agribusiness Management (FAM), at Oklahoma State University. In particular, we evaluate the usefulness of registrar data for predicting academic performance since such data is generally available to academic advisors and course instructors, precluding the need to administer surveys. In the following sections, we present an empirical model of student performance in FAM as a function of registrar data, report and interpret the results of the model, and discuss implications of the results for educators.

Methods

We model student performance in AGEC 3423 "Farm and Agribusiness Management" at Oklahoma State University as a function of data available through the university's registrar:

Student performance = f (Grade point averages, Grades in prerequisites, ACT scores, Major, Transfer, Residency, Gender, Race, Age, and Semester).

We employ two empirical, multiple regression models and used generally-accepted statistical techniques to empirically test the conceptual model and provide estimates of the impact of individual factors on student performance. Model 1 includes only main effects terms:

$$GRADE = \beta_0 + \beta_1 GPA\_OSU + \beta_2 GPA\_HS + \beta_3 ACT\_MATH + \beta_4 ACT\_ENG + \beta_5 TRANSFER + \beta_6 GENDER + \beta_7 RACE + \beta_8 AGE + \beta_9 STATE + \beta_{10} AGEC1114 + \beta_{11} MATH + \beta_{12} MAJOR + \varepsilon$$

where GRADE is the student's final grade (continuous variable) in FAM. GPA_OSU is the student's university-wide cumulative GPA in the semester prior to when the class was taken (continuous), GPA_HS is their high school cumulative GPA (continuous), ACT_MATH is the student's math ACT score (continuous), ACT_ENG is the student's ACT score in English (continuous), TRANSFER indicates whether the student transferred into OSU from another school (1 if transfer), GENDER is student's gender (1 if female), RACE is the student's race (1 if non-white), AGE indicates whether the student's age is <22 years old (1 if <22 years old), STATE captures whether the student was an in-state resident when they took the course (1 if in-state), AGEC1114 is the student's letter grade in the economics prerequisite (class of indicator variables), MATH is the student's letter grade in the math prerequisite (class of indicator variables), and MAJOR is the student's major when they took FAM (class of indicator variables). To account for possible minor differences in students grades across the semesters, we include a semester dummy variable.

Model 2 includes the terms from Model 1, plus interactions between several variables: (1) gender interacted with major, ACT math score, and GPA; (2) major interacted with GPA and grades from the two pre-requisites; and (3) GPA interacted with grades in the pre-requisites. This results in the following additional set of terms that are added to Equation 1:

$$\alpha_1 GENDER * MAJOR + \alpha_2 GENDER * ACT_{MATH} + \alpha_3 GENDER * GPA + \alpha_4 MAJOR * MATH + \alpha_5 MAJOR * AGEC1114 + \alpha_6 MAJOR * MATH + \alpha_7 MAJOR * AGEC1114$$

The model was solved using SAS 9.1 statistical software (SAS Institute, 2002). Since many of the explanatory variables were fixed effects, the model was solved as a generalized model with both continuous and fixed effect variables using PROC GLM.

Data

Student classroom performance in FAM was evaluated for four semesters between fall 2006 and spring 2008. A total of 307 students were included in the analysis (Table 1). The course met three times a week in a traditional lecture setting with a single section that contained an average of 87 students over the four semesters analyzed. Course lectures primarily covered the fundamentals of farm and agribusiness management. This required students to be well versed in various topics from their prerequisite courses in microeconomics (AGEC 1114) and elementary calculus (MATH 1483). The course also contained lectures on the agribusiness industry that are more qualitative in nature. The same instructor, the lead author, taught the course in each of the four semesters analyzed. Student grades in FAM were obtained from the instructor. Grades were on a scale of 0-100, with an average of 82.4 points and a standard deviation of 11.6 points (Table 1).

The remaining data used in the analysis were obtained from the Oklahoma State University's Office of the Registrar. Gender and race variables are included in the empirical models. Over the four semesters, there were slightly more females in the class, who comprised 57.9% of the class Most of the FAM students were classified as White, 86.6%, with the remaining 13.4% split among Native American, African American, and Hispanic students. Student age was categorized into two groups, depending on whether the student was over/under the age of 22. Over the four semesters analyzed, 87.9% of the students were under 22 years of age.

FAM is a traditional subject that integrates concepts from several disciplines and has a significant mixture of major and non-major students. A majority (52.5%) of the students in FAM over the four semesters were agricultural economics majors, but a large percentage (38.7%) were animal science majors. Only 8.8% were neither agricultural economics nor animal science majors (e.g., horticulture, agricultural education, agronomy).

The ACT math and ACT English scores are included in the model using reported scores from the student's high school transcript. Where ACT scores are not available, we use SAT scores to ACT-equivalents. Students enrolled in FAM scored, on average, slightly higher on the ACT math than on English. The average value ACT math score was 21.69, a quarter-point higher than English.

All FAM students are required to complete AGEC1114 "Introduction to Agricultural Economics" and a math prerequisite. AGEC1114 reviews fundamental concepts of economic analysis that are applied

Table 1. Description of Explanatory Variables (N=307 students)

Continuous Variables	*Level*	*Mean*	*Std. Dev.*
Final Grade	0-100	82.4	11.6
GPA (Univ,. cum.)	0-4.0	2.96	0.59
GPA (High Sch, cum.)	0-4.0	3.52	0.61
English (ACT)	0-32	21.44	4.50
Math (ACT)	0-32	21.69	3.83
Category Variables	*Class*	*Count*	*% Frequency*
Gender	Female	178	57.9
	Male	129	42.1
Race	White	266	86.6
	Other	41	13.4
Transfer student	No	77	25.1
	Yes	230	74.9
Age	? 22 years	270	87.9
	> 22 years	37	12.1
In-state resident	Oklahoma	261	85.0
	Out-of-state	46	15.0
Major	Ag. Econ.	161	52.5
	Animal Sci.	119	38.7
	Other[z]	27	8.80
AGEC 1114 grade	A	58	18.8
	B	83	27.0
	C	70	22.8
	D or F	13	4.2
	Not taken	34	11.1
	Taken Elsewhere	49	15.9
Math prereq. grade	A	44	16.9
	B	26	10.0
	C	30	11.5
	D or F	20	7.7
	Not taken	74	28.4
	TE	67	25.7
	Tested Out	46	17.6

[z] Includes horticulture, agricultural education, agronomy, etc.

in FAM. The math prerequisite may be met by a number of math courses, including MATH 1583 "College Algebra" and MATH 1483 "Math Functions." These prerequisites teach math skills and economic principles that are used in FAM, including linear algebra, elementary calculus, and the theory of the firm. We recorded students' letter grades in the prerequisites.

Results and Discussion

Two alternative ANOVA models were evaluated to explore model fit and the presence of significant interactions among variables (Table 2). The use of interaction terms in Model 2 allow us to test the significance of effects across variables, e.g. whether grades in a perquisite course such as AGEC1114 had a different effect on male students compared to females. This method was preferred given our objective to investigate academic performance across the diverse mixture of students in FAM.

Both ANOVA models perform well and are statistically significant at the 99% level of confidence (Table 2). Model 1 explains 42% of the variation around the sample mean of class performance ($R^2=0.42$), which is a satisfactory fit for cross-sectional data (Boyer and Hickman, 2007). Adding interaction terms greatly improves model fit. Model 2 explains 57% of the variation ($R^2=0.57$). The remaining variability in classroom performance is likely explained by other factors that were not included in the data, such as study time, effort, preferred learning style, personality characteristics, and teaching style (Martin, 1989).

We report the results of both models in Table 2. In the following section, we discuss the statistically significant parameter estimates from Model 2, which has much better predictive ability than Model 1. The effect of state residency, transfer status, race, age, and high school GPA are not significant in either model ($P>0.05$) and are not discussed further.

GPA

University GPA is the most significant factor explaining classroom performance in FAM, which is consistent with previous research discussed above (Table 2). The effect of university GPA on a typical student's grade is 9.28 points *($P<0.001$)*. [Parameter estimates for the ANOVA models are not reported in the text due to space limitations. The estimates are available from the authors upon request.] This means that a difference of one letter grade (1.0 point) on a typical student's university GPA is worth 9.28 additional points in FAM which would raise the student's grade by nearly one letter in the class. This result is noteworthy since it predicts nearly a one-to-

Table 2. ANOVA Results for FAM Class Performance Models

	Model 1		Model 2	
Factor	*F Stat.*	*P Value*	*F Stat.*	*P Value*
GPA (Cum. OSU)	44.49	<0.0001***	0.02	0.8797 NS
GPA (High sch.)	1.19	0.2771 NS	1.35	0.2457 NS
English (ACT)	0.18	0.6688 NS	0.15	0.6985 NS
Math (ACT)	2.31	0.1296 NS	0.15	0.6945 NS
Major	4.45	0.0125*	6.72	0.0015**
Gender	0.03	0.8721 NS	0.80	0.3709 NS
Race	0.20	0.6518 NS	0.20	0.6518 NS
Transfer	0.32	0.5728 NS	2.08	0.1507 NS
Age	3.37	0.0565 NS	2.09	0.1500 NS
In-state resident	1.95	0.1641 NS	2.66	0.1045 NS
AGEC1114 grade	0.65	0.6631 NS	2.96	0.0130*
Math prereq. grade	0.18	0.9818 NS	2.01	0.0645 NS
*Gender*Major*	-	-	6.23	0.0023**
*Gender*Math (ACT)*	-	-	7.05	0.0085**
*Gender*GPA (OSU)*	-	-	1.54	0.2163 NS
*Major*GPA (OSU)*	-	-	8.650	0.0002***
*Major*AGEC1114 grade*	-	-	2.25	0.0198*
*Major*Math prereq. grade*	-	-	1.12	0.3448 NS
*GPA*AGEC1114 grade*	-	-	2.83	0.0169*
*GPA*Math prereq. grade*	-	-	2.29	0.0358*
Model	8.20	<0.0001***	4.80	<0.0001***
R^2	0.422	-	0.569	-

NS Not significant, * Significant at $P<0.05$, ** Significant at $P<0.01$
*** Significant at $P<0.001$, Using F-statistics

one correspondence between university GPA and classroom performance. High school GPA, however, does not have a significant effect on classroom performance *(P=0.277)*. It appears that this indicator of prior achievement is too obsolete, or perhaps is tainted by differences in high school academic standards that make it difficult to assess cross-sectional comparisons.

Major

Academic major has a significant effect on classroom performance *(P<0.05)*. Students majoring in agricultural economics perform better than both animal science and other students in the class (Table 2). According to Model 2, a typical agricultural economics student performs 3.8 points *(P=0.06)* higher than a typical student from animal science or other disciplines. Martin (1989) finds a similar effect of academic major in an agricultural economics price analysis class in which agricultural economics students perform better than students from other majors.

We also find a significant interaction effect between university GPA and major on performance in FAM *(P<0.001)*. The impact of university GPA on FAM final grade is strongly influenced by major. For a typical agricultural economics student, each GPA point is worth an additional 7.0 points *(P<0.001)* above the overall mean grade in FAM. For animal science majors, each GPA point is worth 5.4 additional points in FAM, and for non-major students a GPA point is worth only 5.3 points *(P<0.001)*. All else being equal, students with different majors but identical university GPA score differently in FAM, and agricultural economics majors perform 1.6 points better on average than non-majors.

In Table 3, we report the impact of prerequisites on students' final grades in FAM, given their major and university GPA. The effect of major is most apparent among the better students with an overall GPA in the A range (3.5 to 4.0). Here, agricultural economics students outperform animal science students by an average of six points, and students from other disciplines by seven points. Academic major among students with university GPA in the B and C ranges has less effect (Table 3). Agricultural economics students with a B average perform three points better than animal science students with similar GPA and four points better than students from other majors. These findings are noteworthy since the effect of major might be expected to diminish among students with high GPA, but apparently even the better students from other majors find taking a course from outside their field of study challenging.

Table 3. Performance in FAM Based on the Interaction between College GPA and Academic Major from Model 2

	Academic Major			
College GPA	*Ag. Econ.*	*Animal Sci.*	*Other*	*Overall*
A (3.5-4.0)	93	87	86	91
B (2.5-3.5)	85	82	81	83
C (2.0-2.5)	75	72	77	74
D (?2.0)	67	-	-	67
Overall	85	80	81	82

Gender

Gender has a significant effect on class performance, but only when it is included as an interaction with academic major *(P<0.001)* and Math ACT *(P<0.001)*. The Gender-Major interaction is particularly interesting. On average, male animal science students perform significantly lower in the class than male agricultural economics students. However, female animal science students outperform female agricultural economics students by 5.1 points *(P<0.01)*, and outperform male animal science students by 9.3 points *(P<0.01)*. The effect of Math ACT score in its interaction with gender is significantly stronger for males than females. For females, higher Math ACT scores actually lead to worse results in FAM *(P=0.009)*, with each additional point on the Math ACT leading to a 0.95 point drop in the FAM final grade compared to male students. The interaction between gender and university GPA is not significant *(P=0.216)*. This implies that all else equal, students' past academic performance at OSU does not depend on gender, and both females and males are expected to perform the same based on their university GPA.

Prerequisites

As expected, prerequisite courses in economics and math are both significant indicators of classroom performance in FAM. The economics prerequisite, AGEC1114, has significant interaction effects with both university GPA *(P=0.02)* and academic major *(P=0.02)* (Table 2). In Table 4, we report two-interaction effects between prerequisite courses, academic major, and university GPA using the ANOVA model results. Interestingly, if a student earns an A grade in AGEC1114, then university GPA has virtually no impact, since the student is expected to receive an A in FAM whether their university GPA is an A or B. No students in our data set earned an A grade in AGEC1114 and had university GPA of C or lower. For students entering the class with a B from AGEC 1114, the effect of university GPA corresponds directly with their expected grade in FAM. Students with a university GPA of A would on average be expected to receive an A in FAM, B students would be expected to receive a B, and likewise C students a C. For students with a C in AGEC1114, their expected grade is either a low B or a C in FAM, and students with a D in AGEC1114 are expected to perform at the C-D borderline in FAM (Table 4).

The interaction between academic major and grade in AGEC1114 reveals that students majoring in agricultural economics are expected to perform significantly better than non-majors given their AGEC1114 grade (Table 4). The effect is particularly strong for students who earn an A in AGEC1114, where agricultural economics students are expected to outperform non-majors by 6.3 points. For students with either a B or C in AGEC1114, two findings emerge. Animal science students under perform agricultural economics students as well as students from other majors by about two points whether they receive a B or C in AGEC1114. In addition, no significant difference is shown in the performance between agricultural economics students and students from other non-animal science majors, with both expected to receive a grade of either an 85 (B in AGEC1114) or 80 (C in AGEC 1114).

The results suggest that agricultural economics students are better able to make use of the prerequisite course than animal science students. This is likely a combination of agricultural economics students retaining more of their knowledge and skills acquired in AGEC1114 and their ability to apply such prior knowledge in a new setting. Possibly, agricultural economics students have a greater intuition for economics than non-major students, or that non-majors are less motivated to perform in non-major coursework.

Prerequisite math coursework has an effect similar to AGEC1114 on performance in FAM (Table 4). A student's grade in prerequisite math is a solid indicator of performance when combined with their university GPA. An A in math indicates that the student should perform well in FAM, with an expected grade no lower than 83.1 for students with a GPA of C. Students with a GPA of either A or B would be in the upper B range in FAM, with expected grades of 89.3 and 87.5, respectively. Students with a B in math also perform well in the class, obtaining a grade more or less commensurate with their GPA. There is some concern for students with a C in math, who under perform in FAM by almost a full letter grade. Students with a GPA of B would be expected to receive only an 80.6 in farm and agribusiness management, and a C math student would receive a 72.2.

Table 4. Performance Based on Major, GPA and Prerequisite Grade from Model 2

		AGEC1114				Freshman Math			
		A	*B*	*C*	*? D*	*A*	*B*	*C*	*? D*
College GPA	*A (>3.5)*	92	92	-	-	89	89	-	-
	B (3.0-3.49)	90	85	81	-	88	84	81	83
	C (2.0-2.99)	-	74	75	71	83	81	72	73
	D (1.0-1.99)	-	-	-	-	-	-	-	-
		A	*B*	*C*	*? D*	*A*	*B*	*C*	*? D*
Acad. Major	*Ag. Econ.*	93	85	80	69	90	84	78	75
	Animal Sci.	86	83	76	-	83	84	76	77
	Other	-	86	80	-	-	86	80	-

Academic major has a significant effect on classroom performance for students with an A in freshman math, with agricultural economics students performing 6.8 points better than non-major students. Agricultural economics students with an above average grade in freshman math may have a better ability to transfer and apply mathematical skills into farm and agribusiness management than non-major students. For the remaining students, academic major does not appear to have a significant impact in predicting how freshman math translates into classroom performance in FAM.

Summary

In this paper, academic performance in a large undergraduate service course (Farm and Agribusiness Management) is predicted using indicators readily available to instructors and academic advisors, including university GPA, academic major, prerequisite course work, gender, and standardized test scores. We report the results of two empirical models, and discuss one in detail. Cumulative GPA, major, gender, and performance in prerequisites are significant predictors of student performance, while race, residency status, transfer status, and high school GPA are not. We find significant interaction effects between gender and major, ACT math score, and cumulative GPA; between major and cumulative GPA, grade in agricultural economics prerequisite, and grade in math prerequisite; and between cumulative GPA and prerequisites.

Predicting performance can be a useful tool to assist instructors and advisors in identifying students vulnerable to poor performance. At Oklahoma State University, freshman advisors provide students with grade predictions for core courses during their first year. Advisors are able to adjust students' coursework based on these expectations. This approach may be useful for non-core and advanced courses as well, including the FAM course discussed here. The empirical model that we present can support course design and advising. For example, the significant effect of prerequisite courses on performance likely indicates poor retention of fundamental principles, which an instructor could address through course review. The effect of low GPA on class performance could be an indicator of student motivation and/or study skills, which could be addressed by careful monitoring of student effort and attendance, and apportioning adequate time out of class to address certain needs. Future research will be required to investigate whether grade forecasts are beneficial to students. Currently, whether students would be motivated to surpass expectations, or whether expectations could be a self fulfilling prophecy leading to underachievement is unclear.

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Evaluating Teaching Excellence across Diverse Disciplinary Units within Agriculture Higher Education

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Abstract

Workshops were organized at Michigan State University by the College of Agriculture and Natural Resources (CANR) to help faculty and students understand scholarship in teaching and learning. As an outgrowth, a faculty effort was initiated to improve evaluation of teaching and strengthen teaching scholarship across CANR. A Faculty Learning Community (FLC) was formed to review teaching evaluation literature. The FLC synthesized their understandings of evaluation used in other disciplines/institutions to create a conceptual understanding in the discrete domains of effective teaching; scholarly teaching; and scholarship of teaching and learning. Based on consensus, tools were developed to facilitate evaluation of teaching in a flexible manner to accommodate a range of values and teaching assignments. The domains provide the framework for a multi-evidence and multi-source evaluation tool which includes criteria (derived from the definitions and characteristics of each domain), indicators (evidence for the achievement of the criteria) and descriptors (examples of how the criteria have been addressed). It is our intent that these tools be flexible, yet powerful, in helping each individual recognize approaches in their teaching that can be modified/improved, while allowing them to be recognized and rewarded in areas in which they excel. The ultimate goal is to improve student learning.

Introduction

A series of workshops were organized at Michigan State University (MSU), East Lansing, MI by the College of Agriculture and Natural Resources (CANR) Scholarship of Teaching and Learning Working Group during the winter and spring of 2008 to help faculty and students better understand what defines scholarship in teaching and learning. As an outgrowth of these workshops, a grassroots faculty effort was initiated to understand how to improve the evaluation of excellence in teaching and to strengthen the role of teaching scholarship within the college.

A Faculty Learning Community (FLC) was organized in August 2008 within the CANR Office of Academic and Student Affairs. The goal of the FLC was to investigate factors that need to be considered to objectively evaluate components that contribute to teaching and enhanced student learning. Based upon this investigation, it is our belief that teaching within agriculture higher education must be thoroughly evaluated for our work within the academy to have the same level of regard as is given to research and service.

Background and Objectives

The evaluation of teaching should recognize the contextual impact of the unit and institutional missions, cultural norms and performance expectations on teaching (Braskamp, 2000). Statements in several MSU public documents indicate teaching is to be regarded as an integral part of the University's mission; as confirmed by the statement that describes the role of the University as "providing outstanding undergraduate, graduate, and professional education to promising, qualified students in order to prepare them to contribute fully to society as globally engaged citizen leaders" (MSU Mission, 2008). Teaching is often a component of faculty duties that support the MSU Promise (1999) to "offer one of the best undergraduate educations available by providing the advantages of intellectual inquiry at a major research university and practical learning in the land grant tradition." In MSU-CANR, stated support for teaching is represented through support of "learning that imbues current and future stakeholders with intellectual curiosity and offers relevant knowledge and skills, discovery that advances knowledge and enhances productivity and sustainability, and engagement with society that achieves social, economic and environmental equity" (MSU-CANR Mission, 2008). Yet, with all of the official statements of support, MSU-CANR units struggle with how to represent excellence in teaching and learning in merit and promotion evaluations. The MSU-CANR initiative to strengthen faculty

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scholarship across the mission, including research, teaching, outreach/extension/engagement (MSU-CANR Promotion, 2008) has led to the newly formulated promotion and tenure philosophy and protocol that mandate "assessment of faculty performance should recognize the importance of both teaching and research and their extension beyond the borders of the campus as part of the outreach dimension." (MSU-CANR Promotion, 2008)

Ultimately, evaluation should be about improvement and assessment in teaching and learning. Evaluation includes development to improve teaching and learning, appraisal to assess individual competency of teaching, accountability to assess course or institutional outcomes, and innovation to develop knowledge about teaching (Light and Cox, 2001). While the focus of the work of the FLC was on the evaluation of teaching at the individual level, it does not negate the value of assessing, promoting, and enhancing learning or assessing curricular and institutional outcomes. In fact, the ideas presented as a result of the FLC's work give value and merit to the work of teaching that can lead to the improvement of scholarship for our students and advance the body of knowledge of teaching and learning. The focus was also on the external "evidences" that can be documented, communicated, evaluated, and reviewed by others. This approach supports holistic teaching philosophies denoting action and reflection, professionalism, learning communities, and attention to individual character and self-knowledge (Braskamp, 2000; Glassick et al., 1997; Light and Cox, 2001; Palmer, 1997; Ramsden, 2003; Rockquemore and Laszloffy, 2008; Schon, 1983; Tagg, 2003).

Whether teaching is a small or large percentage of a faculty member's assignment, with freshmen or graduates, or with large or small classes, all MSU-CANR faculty are expected to be effective teachers (i.e., student learning outcomes are positive). Faculty may also elect to pursue a scholarly approach to their teaching. Scholarly teaching includes practices of classroom assessment and evidence gathering, it is informed by the latest ideas in the field and by current ideas about teaching in the field, and it invites peer collaboration and review (Hutchings and Shulman, 1999). The scholarship of teaching and learning (SoTL) goes beyond scholarly activity; it is grounded within the disciplines and can be an applied research agenda (McKinney, 2007). The integration of these areas will overlap and should be matched with both the individual's expertise and the needs of the unit.

The current metrics for evaluation of teaching within MSU-CANR include the number of courses taught, student satisfaction as measured by the SIRs (Student Instructional Reports) instrument (MSU Faculty Handbook, 2008) and appraisal by a unit chair or director. Although each of these factors may need to be included in the overall assessment of teaching, they are insufficient measures of teaching for personnel and promotion decisions. Additionally, higher education has shifted from an instructional model to one that is learner-centered and allows educators to rethink how we approach the teaching component of our responsibilities (Barr and Tagg, 1995). The works of Boyer (1990) and Glassick et al. (1997) have stimulated conversation about what constitutes scholarly work and scholarship in teaching; influencing how we teach, how we evaluate teaching and how we reward the intellectual contributions of teaching across the U.S. Thus, there is a need to incorporate the robust knowledge from the literature into a process for evaluating teaching excellence across the diverse disciplinary units within MSU-CANR and agriculture higher education.

Methods

The FLC was to engage in an iterative process involving review of literature, analysis of existing unit materials (i.e., MSU Animal Science Promotion, 2008) and guidance (i.e., MSU Boldness by Design, 2008; Mission, 2008; Outcomes of Liberal Learning, 2008; Promise, 2008; and Washington State University Teaching Portfolios, 2008), followed by dialogue and reflection. Other disciplines within higher education have long debated the implementation of effective methods for evaluating teaching and learning. An examination of the literature provided a robust discussion of common practices that were initially reviewed by the FLC. As a result of this evaluation, two books, *Evaluating Faculty Performance: A Practical Guide to Assessing Teaching, Research, and Service (Seldin, 2006) and Preparing for Promotion, Tenure, and Annual Review: A Faculty Guide* (Diamond, 2004) were selected to direct our initial base line discussions at bi-weekly meetings during the fall 2008 and spring 2009 semesters. Additional information and materials were shared within the group by utilizing a course management software system (ANGEL) to post journal articles and thoughts from different FLC members.

Following the initial review and dialogue, the FLC proceeded to generate and synthesize our understandings of the evaluation of teaching and learning used in other disciplines and institutions. We arranged our conceptual understanding of teaching evaluation into three discrete domains: (a) Effective teaching, (b) Scholarly teaching and (c) SoTL

After developing consensus on the rationale and content of each of these domains, evaluation tools were developed to clarify the evidence and criteria for each domain. Evaluation of teaching would be facilitated in a manner flexible enough to accommodate a range of values and teaching assignments. It was the intent of the FLC to use these evaluation tools to begin a serious discourse among faculty, staff, and administrators that would ultimately lead to a workable and equitable process for evaluating excellence in teaching.

Results and Discussion

Teaching Domains

The three teaching domains identified by the MSU-CANR FLC are discrete, but can be integrated (Figure 1). Thus, evaluation can be focused on effective teaching, scholarly teaching and/or SoTL. Effective teaching should be required of every faculty member who teaches, whether it is in the classroom or in the community through outreach and extension. Scholarship in teaching and SoTL are not expected, nor should they be, of all faculty.

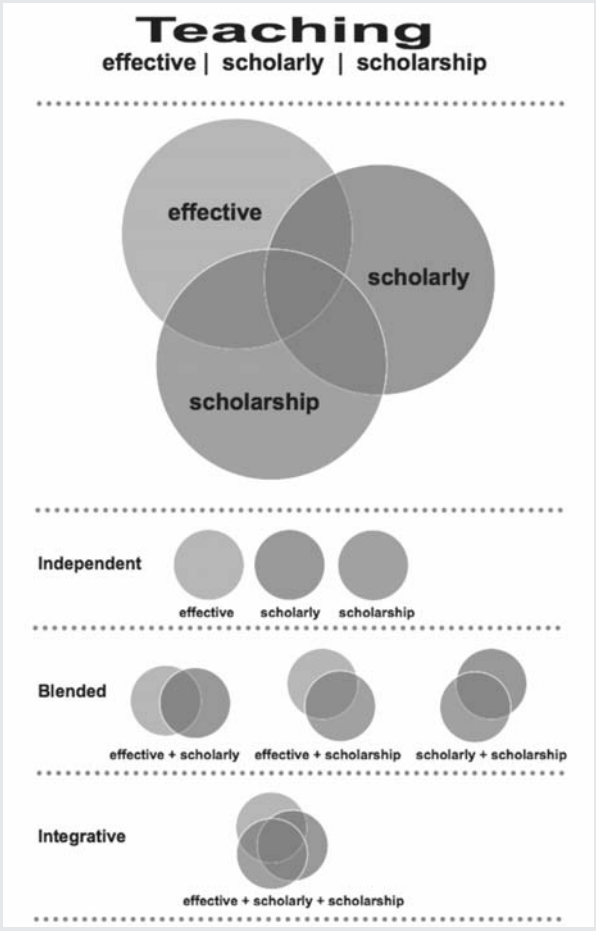

Figure 1. Three teaching domains.

Effective Teaching Domain

Effective teaching advances student learning and is demonstrated through measurable student achievement of desired outcomes. The teaching is developmentally appropriate for the learners' intellectual ability, skill level, personal development and capacity for growth (Ramsden, 2003). Effective teaching is suitable for disciplinary content, methods, skills, ways of knowing, and subcultures (Marsick and Watkins, 2001; Selden, 2006). It is aligned with the unit's curriculum, building on previous learning to expand the students' learning and prepares students for advancement in the curriculum (Diamond, 2008; Huber and Breer, 2007). Indicators of effective teaching include preparedness, organization, comprehensive subject knowledge, interest in the subject matter, confidence with pedagogy, fairness in the classroom, appropriate assessment techniques, and accessibility to students (Jackson et al., 1999; Markley, 2004; Sullivan, 2001). Effective teaching may or may not always be liked, appreciated or valued by students.

Scholarly Teaching Domain

Scholarly teaching involves application of knowledge about teaching and learning to instructional activities and testing new knowledge in teaching practices (Hutchings and Shulman, 1999). Scholarly teaching also includes the infusion of current and evolving literature, and practices of the discipline(s) appropriate to the learning setting. Scholarly teachers view teaching as a profession with standards of practice, identifiable methods and pedagogies, and a knowledge base within which to develop expertise (McKinney, 2007). This kind of instruction involves prior thought, mindfulness, purpose, reflection, and is grounded in the literature on teaching and student learning (Boyer, 1990; McKinney, 2007). Techniques include reflective practice, student assessment, sharing with colleagues, and the application of literature on teaching and learning within the disciplinary context (Brookfield, 1995; Palmer, 1997; Schon, 1983). The impact of scholarly teaching can also be exhibited outside the classroom in course or curriculum development, peer mentoring, or other standards developed at the unit, departmental or college level (Seldin, 2006).

SoTL Domain

SoTL is work that includes the essential scholarship elements of original work, peer review, validation and dissemination (McKinney, 2007). SoTL meets the standards of scholarship by including clear goals, adequate preparation, appropriate methods, significant results, effective presentation and reflective critique (Boyer, 1990). It should be original work that is grounded in current knowledge, is in the public realm and open to critique, is valued by the intended audience, demonstrates significance beyond the immediate setting or community, expands the knowledge base, and can be built upon by others (Boyer, 1996; Diamond, 2004; Hutchings and Shulman, 1999; Prosser and Trigwell, 1999).

Independent, Blended and Integrative Approaches to Teaching Excellence

Effective teaching, scholarly teaching, and SoTL can each exist independent of each other, with effective teaching being considered a minimum standard. Scholarly teaching and SoTL do not necessarily require a faculty member to be in a classroom or engaged in actual teaching activity. Both can be achieved through activities such as curriculum development, pedagogical development, or research

projects, which may take place outside of a typical classroom context.

A blended approach of two domains is possible. Effective teaching can blend with scholarly practices that reflect information that is well crafted, timely, appropriate, and contextual for the student population. Effective teaching can blend with SoTL to create original works that validate and communicate effective teaching techniques. Scholarly teaching can blend with SoTL to create works about pedagogy, student learning, or instructional content. (Figure 1).

Integration brings all three domains together with interplay of effective teaching, scholarly teaching and SoTL. An integrative approach can cross courses, disciplines, and research and service activities. A faculty member may engage in effective and scholarly teaching in a particular class and demonstrate SoTL through a service or committee assignment. Regardless of how much blending and/or integration occurs, effective teaching, scholarly teaching and SoTL should be recognized, valued and considered meritorious by the academic unit faculty members, college and university.

Evaluating Teaching: Sources of Evidence (Criteria, Indicators and Descriptors)

A range of substantiation and sources can inform the evaluation of teaching. Each type of evidence has strengths and limitations and each source has a unique perspective and bias. Berk (2006) identifies 13 sources of evidence including student ratings, peer ratings, external expert ratings, self-ratings, videos, student interviews, exit/alumni ratings, employer ratings, administrator ratings, teaching scholarship, teaching awards, learning outcome measures, and teaching portfolios. Multiple sources should be used to build a solid foundation for decision making. Traditional perspectives for evaluative input include self, students, peers, administrators, multidisciplinary review committees, and external reviewers. Who "validates" or provides the assessment is an important consideration in designing an evaluation tool.

Self-evaluation is a valuable reflective tool, but can be time intensive to develop and review, and is self-limiting based on what a person knows. Student ratings provide a unique experiential perspective, are traditionally focused on written perceptions or surveys of satisfaction, can be influenced by a host of factors such as class size, gender, elective or required course, and often are not analyzed in conjunction with important contextual information such as student attitudes and study habits. Peers can evaluate depth of disciplinary knowledge and pedagogical techniques within the disciplinary norm or an area of expertise. However, there is potential for bias when evaluating new or non-traditional teaching approaches. In-class observation can give a real sense of how a person teaches, but it is time intensive to have multiple observation sessions, develop evaluation criteria, and train peer reviewers and evaluators. To bring consistency and balance to the process observers should be trained and have a well-developed evaluation instrument. This type of observation may be best done by outside evaluators to minimize bias and personal opinion of a peer evaluator. Administrative and multidisciplinary review committees are able to compare and contrast evaluative materials across faculty groups. However, comparison across disciplines may not always be appropriate, and can lead to a tendency to minimize information to quantitative expressions. External reviewers are able to compare and contrast

Table 1. Effective Teaching Evaluation Tool

Effective Teaching			
	Criteria	**Indicators**	**Descriptor**
1.	Sets clear goals	- Syllabus, Handouts, Assignments, and/or Projects	- Goal Statement - Connection with course organization
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			
2.	Indicates adequate preparation, comprehensive subject knowledge, and competent with appropriate pedagogy	- Assessment aligns with goals	- Syllabus - Teaching Strategies - Exams
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			
3.	Uses appropriate methods	- Method/Activity matches goals - Yields results that can be duplicated with multiple cohorts	- Examples of connection of activity with lesson - Assignments with outcomes
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			
4.	Advances student learning	- Progression in comprehension & application - Maturity of thoughts	- Pre- and post-testing - Bloom's Taxonomy - Student journals
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			
5.	Appropriate student assessment techniques	- Assessment - Course Exams	- Appropriate measurements; Oral presentations; Lab Write-up; Projects
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			
6.	Developmentally appropriate for the learner	- Addresses diverse learning styles; Academic skills include reflection and application	- Appropriate source materials and/or projects; Reflective Statement
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			
7.	Appropriate for the discipline	- Problem-based; Authentic lessons and connections with certification/ accreditation organization (where applicable)	-Syllabus assignments that meet the stated criteria
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			
8.	Aligns with the unit's curriculum	- Correlates with unit mission and/or objectives	- Syllabus; Appropriate assignments and measurements
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			
9.	Student satisfaction	- SIRs (Student Instructional Review)	- SIRs (Student Instructional Review) - Course Evaluation
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			

Table 2. Scholarly Teaching Evaluation Tool

Scholarly Teaching			
	Criteria	**Indicators**	**Descriptor**
1.	Exhibits mindful application and reflection of knowledge about teaching and learning	- Citation of pedagogy models - Development of assessment models	- Attendance and application of Lily seminars & FLC's - Statement of Teaching Philosophy
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			
2.	Infuses current and evolving literature, methods, and practices of the discipline	- Use of journal articles – cutting edge and classic - Use of guest speakers with discipline expertise	- Reading List - Cases Studies - Internship - Real world validation - Fieldwork - Syllabus
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			
3.	Views teaching as a profession (standards, methods, pedagogies)	- Seeks professional development	- Statement of Teaching Philosophy & Application - Membership in: Professional organization; Subgroup of disciplinary organization
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			
4.	Shares knowledge of teaching and learning with colleagues and others	-Formal and/or informal presentations - Blogs - Web site development	- Presentation - Blogs - Web site
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			
5.	Impacts--course or curriculum development; peer mentoring to improve teaching; policy; standards; or other developments at the unit, department or college level; changes in enrollment	- Modification of course content, procedures, and/or assessment - Recipient of an award - Program changes - Committee & FLC work	- Evidence of pre- & post-modifications - Outcomes & Recommendations
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			

Table 3. Scholarship of Teaching and Learning Evaluation Tool

Scholarship of Teaching and Learning			
	Criteria	**Indicators**	**Descriptor**
1.	Indicates scholarship through original work – creates something new	- Is grounded in current knowledge - Is valued by the intended audience - Has impact or significance beyond the immediate setting or community - Expands knowledge	- Use, adaptation or implementation by others - Citation by others - Publication & presentation - Awards - Grants
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			
2.	Meets essential scholarship elements	- Peer Review - Validation - Communication	- Use, adaptation or implementation by others - Citation by others - Publication & presentation - Awards - Grants
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			
3.	Meets advanced standards of scholarship	- Significant results - Effective presentation - Reflective critique	- Use, adaptation or implementation by others - Citation by others - Publication & presentation - Awards - Grants
Reflective Comments:			
Evaluation: ____ Exceptional ____ Satisfactory ____ Unsatisfactory Comments:			

evaluative materials within a discipline or expertise across different institutions and settings, allow for expression of institutional variation in what is valued or considered norms of practice, and are time intensive with minimal institutional rewards for doing a thorough review (Berk, 2006; Peterson et al., 2001; Jackson et al., 1999; Richardson, 2001; Scriven, 1995).

Evaluating Teaching Excellence Framework

The three teaching domains provide the framework for a multi-evidence and multi-source evaluation tool. The framework includes a tool for each of the teaching domains to evaluate teaching performance in a manner flexible enough to accommodate a range of goals, values and assignments (Tables 1 to 3). Each domain includes criteria, indicators and descriptors. The criteria are derived from the definitions and unique characteristics of each teaching domain. Indicators provide evidence for the achievement of the criteria. Descriptors are specific examples of how the criteria have been addressed. After each criteria room is provided within the tool for inclusion of reflective statements by the evaluator and the individual to be evaluated; ranking of performance in meeting the criteria; and comments to explain the efficacy of the criteria for the individual's appointment.

College faculties need to both examine and conduct a pilot test on the domains, indicators, and descriptors. Not all criteria will be appropriate for all teaching environments or individual instructors. It is the intent of the FLC that these tools are flexible, yet powerful enough to help each individual recognize approaches in their own teaching that can be modified/improved, while allowing them to be recognized and rewarded in areas where they already excel.

Conclusion

Evaluation of teaching is not a uniform proposition, thus several facets of teaching and learning need to be included. Each facet must be recognized, valued, and considered meritorious by unit faculty members, their college and their university in order for teaching and learning to meet the standards we strive to provide to college of agriculture students across the U.S.

Teaching excellence and student learning are essential qualities of higher education and must continue to be a hallmark of agriculture colleges. It will take dedication and sustained effort to bring the evaluation of teaching excellence to fruition in a way that recognizes individual achievement and improved student learning. The primary purpose of this work is to engage those within MSU-CANR and

other agriculture colleges in a process that will ultimately enhance student learning through a thoughtful, consistent, and fair evaluation of teaching. Additionally, the process should provide the means to recognize and reward excellence in teaching. The authors do not envision a "one size fits all" instrument or process. Rather, we seek to encourage different agriculture units and the individuals who teach in them to use these instruments to develop the processes that will serve their mission in the most constructive way possible.

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Perceptions of the Impact of an Equine Program on Student Satisfaction and Retention

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Abstract

The objective of this study was to assess the personal and educational impact of an equine program on students at Southern Utah University (SUU). A survey was developed with statements to be evaluated on a Likert-type scale with five response levels. The survey was distributed to students enrolled in equine courses during three consecutive semesters. A total of 163 students voluntarily completed the survey, which included students of various horse experience, majors, and class standing. Students expressed their strongest agreement with items related to gaining new knowledge *($P < 0.01$)*, followed by items related to providing personal benefits. Students also agreed equine courses helped them develop skills and had a favorable impact on their education at SUU. Almost one-half (47.1%) of the students indicated the horse program had influenced their decision to attend or remain at SUU, and 98.8% of students agreed or strongly agreed they would recommend the courses to others. More than one-third of students also expressed interest in an equine science degree or minor. It has been concluded from the survey results that equine courses have a favorable impact on students through personal and educational value, and they strengthen the educational experience at SUU.

Introduction

In a competitive world where students are torn between a variety of activities and interests, schools must continue to seek ways to increase the quality of instruction and improve the overall educational experience. Recruiting students is a continual challenge as is keeping students in school once they start. Numerous researchers have investigated the challenges of retention and recruiting (Jackman and Smick-Attisano, 1992; Mallory and Sommer, 1986; Manderscheid, 1988). Most researchers agree that highly satisfied students are more likely to remain in school and ultimately graduate. Providing a positive learning environment, one that builds confidence and increases skills and knowledge has been shown to improve retention rates in institutions of higher education (Elliott, 2003). Colleges with higher satisfaction levels enjoy improved retention and graduation rates, lower loan default rates and increased alumni giving (Miller, 2003).

Successful institutions realize that it is important to identify factors that enhance student satisfaction and focus on those factors (Elliott and Shin, 2002). A variety of factors influence and contribute to student satisfaction. As students expand their knowledge and experience level, new and exciting opportunities are opened to them. Elliott and Healy (2001) identified a variety of components that impact students' educational experiences. They determined that the quality of classroom interaction and positive feelings about their classes, connection with faculty, and a sense of fitting in increased the level of fulfillment in the educational environment. Understanding what keeps students satisfied improves retention rates and creates a more sustainable campus environment (Elliott and Shin, 2002).

The agriculture program at Southern Utah University (SUU) currently offers various equine related courses, including Horse Production, Horse Science and Industry, Beginning Horsemanship, Intermediate Horsemanship, and Advanced Horsemanship. Students from a variety of backgrounds and majors enroll in these courses. A number of benefits and opportunities from horses and horse riding have been recognized. The horse industry is a major contributor to the U.S. economy, with an estimated direct economic effect of $39 billion annually and estimated employment impact of 1.4 million jobs (American Horse Council, 2005). Numerous physical, mental, and emotional benefits have been observed in those working with horses (Bizub et al., 2003; Brickell, 2005; Smith et al., 2006). Limited information has been obtained to quantify the effect the equine program at SUU could have on students and their educational experience at SUU. Understanding students' views of the equine program will be useful to strengthen the program and improve the educational benefits for students. The objective of this study was to assess the perception of undergraduate students regarding the impact an equine program has on the overall educational experience as well as potential impact on life skills.

Materials and Methods

A survey tool was developed consisting of basic demographic information, statements for response on a Likert-type scale with five levels (1=Strongly Disagree, 5=Strongly Agree), and an open-response

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question regarding how the student changed from taking the course. The paper and pencil survey was distributed to all students enrolled in all equine specific courses during each of three consecutive semesters. The surveys were given out with the final exam each semester, and then handed back separately so students were not required to take the survey. Some students were enrolled in more than one equine course over the three semesters; however only one survey was completed per student regardless of how many classes they took. A total of 163 different students voluntarily completed the survey.

Data were analyzed using the SPSS version 13.0 for Windows. Distributions of responses were compared using chi-square analysis. Mean responses were compared using one-way analysis of variance.

Table 1. Demographic Summary of Students that Completed the Equine Program Survey

Demographic	%
Gender	
Female	76.5
Male	23.5
Major	
Agriculture	17.9
Science (Non-agriculture)	23.8
Other	58.3
Riding Experience	
Beginner	46.3
Intermediate	31.5
Experienced	14.8
Advanced	7.4
Class Standing	
Freshman	29.4
Sophomore	24.4
Junior	23.1
Senior	19.4
Other	3.8
How did you find out about this class?	
Faculty/Advisor/Class	13.5
Catalog	29.1
Family/Friend	54.7
Other	2.7

Results and Discussion

A summary of the demographic data for survey respondents is displayed in Table 1. Students were predominantly female, non-agriculture majors, with limited riding experience. Since students from several majors outside agriculture enroll in equine courses, there is the potential to have an impact on a variety of students across campus. A necessary component of the equine classes, particularly the horsemanship classes, is interaction with other students and with the instructor. As students interact with each other relationships are developed which increase satisfaction in the overall educational experience.

Table 2. Summary of Responses to Survey Statements Focused on Knowledge Gained from Participation in Equine Courses

Statement	n	Response, %[z,y]					Mean Response
		1	2	3	4	5	
The Horsemanship classes at SUU have helped me develop a better understanding of horses and horse behavior.	161	0.6	0.0	0.6	16.8	82.0	4.80
Horsemanship classes have helped me to realize the responsibility that goes along with owning a horse.	161	0.6	0.6	6.8	13.7	78.3	4.68
Horsemanship has been a valuable learning experience for me.	161	0.6	0.0	1.9	11.2	86.3	4.83

[z] Respondents used the following Likert-type scale:
1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree.
[y] Chi-square analysis for distribution of responses $P = 0.048$.

Table 3. Summary of Responses to Survey Statements Focused on Personal Benefits Obtained from Participation in Equine Courses

Statement	n	Response, %[z,y]					Mean Response
		1	2	3	4	5	
Horsemanship has been a stress reliever to me.	163	1.8	1.2	4.9	24.5	67.5	4.55[a]
The experiences I have had while taking Horsemanship have helped me to overcome my fears.	162	4.9	7.4	15.4	25.9	46.3	4.01[b]
I am a more confident person after learning to work with my horse.	163	0.0	1.2	8.6	23.9	66.3	4.55[a]

[z] Respondents used the following Likert-type scale:
1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree.
[y] Chi-square analysis for distribution of responses $P < 0.001$.
[a,b] Means with different superscripts within column differ by one-way ANOVA at $P = 0.001$.

The most common source from which students found out about the horse courses was family or friends. It appears from this data that word-of-mouth is an important recruiting tool for these courses. The courses are likely to be recommended to others by those who know about them. The average age of respondents was 21.9 years, ranging from 18 to 61 years of age. A number of non-traditional students are attracted to the courses each year, providing a broad base of experience and exposure.

Overall, students expressed their strongest agreement *(P < 0.01)* with statements related to gaining new knowledge, followed by statements related to providing personal benefits. More than 90% of respondents agreed or strongly agreed with each of the statements related to gaining new knowledge (Table 2). These results provide indirect evidence that the academic objectives of these courses are being accomplished. There was also broad agreement among respondents with all statements related to obtaining personal benefits (Table 3). Agreement was greatest with respect to the equine courses providing stress relief and increasing self-confidence *(P < 0.01)*. Considering the many pressures associated with attending college, opportunities for stress relief and building confidence are important.

Students also agreed they developed new skills through participating in the equine courses (Table 4). Of the statements related to skills, they expressed their strongest agreement *(P < 0.01)* with the statement referring to developing physical skills. Other statements referred to transferable skills of communication and problem-solving. Of these,

students expressed more agreement *(P < 0.01)* with the ability to apply reasoning and problem-solving skills they learned to other areas of their education and life. These transferable skills are often included in the outcomes objectives of academic programs. Equine courses appear to be one effective method through which these objectives may be accomplished. These results agree with the findings of Smith and colleagues (2006), who demonstrated teaching horsemanship skills promoted the development of numerous life skills in youth. Brickell (2005) also noted achievements in riding horses promote emotional and physical responses that can improve management skills in life beyond riding. In addition, developing the ability to guide a horse encourages decision making and independence.

Students strongly agreed that equine courses had a positive impact on their experience at SUU (Table 5). Over 95% of the student respondents felt taking equine courses improved the quality of their educational experience, and most students agreed the equine program could attract students to SUU. With less than 20% of the respondents majoring in agriculture, these results indicate horse related courses are improving the quality of the educational experience for students in many academic programs across campus.

The results also show 47.1% of students indicated the horse program influenced their decision to attend or remain at SUU (Table 5). This strongly indicates the impact of the equine classes, especially noting these courses were not required for any degree at the time of the survey. Satisfaction of students with equine courses was also evident in that 98.8% of students agreed or strongly agreed they would recommend the courses to others. This is consistent with the fact that most students found out about the courses through the recommendation of a friend or family member. Alumni of the Colorado State University Equine Science Program similarly expressed a high degree of satisfaction with their equine program. They also indicated they would recommend the program to others, even though many of those alumni were not employed in the equine industry (Denniston and Russell, 2007).

The survey also contained statements to assess the interest of students in obtaining a degree or minor in equine studies. Over one-third of respondents agreed or strongly agreed they were interested in an equine related degree or minor (Table 6). Interest in an equine degree was found to be associated with riding experience, with the most experienced riders expressing the greatest interest *(P < 0.01)*. After sorting the responses by riding experience, 93.7% of advanced riders, 63.8% of experienced riders, 43.6% of intermediate riders, and 16.0% of beginner riders agreed or strongly agreed they were interested in an equine degree or minor. These results would be anticipated because individuals that are interested in equine studies and horsemanship would be most likely to have some riding or other horse experience. There also remains an obvious strong interest in the horse classes from less experienced riders, even those not seeking a degree.

When students were asked how they had changed because of the class, the most common responses

Table 4. Summary of Responses to Survey Statements Focused on Skills Developed from Participation in Equine Courses

Statement	n	Response, %[z,y]					Mean Response
		1	2	3	4	5	
Riding horses has helped me improve skills such as balance, timing, and coordination.	163	0.0	1.2	6.1	21.5	71.2	4.63[a]
Learning to understand and communicate with my horse has improved my ability to interact and communicate with other people.	161	2.5	5.0	32.3	35.4	24.8	3.75[c]
I can apply reasoning and problem-solving skills learned in Horsemanship to other areas of my education (and life).	161	0.6	2.5	21.1	41.6	34.2	4.06[b]

[z] Respondents used the following Likert-type scale:
1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree.
[y] Chi-square analysis for distribution of responses $P < 0.001$.
[a,b,c] Means with different superscripts within column differ by one-way ANOVA at $P = 0.001$.

Table 5. Summary of Responses to Survey Statements Focused on the Influence Participation in Equine Courses had on Students' Education

Statement	n	Response, %[z,y]					Mean Response
		1	2	3	4	5	
Taking Horsemanship has improved the quality of my educational experience at SUU.	163	0.0	0.6	4.3	24.5	70.6	4.65[a]
The Horsemanship program has influenced my decision to attend or remain in school at SUU.	157	10.2	14.6	28.0	21.0	26.1	3.38[b]
The equine program could be influential in attracting students to SUU.	161	0.6	0.6	9.3	29.8	59.6	4.47[a]

[z] Respondents used the following Likert-type scale:
1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree.
[y] Chi-square analysis for distribution of responses $P < 0.001$.
[a,b] Means with different superscripts within column differ by one-way ANOVA at $P = 0.001$.

Table 6. Summary of Responses to Survey Statements Focused on Interest in an Equine Science Degree or Minor among Students Participating in Equine Courses

Statement	n	Response, %[z,y]					Mean Response
		1	2	3	4	5	
I would be interested in earning a Bachelors Degree in Equine Science.	158	20.3	19.0	29.1	8.9	22.8	2.95
I would be interested in earning a Minor in Equine Science.	157	14.0	14.6	26.8	19.7	24.8	3.27
I would be interested in earning an Associates Degree in Equine Science.	157	17.2	21.7	24.8	14.6	21.7	3.02

[z] Respondents used the following Likert-type scale:
1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree.
[y] Chi-square analysis for distribution of responses non-significant.

referred to developing greater confidence, overcoming fears, and expanding knowledge and skills.

Summary

The survey results provide substantial evidence that equine courses have a favorable impact on SUU students through both personal and educational value. These courses appear to strengthen the overall satisfaction in their educational experience. The data indicate that continuing and improving the equine courses at SUU will benefit the agriculture program and the university. The interest expressed in an equine science degree or minor has provided valuable support for the proposal of an equine degree. Since completion of this survey, an associate of applied science in equine studies has been approved by the Utah State Board of Regents and implemented at SUU. Further assessment will be useful to determine specific ways to develop and improve the program. Perspectives of alumni and industry professionals will also be a valuable component of future program assessment and development.

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Enhancing Active and Interactive Learning Online - Lessons Learned from an Online Introductory Agroecology Course

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Abstract

While web-based course offerings are growing rapidly across various institutions and disciplines, there is an emerging need to enhance student interactions and active learning for online learning environments. An Introduction to Agroecology online course was developed at North Carolina State University purposefully with the intention of maximizing student interactions and active learning through diverse instructional strategies to create a collaborative, virtual learning community. This paper will describe the course development, outline the specific strategies to promote active learning and student interactions used, and share student evaluations and lessons learned; complied after eight semesters of teaching this online course. From course evaluations and post-course surveys, students valued the opportunities to interact with each other and the instructor and stressed the importance of making time and treating their online course like their face-to-face courses. The instructor used the evaluations and surveys each semester to continually assess student experiences and impacts of specific course components. The instructional strategies, evaluation process and lessons learned described here are general and diverse enough to be easily utilized by a variety of online courses in various stages of development. This purpose of this paper is to stimulate further communication on successful pedagogical strategies for collaborative and interactive online teaching and learning.

Online Education and the Need for Active Learning

The growth of web-based educational technology and the increasing demand to offer distance education courses has led to the rapid development and diversity of courses offered online. More than two-thirds of all higher education institutions offer web-based courses and in fall 2006 there were more than 3.48 million students enrolled in online courses representing close to 20% of the total student enrollment (Allen and Seaman, 2007). Online courses and programs can extend the reach of the university; providing learning opportunities to new audiences that would otherwise be limited by time or distance. As online education continues to quickly develop across many disciplines and institutions, instructors are seeking innovative approaches to improve the online learning experience for students.

Teaching an online course requires more than a mastery of the subject knowledge sufficient for a traditional classroom-based course. Faculty not only must learn new technologies, but consider effective instructional strategies to enhance student learning and interactions in a virtual environment (Gaytan and McEwen, 2007). Web-based courses and advanced educational technologies can improve instructors' abilities to expand information to new audiences, but these alone do not guarantee effective teaching and learning outcomes. A variety of studies have found that instructors teaching online share similar concerns that include lack of institutional support and incentives, increased time needed for online course development, potential technology problems, and effectiveness of student-instructor interactions (Born and Miller, 1999; Gammill and Newman, 2005). The lack of interaction among students and instructors in online courses is a concern also shared by students (Flowers, 2001; Schmidt and Gallegos, 2001). Although a number of studies have found online students to perform equal to or better than their classroom counterparts (Dutton et al., 2002; Schroeder-Moreno and Cooper, 2007), the failure to complete courses is much more frequent for online students than for traditional classroom-based students (Dutton et al., 2002). Although the reasons students withdraw from online courses are often complex (Garland, 1993), the lack of real-time interaction and stimulation from online course materials can often cause learners to feel isolated in the online environment (Fulford and Zhang, 1993). While the dynamic nature of online courses can provide a flexible learning (and teaching) format in which students can progress at their own pace, they must be self-disciplined and highly motivated to be successful in online courses (Waschull, 2005). Instructional strategies that enhance frequent interactions and student engagement in online courses can help keep students connected to the material and to each other and motivated, even in virtual space (Phillips, 2005).

Active and interactive learning activities may be fundamental strategies to keeping students engaged in online courses (Edwards et al., 2007). Active

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learning is a learner-centered approach where students actively take part in their learning through discovery and inquiry and is often found to be more effective than passively receiving course content (Bruner, 1973). Active learning can enhance students' ability to control and regulate their own learning, which can facilitate the cognitive, motivational, and emotional learning processes (Bell and Kozlowski, 2008). There is a great deal of acknowledgement in the literature that active learning and learner-centered approaches can promote student understanding and success in online courses (Phillips, 2005). It is often a challenge for faculty to be aware of and select from the many specific instructional strategies, such as asynchronous discussions, chats, videos, interactive content materials, formal and informal quizzes, etc. that can provide meaningful interactions and enhance learning in an online environment for students with various learning styles.

This paper aims to identify a selection of successful strategies to engage students in active and interactive learning in an online environment based on the experiences from teaching an Introduction to Agroecology online course at North Carolina (NC) State University. The course format, design, and learning activities for this agroecology course were developed purposefully with the intention of maximizing student interactions and active learning online. The description of the activities and instructional strategies for this course are general and diverse enough to be easily utilized by a variety of online courses. This paper will describe the Introduction to Agroecology course development, outline specific strategies to promote active learning and student interactions used in this course, and share student evaluations and lessons learned complied after eight successions of teaching and "field-testing" this online course and general pedagogical methods to teaching online supported by other studies. The information in this paper can be valuable to the development of an online course in any discipline and hopefully will stimulate further communication about shared pedagogical strategies to successful online teaching and learning.

Course Description

The Introduction to Agroecology online course was first offered in fall 2005 and was developed to support a new undergraduate Agroecology Minor program at NC State University. A face-to-face section of this course had already been developed, so much of the course materials already existed but needed to be reorganized and formatted specifically for an online course. Throughout the agroecology course, students are required to critically analyze the sustainability of various agricultural systems and practices from a balance of the environmental, social and economic perspectives presented in the lecture materials, scientific readings, and case studies.

The development of this online course was initiated through an Innovation in Distributed Education Applications (IDEA) grant through the Distance Education and Learning Technology Applications (DELTA) at NC State University. This IDEA grant provided funds for the course development, educational training for the course instructor and focused support from a team of DELTA instructional designers. In the initial steps, the instructor participated in a Teaching and Learning with Technology Summer Institute to learn about the many resources, instructional technology tools and techniques available that can be used to support teaching and learning online at NC State. Participation in this summer training experience also provided the instructor a collegial environment to connect with other faculty teaching online courses across many disciplines at the university. Through the grant period and afterwards, the DELTA instructional designers worked with the course instructor to determine the appropriate technology tools and educational strategies for online instruction specific for the course objectives. Because agroecology is multidisciplinary and applies ecological concepts to agriculture for the design and management of sustainable agriculture and food systems (Francis et al., 2003), experiential and inquiry based learning play a fundamental role in agroecology education (Trexler et al., 2006). The course instructor worked closely with DELTA instructional designers to develop a course design format, instructional techniques, activities, and assessment tools aimed to engage students with each other and with the agroecology materials that promoted interaction and active learning in an online environment. Students logged into one central site for all course activities, WebCT Vista® 4.0, which was the primary online learning environment for in this course.

Because agroecology is a relatively new discipline and it was also important to develop a course that could serve as a model for other institutions looking to create web-based agroecology materials or courses. This course has been taught eight times by the same instructor with a total enrollment of over 90 students (average online class size is 12 students). The strategies and course components listed below are a compilation of key approaches to enhance active learning and student interactions in this online course and they have been refined from student feedback over the multiple offerings of this course. It is important to note that much of the course success and strategies for active learning would not be possible without the DELTA instructional design support and prompt technical support staff at NC State University.

Strategies to Promote Active Learning and Student Interactions in the Introduction to Agroecology Online Course

1. Creation of online student and instruc-

tor collaborative learning community. It was important early in the course to create a learning community that would encourage students to communicate and experience genuine interactions with each other and the instructor in an online environment.

Specific course components include:

• Use of WebCT Vista® for course online environment. Only students enrolled could access the course and all materials, activities, and communication through this one central program.

• Instructor introduction through a short video clip and discussion board message welcoming students the first day of class.

• Student introductions to each other through use of a discussion board where they were asked to describe their background, major, and interests. Students were also asked to upload a recent photo of themselves to the discussion board the first week of class.

• Creation of virtual student lounge where students could interact outside formal assignments. Several students (no more than 20% from each course) used these to share news headlines, on campus seminars or local events related to the course subject.

• Use of peer review for a topic paper assignment. Students were allowed to write their topic paper on any subject related to the course and approved by the instructor. The instructor then grouped students in pairs based on papers with similar topics. Students were required to review each other's paper through a peer review process where they a grading rubric developed by the instructor. They could virtually meet through a discussion board, chat or email to discuss their papers. This peer review grading was an important course component that not only helped students understand how to critically evaluate writing from a peer but also to develop a student's sense of community in a small group within a large online course. All papers were also reviewed and graded by the course instructor and the students also critiqued their peer review partner. Peer review critiques comprised only 20% of the total grade of the topic paper and the instructor had the ability to override the peer review grade if necessary.

2. Development of clear course objectives, educational goals and unambiguousness course assignments and deadlines. Some online students can have a harder time keeping up with course materials and assignments and can disengage and drop out of online courses more frequently than face-to-face students (Bernard et al., 2004; Carr, 2000). For this reason, it was important to make learning objectives, course assignment descriptions, and due dates as clear as possible and easily accessible to reduce student frustration in the online course.

Specific course components include:

• Course syllabus downloaded from main page that clearly describes course goals, assignments, grading and expectations. A lecture schedule with dates for completing assignments and lectures modules (twice a week) was also included to encourage students to designate a set amount of time each week similar to their face-to-face courses.

• Development of educational goals for each lecture module that defines what a student should know after reviewing materials. Students are encouraged to use these educational goals to prepare for exams.

• Use of a calendar tool to remind students of assignment due dates. Students can also use the calendar tool to add individual reminders and notes.

• Creation of "Steps to Succeed in the Course" document that outlines specifically what a student needs to do to succeed in the class. Although much of the information seemed intuitive to the instructor, students liked this "how to manual" suggested by a previous online student.

• Announcement function (as a pop up window when students log into the course) and email used to reiterate important assignment due dates.

• Development of clear grading rubric for topic paper (a high point value assignment), which was broken into smaller assignments spread throughout the semester including an outline, draft, peer review and revision process. Through this grading rubric, students understood how the instructor would grade the paper before they wrote it which resulted in more well written papers. This grading rubric was also used by students to peer review each other's papers. The students then used the two reviews of their paper to revise their paper in a final draft, which was also graded using the same grading rubric. The whole process of writing an outline, draft, peer review and revision process on a topic of their own enabled students to focus on a specific aspect of the course they found interesting. Understanding and valuing the process of review and revision, created an additional opportunity for individual interactions with the instructor and fellow students.

3. Transition away from typical PowerPoint lectures to creating integrated learning modules. Each previous PowerPoint based lecture was reorganized into integrated lecture modules that outlined overall learning outcomes and then broke up the information into 5-10 concise subthemes (Figure 1). The learning modules were html documents that contained both graphics and/or tables intermixed with text that the instructor normally would orally describe in a face-to-face lecture. The text was concise and organized in bullet points with main points or definitions highlighted so students would understand the emphasis on particular details. The emphasis on focal points through bold or highlighted text boxes in the online course were important to substitute for emphasis sometimes made through voice inflections or other methods in a typical classroom lecture. All lecture modules could

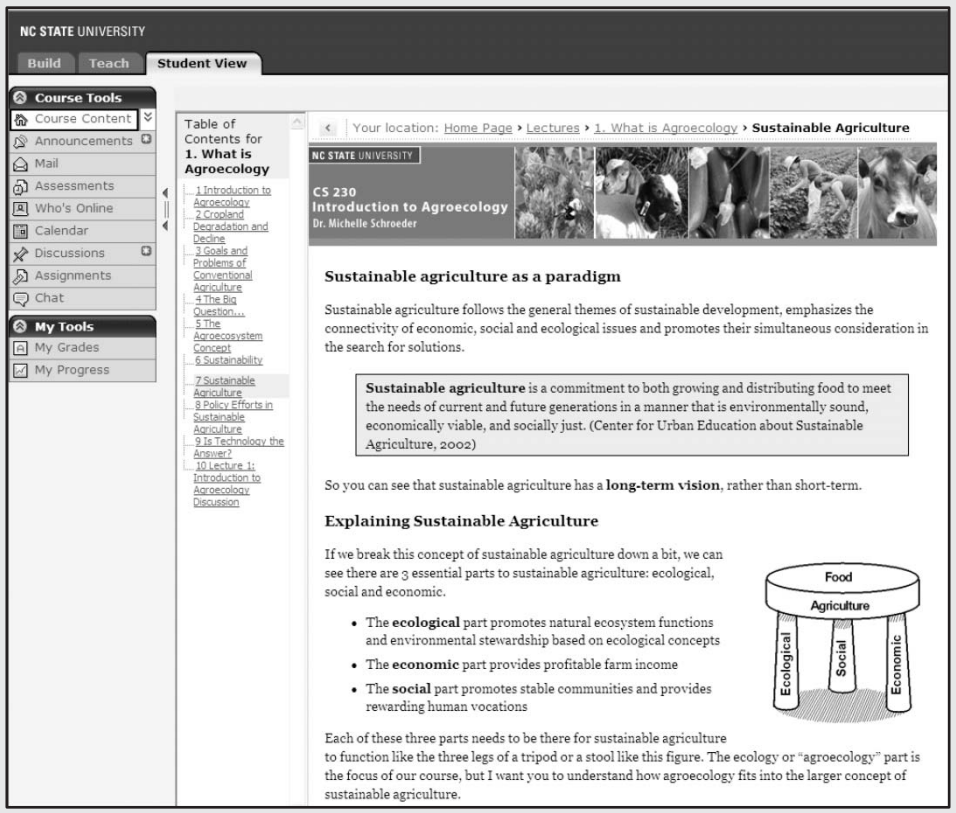

Figure 1. Screen shot from Introduction to Agroecology online lecture module from a student view of the course. The lecture module is organized in nine sub-themes and ends with a question for students to answer linking to a discussion board that is viewed in the Table of Contents (top left middle heading). Course tools (top far left) enable students to easily navigate to email, discussions, assignments, grade book ("My grades"), and other important course tools. The "Build" and "Teach" views are only accessed by the instructor where course materials, assignments, and grade book can be modified.

be printed for students to take separate notes on or to use for studying.

4. Use video clips and graphics to engage visual learners. Whenever there was an appropriate opportunity, the instructor would try to use videos or graphics to emphasize a point over text. Moreover, because agroecology as a discipline is very inquiry-based and multidisciplinary, the instructor often brought students to local farms or brought in sustainable agriculture experts from various disciplines into the face-to-face section of the course. These same learning activities were developed in the online course through the use of focused video clips. It was important to use the short video clips selectively to emphasize specific points or case study examples rather than using videos for all the lecture material. Moreover, the integrated learning modules described above allowed students to easily print the material, which would have been challenging to accomplish if all the lecture material was on video format. Additionally video files may be more difficult to update with new information but they very valuable to illustrate specific concepts in a visual format.

Specific course components include:

• Creation of a virtual farm tour of a local farm. The instructor worked with a local producer highlighted for his sustainable production practices and DELTA instructional video designers to develop short two to three minute video clips organized in topical themes on a virtual tour of the farm (e.g., "sustainable soil management," "managing crop diversity," etc).

• Development of a video clip that introduces the instructor to the students and provides overview of course.

• Development of four guest lecture videos, accompanied by PowerPoint presentations which introduced students to various sustainable agriculture researchers and experts from NC State and partner institution, NC Agriculture and Technical University.

• Increased use of figures, graphs and photos integrated in lecture modules to emphasize learning objectives.

5. Development of diverse opportunities for students and instructor to interact and communicate online. It was important to incorporate both graded and non-graded scheduled discussions throughout the semester to keep students engaged in material and with each other.

Specific course components include:

• Creation of six student-led discussions spread throughout the semester designed to develop students' critical thinking and oral communication skills on current topics in sustainable agriculture. These discussions were based on readings selected by the instructor that consisted of a farm case study and a scientific or theory paper that complemented a lecture module topic. All discussions occurred on a discussion board for a scheduled date over approximately a one week period. Student discussion leaders worked in small groups (2 to 4) and were expected to post questions the first day of the discussion and respond to other student posts. Students were encouraged to share individual experiences, opinions and respect the diversity of perspectives around the various topics. Students were graded both on leading a discussion and participating in discussions led by other students. Although there were always a few students that continually posted to the discussion

boards, many online students need an incentive to participate in discussions (Andresen, 2009), even if it consisted of only a few points.

• Integration of discussion questions into lecture modules that assessed periodic student comprehension of material.

• Creation of discussion board for student collaborative groups working on peer review or discussion assignments.

6. Diverse learning assessments and regular performance feedback. Various types of learning assessments were created to meet the needs of different learning styles in the online course. Immediate and individual feedback on the assignments also provided students with concrete information about their performance and encouraged continued student engagement.

Specific course components include:

• Development of five, short quizzes spread throughout the semester that focused on key topics from lecture modules. Quizzes were timed (15 minutes) and graded automatically, except when short answer questions were used. The instructor could incorporate individual feedback for each question and students could print graded quizzes with corrected answers and feedback.

• Use of a grade book that was continually updated and available for student access throughout the semester.

• Development of a topic paper assignment that assessed students' writing and analytical skills on an individually chosen topic agreed on by instructor. Students used research articles to support their topic and this assignment was broken into four graded components consisting of an outline, paper draft, student peer review, and final revision. After the paper drafts were turned in, the instructor paired students together in groups of two with similar topics and each student peer reviewed their partner's paper. The instructor reviewed and graded all papers and the students were given a grading rubric before they began writing and used this rubric to review peer papers.

• Use of cumulative final exam that integrated the use of multiple choice, fill in the blank and matching questions (similar to the quizzes) and a longer essay question. This was also timed (two hours) and the instructor could also provide individual feedback on each question.

7. Provide prompt feedback and personal contact with individual students within and outside of the online environment. It was very important to maintain continual communication with students and to answer students' questions over email promptly in the online course, more so than in a face-to-face course. It also became important to inform students at the beginning of the online course to expect a 24 to 48 hour response time from the instructor because some students expected instantaneous responses to their emails. Physically meeting with students (when possible) also became an increasingly important strategy after the course had been taught a few times to help keep students engaged in the class early on and help students feel that instructor is a real person that they can come see or call when they have questions.

Specific course components include:

• Required face-to-face meeting (or individual phone call if students could not meet) with students and instructor in the first week of the course.

• Use of email (within WebCT Vista® 4.0) to communicate with individual students about their progress or answer any questions. Instructor checked email daily and responded to student emails promptly. Emails were also sent to students early on in the course if instructor observed they were falling behind.

• Encouragement of students to come see instructor in person or call if they had any questions about the material or assignments throughout the semester.

Student Feedback and Evaluations

Student feedback and evaluations of the Introduction to Agroecology online course were compiled from NC State University official course evaluations from spring 2007 thru spring 2009 and from post-course surveys from fall 2005 thru spring 2009. Because the web-based evaluations for online courses were not initiated until spring 2007 at NC State, the instructor developed post-course surveys early on as a way to obtain student feedback and continually improve the course. Development of a post-course survey also allowed the instructor to develop questions about specific assignments and learning aspects of the course that a general university evaluation does not include. Moreover, individual ratings on overall student satisfaction alone are not enough to effectively evaluate student engagement and interaction, which is another motivation for assessing student responses to specific course assignment and instructional strategies through multiple question types (Likert vs. open ended questions) and course evaluations. Questions and mean student responses based on a Likert scale (same scale used for each evaluation) from the NC State course evaluations and instructor post-course surveys are displayed in Table 1. Questions from the post-course survey that were repetitive with the official course evaluation were omitted. The instructor also included a few open-ended questions on the post-course survey to capture additional student opinions and perspectives and a selection of the most predominant responses are displayed in Table 2. The predominant answers displayed were representing a selection of responses based upon criteria if 30% of all students responded with similar answers to the post-course survey from fall 2005 thru spring 2009 (excluding fall 2006). Average student response rate to the NC State course evaluations and the instructor

post-course surveys were 69% (N= 46) and 75% (N=65), respectively. Key findings from the evaluation and survey results are discussed below.

Overall, students found the online Introduction to Agroecology course to be a positive learning experience indicated by their high ratings from the NC State course evaluations ranging from 4.29 to 4.55 and from the instructor post-course surveys ranging from 3.97 to 4.64 (highest score is 5 for each survey) (Table 1). From the NC State course evaluations, some of the highest scores were in agreement with the statements concerning the instructor responded to the unique needs of distance learners, the instructor effectively used instructional technology, the instructor was receptive to student questions, the course improved subject knowledge and the course readings were valuable learning aids (Table 1). These student responses indicate that how an instructor communicates with students and what they do to create a collaborative learning environment is as important as the course materials or technology used online. Students expressed that they liked the course readings used in the student-led discussions, which were a mix of real farm case studies, scientific journal articles, and book chapters, because they reinforced the information from the lecture modules. The lowest score (but still 4.29, which indicates agreement) was found for the statement that the instructor gave prompt and useful feedback. Responses to this feedback question differed considerably (greatest variance). In initial semesters of teaching the course before the suggested response time was initiated, responses to this question were slightly lower. From the instructor post-course surveys, the highest score (4.64) was in agreement from a statement focused on the lecture module format and organization.

From instructor discussions with students and open-ended post-survey questions, students indicated that they liked having the educational goals at the beginning of each lecture module and the highlighted boxes of important bullet points because it helped them focus on the important aspects of each lecture module and effectively study for quizzes and the final exam. Many also indicated that they liked that the lecture module was divided into smaller, concise sub-sections because it didn't feel overwhelming to read or understand. The lowest score (3.97) received from a statement in the post-course survey was centered on the student-led discussion assignment. Responses to this question also differed greatly among students and some students may have not agreed with this statement because of lack of understanding about how to lead a discussion, frustration with working or communicating with other group discussion leaders or missing the purpose of communicating with peers. Some lack of agreement with this question did not agree with many of the positive responses about the discussions received in the open-ended questions of the post-course survey.

The most informative student feedback came from responses to the open-ended questions of the post-survey (Table 2). When students were asked what learning activities influenced their learning most in the course, many responded to an aspect of the learning modules. Some indicated they liked the shorter sub-sections, the educational goals listed in the beginning of each, the integrated discussion board questions, the different visual components from guest lectures, videos, figures, or how information was displayed in tables. A variety of students articulated that they liked the student-led discussions because the readings provided real-life examples of sustainable farming practices and gave students opportunities to interact and relate to each other (see Table 2). The instructor tried to limit posts to these discussions and provide an environment where students felt discussions were student-owned and not intimidated to articulate their opinions. Because student backgrounds and experiences with agriculture were very diverse, the instructor always reminded students about respecting different opinions before these discussions occurred. This diversity of perspectives never posed a problem in any of the discussions and quickly become a strength of the course when these diverse student experiences were valued in this way. There were only a few responses (less than 30% and therefore not displayed) to this question found the peer review process to influence their learning. Although the peer review process and grading rubric was clearly explained, some students lacked confidence in their ability to critique their peers or found the instructor's review more valuable than their peers. Although not highly valued among students, the instructor continues to utilize this educational method for their topic paper assignment because of the skills gained through the process of peer review and revision of writing, even if it didn't enhance student interactions to a great deal online.

When students were asked to give advice to future students in the course, many responses were simple and clear messages to stay on top of the syllabus, lecture modules, and assignment due dates (Table 2). Many students said to make time for this online course and treat it like “real” class, similar to face-to-face courses. Even though there were students who had taken online courses prior to this course, many perceived online courses weren't as real or as rigorous as face-to-face courses. With that initial attitude, some students were surprised by the expectations in this online agroecology course and had a harder time keeping up with the course assignments. The instructor made additional efforts to send reminders about assignment deadlines and expectations, email individual students and enter grades in the online grade book promptly with individual feedback. Sometimes a zero grade for a smaller assignment early in the course was enough to motivate and remind students to keep up with the course.

Student responses to the post survey questions also emphasized to ask the instructor questions and meet with the instructor when needed. When students were asked for any additional comments or suggestions in the post survey there were a diversity of responses that ranged from making the time for taking the quizzes longer (the instructor did increase the time for these after that suggestion) to commenting how easy it was to fall behind in an online class. A number of students also responded how much they enjoyed communicating with other students in the class and that discussions made the course more "social and interesting." This emphasized the value of creating opportunities for communication and interactions among students and the instructor in the online class. The instructor valued these post-survey questions greatly since many of these responses and ideas for improvement would not have been evident from the NC State course evaluations.

Table 1. Course Evaluations Complied from NCSU Evaluations from Spring 2007x thru Spring 2009 and from Post-Course Survey Questions Developed by Instructor from Fall 2005 thru Spring 2009 (excludes fall 2006). Open-ended Questions from Post-Course Survey are Displayed in Table 2 and Repetitive Questions with the NCSU Course Evaluation were excluded. The Response Scale was the Same for Both Evaluations.

Evaluation Questions	N	M[y]	SD
Official NCSU course evaluation questions:			
1. Overall, the instructor created an effective distance learning environment.	32	4.42	.68
2. The instructor responded to the unique needs of distance learners.	32	4.54	.65
3. The instructor provided sufficient opportunities for interaction among students.	32	4.48	.68
4. The instructor effectively used instructional technology.	32	4.54	.68
5. The instructor gave prompt and useful feedback.	32	4.29	.90
6. The instructor was receptive to students questions and concerns.	32	4.55	.61
7. The instructor stated course objectives/outcomes.	32	4.40	.75
8. This course improved my knowledge of the subject.	32	4.53	.52
9. The course readings were valuable aids to learning.	32	4.54	.63
10. The course assignments were valuable aids to learning.	32	4.51	.55
Post-course survey questions:			
1. I felt the format of the lecture modules was organized and made clear points.	65	4.64	.42
2. I felt the quizzes were fair and tested what we learned in the course.	65	4.11	.80
3. I felt the student-led discussions were useful and I would keep them as an assignment.	65	3.97	.68
4. Writing the topic paper was a positive experience and I learned a lot about an aspect of agroecology.	65	4.14	.68
5. Sufficient instructions were given to complete all assignments.	65	4.38	.69

[x] NCSU course evaluations of online courses were not made available until spring 2007.
[y] Scale: 1= Strongly disagree, 2= Disagree, 3= Neither agree nor disagree, 4= Agree, 5= Strongly agree

Lessons Learned

After eight consecutive semesters of teaching this Introduction to Agroecology course online and analyzing student responses from various evaluation and survey questions, there are number of lessons learned that can be valuable to the development of online courses in any discipline. The lessons learned described below are meant to provide ideas for successful strategies and a running start to individuals new to developing online courses. They are also meant to stimulate those currently teaching online and create a dialogue about effective instructional strategies used in web-based learning. Although these lessons learned were developed from experiences teaching this online agroecology course, several of these parallel the Seven Principles for Good Practice in Undergraduate Education (Chickering and Gamson, 1987) and therefore germane to traditional face-to-face courses as well.

1. Learn about the resources available at your institution and from others currently teaching online. This is a fundamental step for those interested in developing online courses with no prior experience. Not understanding the technology or resources needed for teaching online is a primary obstacle instructors identify for developing new online courses (Maguire, 2005). Many institutions have distance education staff, departments and resources (including funding) that can help instructors design new online courses. It's also important for faculty currently teaching online courses to communicate across disciplines and share similar challenges and educational strategies in a collaborative learning community. Such networks may exist or can easily be formed and supported within many intuitions or across institutions.

2. Field of dreams myth. Although some may feel if "you build it, they will enroll and succeed," for most instructors currently teaching online courses, they understand the value and success of the course will depend upon how it can evolve with various student learning styles and keep up with changing course information and technology. Online courses should be developed to accommodate various types of changes

Table 2. Student Responses from Open- ended Questions on Post-Course Survey Compiled from Fall 2005 thru Spring 2009 (excludes fall 2006). Selected Responses Represent Predominant Responses from 30% or Greater from all Students for Each Question

1. What learning activities most influenced your learning? Please describe
• *I liked the variety of using recorded lectures as well as lecture modules (the goals stated for each lecture module was very helpful). I think it was helpful to have quizzes along the way to measure how much I had learned. However, I was always very nervous about the quizzes since they were timed.*
• *The lecture questions and student-led discussions provided the most influence on my learning because it required me to interact with my classmates and to use critical thinking skills.*
• *I liked the student-led discussions because they gave us real-life examples of farming practices. It also gave every student a chance to voice their opinions and hear those of others in the course. It helped each student relate to one another.*
• *The shorter sections of the lecture modules made it a task that was not daunting. The charts and pictures that accompanied the lecture modules helped. As a visual learner, these helped me learn and remember more of the notes.*
• *I liked having the educational goals listed at the beginning of each lecture module. I also liked the guest lecture videos, just to hear the material audible helped. I also liked whenever information was displayed in a table or chart form. This really helped me visually and mentally organize the information.*
• *All the videos- I'm a visual learner.*
2. What words of advice would you offer to a future student in this online class?
• *Use the course syllabus and immediately mark the assignments and due dates in your personal calendar. Choose 3 hours per week as if you had class and do your work then, just like you were attending a traditional class.*
• *Check WebVista daily, do not get behind and really put the effort into the class discussion as it can benefit everyone.*
• *Keep the syllabus posted near your computer and put sticky notes somewhere as reminder for assignments. Otherwise, out of sight is out of mind.*
• *Do the work on time. Keep up with the lectures/discussions/assignments and paper. It's simple but it makes the class and material much more enjoyable and stress free. Also, get involved and ask questions. It's a lot easier to ask questions one would otherwise probably not ask in front of a class full of peers.*
• *If you have a question, ask. The teacher is always willing to help, you just must ask for it.*
3. Any additional comments or suggestion on any aspect of the course?
• *At first I did not see any value to communicating with other students, but eventually I found that I was reading everything that they were posting! This "social" part of the course actually made it more fun and interesting.*
• *The topics are presented in an easily-understood manner with picture, graphs, maps, videos and relevant assigned readings. Some students may feel overwhelmed by the amount of work involved but I enjoyed the feeling of being challenged.*
• *I felt I slowly fell behind as the semester went on. I know it is my responsibility to keep up with the course material, I just found it difficult to balance as online course with a full schedule of actual classes.*
• *I would have liked more time on the quizzes. I felt anxious when taking them and therefore did not do very well on those.*
• *The length and diversity of lecture materials is efficiency and effectively used in a way that students are not bombarded with readings that they never read and never use. I would also like to add that agroecology should be a required course for all students in CALS especially with the changes and needs that are arising in agriculture.*

easily and instructors must continually strive to understand the specific course audience and their needs and challenges (Mupinga et al., 2006). Additionally, new online courses may not have immediate enrollment and may be slower to build student interest and awareness than traditional face-to-face courses. Because of this instructors may need to advertise online courses in new ways within their institutions and outside the institutions to networks of similar disciplines.

3. Online courses are not static and must be updated regularly to be relevant and interesting. Students can see right through course materials and information that have not changed in years. For this reason, it is essential to consider a course format, delivery of materials (e.g., how to update information in audio or video files), and learning environment that facilitates change and updating specific information with ease early in the development of an online course. Updating the course with relevant materials, discussing current news related to course topics, engaging different external experts (farmers, extension agents or related faculty in the case of this agroecology course) will connect the course to real-life topics and keep students engaged and interested in the course.

4. Learning is a social process– Instructor facilitated and student owned. Activities and assignments for online courses should be developed to promote active student participation in their learning (Phillips, 2005). Working with others, sharing one's ideas, and responding to others' often increases student involvement in learning. This can be achieved no matter what discipline; through providing diverse opportunities for communication and engaging students in discussing real-world problems and sharing their own experiences through formal or informal assignments. This can also be accomplished even if the online class size is large through creating smaller student learning communities of two to five students focused on specific questions or topics. In addition to utilizing discussion board, chat or videos described in this course, there are new technologies, such as virtual worlds and use of avatars that can provide students a shared virtual environment where they can see, hear and modify artifacts together which

can also work to engage students in a collaborative learning community (Franceschi et al., 2009). Engaging students in discussions and interactions can stimulate teaching and learning in online environments, but it must be developed carefully to achieve course goals and learning objectives no matter what technology is used (Zhu, 2006). Development of an online learning community is fundamental goal where good learning is collaborative and social, not competitive and isolated (Chickering and Gamson, 1987).

5. Set educational goals, guidelines, and schedule and stick to them. Clearly stating the educational objectives for the overall course, each lecture module and individual activities not only makes the expectations understandable and achievable for students but also allows instructors to effectively assess them. Clear and obvious assignment due dates and descriptions are essential to alleviate student frustrations in online courses, where information may seem less apparent or accessible than traditional classroom courses (Hara and Kling, 2001).

6. Technology is helpful but not enough alone to demonstrate successful student learning online. Technological tools and programs that are used in online courses need to reflect specific educational goals within the course. Educational technology, programs and communication tools are increasing at a rapid rate, much faster than most instructors can keep up with. It is enticing to implement the latest technology in online courses; however, each tool should only be used for a specific purpose or enhancement of a course educational objective. It is much easier and worthwhile to assess what educational technology, communication tool or learning environment is the best to help achieve specific learning objectives and enhance student active engagement with the material. When assessing online course effectiveness, Rovai and Barnum (2003) found only active interaction was a significant indicator of an online student's perception of their own learning. Moreover, many student frustrations in online courses are derived from pedagogical issues rather than technical ones (Kanuka, 2001). Our most important goal, therefore as online educators is to develop sound pedagogical strategies to enhance active learning first and then the appropriate technologies to accomplish this will follow. With that in mind, it is also important to understand the various student learning styles, backgrounds, any accessibility or other specific challenges to select the most appropriate technology or communication tool for the specific course audience (Mupinga et al., 2006).

7. Prompt and consistent feedback and assessment is fundamental. Timely instructor responses to student questions and frequent communication, especially early in the course, are essential for students to assess performance. Prompt and informative feedback as well as additional care in creating course materials, assignments and instructions that are clear, well organized and easily accessible can also help decrease student's sense of isolation and frustration in an online course (Bray et al., 2007; Hara and Kling, 2001).

8. Encourage as much personal communication and face-to-face interaction as possible. Face-to-face meetings (when possible) and personal communication through phone calls or individual emails has become an increasingly important means of helping students feel engaged in this introductory agroecology course. Early and frequent personal communication with students, beyond just email, helps promote an environment where students feel that the instructor is concerned about their individual needs and can be easily contacted with questions about any aspect of the online course (Minich, 1996). Moreover, a meeting at the beginning of the course with all the students and instructor allows opportunities for students to meet and interact with each other in person, which encourages more student communication throughout the online course.

9. Online courses require evaluation and need to be valued for promotion and tenure. Although all would agree with this statement, we have been slower to design and implement effective evaluations for online courses. The way we evaluate online courses and the questions we ask should differ from traditional face-to-face courses. Moreover, as collaborative and interactive teaching strategies have been shown to increase the effectiveness of student learning online, they also need to be specifically evaluated, which means rethinking traditional evaluation methods (Swan et al., 2006). As online instructors, we need to continually assess what and how we are teaching to improve the learning experience for students. Achieving excellence in online education at the individual or institutional level requires adequate support, training for faculty and recognition of value for promotion and tenure responsibilities, similar to face-to-face courses (Bray et al., 2007).

Summary

The student evaluations and feedback accumulated over eight semesters from the Introduction to Agroecology online course demonstrate the value for opportunities for active and interactive learning, frequent and constructive instructor feedback, clear expectations and personal communication and guidance in an online learning environment. Although all of these are also essential to successful face-to-face courses, activities and instructional strategies to enhance active and interactive learning must be prominent in the design and implementation of online courses to be successful (Fulford and Zhang, 1993; Rovai and Barnum, 2003). Online students need to feel that they are part of an interactive and collaborative learning community, even in virtual space. The instructional strategies to enhance

interactive and active learning, evaluation process, and lessons learned described here are general and diverse enough to be easily utilized by a variety of online courses in various stages of development. This paper is also meant to stimulate further communication on successful pedagogical strategies to online teaching and learning.

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Valuing Teams: What Influences Student Attitudes?

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Abstract

The ability to work with others is a skill highly valued by employers. Students often work in groups for class projects, but extensive teamwork is usually limited. This research explores student attitudes toward working with peers through a "Value of Teams" survey administered in three introductory and two intermediate level economics courses between fall 2007 and spring 2009. The extent to which a semester in an intensive team-based learning environment changes student attitudes about working with peers and whether or not attitude changes persist beyond that semester are both assessed. In addition, the degree to which student attitudes vary in relation to demographic characteristics and academic ability is estimated using ordered probit models. Prior experience with teamwork in an academic setting significantly influences initial attitudes, but attitudes do not generally vary significantly across students based on gender, age, or class levels. While a negative correlation exists between grade point average and student attitudes toward teamwork, attitudes improved over the course of the semester for nearly every demographic group, some more than others.

Introduction

The ability to work with others and communication skills are two of the traits employers most desire in prospective employees, a fact that has changed very little over time (Lizenberg and Schneider, 1987). The National Association of Colleges and Employers annual survey of employers consistently finds "teamwork skills" and the ability to work with others among the top five qualities employers want in employees. Good teamwork requires effective communication, regular interaction, mutual respect, and trust. Teams are more than just groups working together. Teams are comprised of a small number of people with complementary skills who work cooperatively to achieve a common goal and hold themselves mutually accountable.

Perhaps the most common experience students have working with others in an academic setting is in group projects or group activities. Such experiences are not always viewed positively by students. Impediments to effective teamwork range from free-riding to overly dominant personalities to group apathy and generally poor leadership. Many of these problems arise as a result of either one-time use of groups or constantly changing groups for daily cooperative activities; both of these limit the opportunity to build trust and synergy. Team-based learning attempts to address these impediments to effective group interaction by keeping students in the same group throughout the semester and utilizing collaborative activities daily in class. In such a context, "teams" are distinct from and more effective than "groups." But it is only after some period of time, as students begin to trust each other and develop a commitment to the group that the group becomes a team (Michaelson, 2002). Just as in a work environment where a team cannot be built by having a retreat for a couple of days each year, student teams are not built by doing a group project each semester. Team building is something that must be done on a regular basis.

Numerous researchers of cooperative learning have found both cognitive and social and emotional gains from group learning (Barkley, et al., 2005; Natasi and Clements, 1991; Millis and Cottell, 1998). Working in small groups improves higher level critical thinking skills and improves students' motivation and attitudes toward the subject matter (Johnson et al., 1991). Cooperative learning enhances communication skills (Johnson and Johnson 1987; Sharan and Sharan, 1992) and results in greater achievement (Johnson, et al., 1990; Slavin 1987; Holtfreter, et al., 1997). While research on group learning in higher education is not as extensive as in K-12 education, learning gains have been found at all levels. In a study of managerial finance students, Wilson (2005) found significant improvements in decision-making from use of team-based exercises in senior and graduate level courses. In a meta-analysis of undergraduate science, mathematics, engineering, and technology (SMET) research, Springer, Stanne, and Donovan (1999) found significant favorable impacts on academic achievement, attitudes toward learning, and persistence in SMET courses and programs from cooperative small group learning.

The cooperative/collaborative learning literature focuses on how to structure successful collaborative learning environments and their impact on learning and student satisfaction with their learning, but few researchers have analyzed student attitudes toward small group learning itself. Glass and Putnam (1989) and Holtfreter and Holtfreter (2002) determined that students prefer cooperative learning to the more traditional lecture/discussion format, but did not measure changes in attitude over time. Using a variety of measures, Levine et al. (2004) found that

student attitudes about working in teams increased following their experiences with team learning in a clinical psychiatry course. Parmelee et al. (2009) compared changes in medical student attitudes toward team based learning during the first two years of medical school, finding an improvement in overall satisfaction with the team experience. None of these studies, however, analyze what influences students attitudes toward working with others prior to beginning a cooperative learning experience. Attitudes are most often formed on the basis of experiences, both positive and negative, but differences in personalities, learning styles, and backgrounds of students will all play a role. Once formed, attitudes shape a person's actions, and affect their subsequent experiences, producing a continuous feedback between attitude and behavior. Having some recognition of this diversity of factors influencing attitudes toward group interactions may help instructors design more effective collaborative learning environments.

Three aspects of students' attitudes toward teamwork are assessed here. First, whether or not student attitudes about working with others change after a semester of working in a team-based learning (TBL) class is measured by comparing responses to a "Value of Teams" survey from the beginning of the semester and end of the semester. Next, the enduring impact of a TBL experience on attitudes is measured by surveying students in an upper division class for which a significant proportion had a lower division TBL courses as a prerequisite. Finally, the extent to which student attitudes toward teamwork are affected by age, grade level, gender, and prior experience working in groups is estimated.

Methods

In all of the courses analyzed, students worked in the same team of five to seven students throughout the semester, with daily interaction involving both graded and un-graded activities. Team-based learning is learner-centered but uses a very structured individual and group accountability process. At the start of each unit, readiness assessment tests encourage student preparation, while group assessments and activities hold individuals accountable to peers. Individual homework assignments and end of unit tests ensure students cannot free-ride on efforts of teammates. In the courses analyzed here, teams are formed to take greatest advantage of student diversity, accounting for differences in grade point average, major, and class level. Geographic and gender diversity are also considered in team formation. For more information about TBL, see Michaelsen et al., (2002).

All courses analyzed were taught by the same instructor. At the beginning of the fall 2007 and 2008 semesters, a survey was administered to 142 students in three introductory level agricultural economics courses. Seven of the students failed to complete the second page of the survey so were not included in the analysis. This survey is a modified version of an instrument developed at Baylor College of Medicine (Levine et al., 2004) and includes twelve statements about working with peers both in the classroom and in a career as shown in Table 1. Students were asked to indicate the extent to which they agreed with each statement on a scale of 1 to 5, with 1 being "strongly disagree," 2 being "disagree," 3 being "neither agree nor disagree," 4 being "agree," and 5 being "strongly agree."

Students were also asked whether or not they had previous experience with "team based learning" and if so, to rate the quality of the experience on a scale of 1 to 7 where 1 was "horrible" and 7 was "excellent." Students were not provided with any details about the implementation of TBL in the course they were just starting, nor were any details about their prior experience collected other than their subjective assessment of its quality. This subjective assessment, that is, students' feelings about their prior experiences, as opposed to any details about their experience, is what is expected to influence their attitude about working with peers in the classroom and work settings. Students were also asked how familiar they were with the instructor's teaching methods on a scale of 1 to 7, where 1 was "not at all familiar" and 7

Table 1. Value of Teams Survey Statements[a]

1. The ability to collaborate with my peers will be necessary if I am to be successful as a student.
2. It is a waste of time to work in groups.
3. I have a positive attitude about working with my peers.
4. The ability to work with my peers is a valuable skill.
5. In my career, I can be as successful working alone as working with others.
6. Collaborating with my peers will help me be a better student.
7. Collaborating with my peers will help me in my career.
8. Solving problems in a group is an effective way to practice what I have learned.
9. Solving problems in a group is an effective way to learn.
10. Working in teams in class is productive and efficient.
11. Group decisions are often better than individual decisions.
12. Solving problems in groups leads to better decisions than solving problems alone.

[a] These statements were adapted from an instrument developed at Baylor College of Medicine (Levine et al., 2004).

was "very familiar." Demographic information collected includes age, gender, and class level, while academic information includes grade point average, major, and whether or not the student had a scholarship that required maintaining a B (or better) grade point average.

This same survey was also administered to 54 students in two intermediate level natural resource economics courses in which just over 60% of the students had a previous TBL experience from the same instructor in one of the introductory level agricultural economics courses, although not necessarily during the immediately preceding semester. Finally, during the last class session of the semester, students in all of these classes were asked to respond to the same survey statements about working with peers that they completed at the beginning of the semester.

Data

Demographic information is summarized in Table 2, disaggregated by course section. About one-third of APEC 202 Introduction to Agricultural Economics students were freshman, one-third were sophomores, and the remainder upper classmen. Of the forty students in APEC 202, one quarter were animal science or pre-veterinary science majors, 17.5% were food science majors, 10% were agricultural economics majors, and no other major had more than three students. Averaging across the two sections, APEC 257 Natural Resources, Environment, and Economics students were primarily sophomores (33%) and juniors (42%) majoring in wildlife and fisheries biology (29%), environment and natural resources (36%), or parks and protected areas management (21%). APEC 202 had a much greater proportion of female students at 67% to only 33% male, while in APEC 257 those proportions were reversed, with 67% male students and only 33% female between the two classes. APEC 202 also had a higher percentage of students on academic scholarships than APEC 257 (54% versus 37%) yet average GPA among the non-freshmen was not significantly different across the three classes. This difference in scholarships is likely due to the higher percentage of freshman in APEC 202, many of whom lose their state grade-based scholarships during their first year of college.

Table 2. Summary Demographic Information by Class[a]

	APEC 202 F07 (n=40)	APEC 257 F07 (n=44)	APEC 257 F08 (n=51)	CRD 357 S08 (n=27)	CRD 357 S09 (n=27)
Age (years)	19	21	20	21	21
Male	33%	61%	72%	56%	60%
Female	67%	39%	28%	44%	40%
Freshman	34%	2%	12%	0%	0%
Sophomore	37%	32%	33%	48%	5%
Junior	23%	49%	37%	37%	61%
Senior	6%	17%	18%	15%	35%
GPA (4.0 scale)	2.93	3.00	3.04	3.08	3.22
Scholarship[b]	54%	34%	40%	52%	56%
Prior TBL experience	80%	77%	92%	100%	80%
Neutral/bad prior TBL	21%	29%	30%	7%	25%
Familiar with instructor's style	10%	14%	10%	74%	47%

[a] APEC 202 is "Introduction to Agricultural Economics," APEC 257 is "Natural Resources, Environment, and Economics," and CRD 357 is "Natural Resource Economics"
[b] Scholarship indicates if the student has a scholarship requiring maintenance of a B (or better) average.

Like APEC 257, a significant proportion of CRD 357 Natural Resource Economics students are sophomores (26%) and juniors (49%) although 25% are seniors. Many of these students take APEC 257 during the fall semester of their sophomore year and CRD 357 during the following spring semester. Compared to the other two classes, CRD 357 has more gender balance with 58% males and 42% females and somewhat higher average grades at 3.15.

High percentages of students indicated having prior "team based learning" experience in all of the classes with only 13 out of 189 rating their experience negatively (less than 4 on a scale from 1 to 7). Another 25 gave their experience a neutral rating, while the majority rated their experience relatively good, with about 9% rating it a 7, 29% rating it a 6, and 40% rating it a 5. A much higher percentage of students in CRD 357 were familiar with the instructor's teaching style from having taken either APEC 202 or APEC 257 from her. Those students in APEC 202 and APEC 257 who indicated familiarity with the instructor's teaching style had likely taken an introductory University Success Skills course from her.

Results and Discussion

Analysis of Attitudes over Time

The average responses by class at both the beginning and the end of the semester are summarized in Table 3a for the 200 level courses and Table 3b for CRD 357. These tables also indicate whether or not there was a statistically significant improvement in attitudes as measured by the response to each of the survey statements using a one-tailed t-test. A one-tailed test was used rather than a two-tailed test because attitudes were anticipated to improve between the beginning to the end of the semester.

The results suggest that for the 200 level students, attitudes toward working with others changed significantly over the course of the semester. At the end of the semester, these students were less likely to agree that working in groups is a waste of time and more likely to agree that working in teams in class is productive and efficient. They were also more positive about the quality of group versus individual decisions. Students in two out of three of the classes were more likely to agree that solving problems in groups is both an effective way to learn and an effective way to practice what has been learned. Fall

2007 APEC 257 students were more likely to agree that working with peers is a valuable skill and these students had a more positive attitude about working with peers in general by the end of the semester. Fall 2008 APEC 257 students were more likely to agree that collaborating with peers would help them become better students. Few of the responses by CRD 357 changed significantly, but the students' attitudes started at a higher level relative to the other classes, with not much room for change in survey responses ranked on a scale of 1 to 5. Yet, responses in the spring 2008 class were significantly more positive regarding the quality of group decisions at the end of the semester and both CRD 357 classes were more positive in response to the statement, "Solving problems in groups leads to better decisions than solving problems alone."

In order to compare the enduring effect of TBL experiences on attitudes and team interactions, average responses of CRD students who had previously taken a TBL course with the instructor are compared to the average responses of the students in the introductory level APEC courses. Although survey responses were anonymous, students' indication of being very familiar with the instructor allowed these students to be separated from those who had not previously had a course from the instructor. Cross checking course rosters confirmed that 60% of the CRD students had taken either APEC 202 or APEC 257 taught using TBL, but only about a third of those had taken it during the previous semester. All but one student had taken the introductory level course within the previous three years. These CRD students' responses at the start of the semester are compared to APEC students' responses at both the start and the end of the semester. Results are shown in Table 4.

Significant differences exist between the starting attitudes of the two groups of students, with statistically significant responses to 9 out of 12 questions, suggesting that the CRD students enter the class with a more positive attitude about working in teams and with peers. Comparison of the end-of-semester 200 level APEC student responses to the beginning-of-semester 300 level CRD student responses indicates almost no differences, suggesting that the changes in attitudes achieved over the course of the first semester of TBL carry over to subsequent courses. The only response that was significantly different was for the statement, "Group decisions are often better than individual decisions" and it was only significant at the 10% level. However, this gap was closed by the end of the semester.

Table 3a. Survey Responses and Changes by Class: Introductory Level Courses

	APEC 202 F07			APEC 257 F07			APEC 257 F08		
Statement	Start	End	**t-statistic for difference**	Start	End	**t-statistic for difference**	Start	End	**t-statistic for difference**
1	4.35	4.49	**0.97**	3.94	4.42	**3.16****	4.12	4.33	**1.56***
2	2.23	1.73	**-2.62****	2.18	1.91	**-1.85****	2.27	2.07	**-1.35***
3	4.35	4.24	**-0.74**	4.00	4.22	**1.70****	3.94	4.07	**0.92**
4	4.50	4.57	**0.53**	4.39	4.67	**2.47****	4.39	4.53	**1.18**
5	2.80	2.86	**0.24**	3.08	3.09	**0.04**	3.12	2.96	**-0.78**
6	4.13	4.24	**0.93**	3.96	4.13	**1.16**	3.92	4.18	**1.89****
7	4.28	4.41	**0.95**	4.18	4.27	**0.72**	4.27	4.32	**0.43**
8	4.20	4.41	**1.56***	4.14	4.20	**0.44**	3.96	4.32	**2.53****
9	4.05	4.27	**1.45***	3.92	4.13	**1.21**	3.92	4.14	**1.50***
10	3.70	4.03	**1.76****	3.57	3.91	**1.95****	3.27	3.95	**3.81****
11	3.60	3.97	**1.73****	3.69	4.11	**2.58****	3.59	4.28	**4.42****
12	3.68	4.03	**1.90****	3.73	4.07	**2.20****	3.69	4.23	**3.54****
N =	40	37		44	41		51	57	

Note: * and ** indicate statistically significant at the 10% level and 5% level for a one-tailed test.

Table 3b. Survey Responses and Changes by Class: Intermediate Level Courses

	CRD 357 S08			CRD 357 S09		
Statement	Start	End	**t-statistic for difference**	Start	End	**t-statistic for difference**
1	4.22	4.28	**0.40**	4.19	4.26	**0.41**
2	1.96	1.88	**-0.39**	2.08	2.19	**0.52**
3	4.15	4.36	**1.17**	4.04	3.93	**-0.55**
4	4.48	4.64	**1.14**	4.37	4.41	**0.23**
5	3.15	3.20	**0.17**	3.07	3.22	**0.51**
6	4.19	4.28	**0.50**	3.81	4.04	**0.97**
7	4.37	4.48	**0.68**	4.19	4.26	**0.39**
8	4.30	4.24	**-0.29**	4.22	4.00	**-1.14**
9	4.26	4.36	**0.62**	3.96	3.89	**-0.35**
10	4.00	4.12	**0.55**	3.74	3.52	**-0.91**
11	4.00	4.28	**1.38***	3.96	4.15	**0.86**
12	4.07	4.40	**1.78****	3.78	4.15	**1.85****
N =	27	24		27	27	

Note: * and ** indicate statistically significant at the 10% level and 5% level for a one-tailed test.

Table 4. CRD Students with Prior TBL Experience with Instructor Versus 200 Level Students

	200 Level APEC Courses		CRD 357	t-statistic for CRD v APEC at the start	t-statistic for CRD v APEC at the end
Statement	Start	End	Start		
1	4.12	4.40	4.34	1.86**	-0.50
2	2.23	1.93	1.97	-1.48*	0.22
3	4.08	4.17	4.14	0.46	-0.21
4	4.42	4.58	4.59	1.56*	0.33
5	3.01	2.98	3.00	-0.06	0.10
6	3.99	4.18	4.10	0.80	-0.56
7	4.24	4.32	4.34	1.38*	0.71
8	4.09	4.30	4.34	1.98**	0.34
9	3.96	4.17	4.21	1.77**	0.24
10	3.50	3.96	4.03	3.45***	0.50
11	3.63	4.14	3.93	1.85**	-1.29*
12	3.70	4.12	4.03	2.36***	-0.62

Note: *, **, and *** indicate statistically significant at the 10%, 5%, and 1% level respectively for a one-tailed test.

Demographic Analysis of Attitudes

To determine the role demographics, academic ability, and prior TBL experiences play in influencing student attitudes toward working with peers, ordered probit models are estimated for each of the survey statements. For this study, choices range from 1 to 5 in response to each of the survey statements, with a higher number indicating a higher degree of agreement with the statement. The cumulative model has the form

$$\Pr(Y \le 1 \mid x) = F(x'\beta)$$

$$\Pr(Y \le i \mid x) = F(\alpha i + x'\beta), 2 \le i \le 5$$

where β is a vector of parameter estimates, F is the cumulative distribution function, x is the vector of explanatory variables including an overall intercept term, and $\alpha 2,\ldots,\alpha 5$ are intercept shift parameters.

Probit models were estimated for both beginning-of-semester responses and end-of-semester responses. Explanatory variables for student responses include demographic variables, academic ability, and prior experience working with peers. Demographic variables included in the survey are age, class level, and gender. Age and class level are highly correlated, so only age is included in the regression. Age also likely better reflects students' experiences that might influence receptivity to TBL than class level, but results were not significantly different when class level was used instead of age. Indicators of academic ability include grade point average and whether or not the student had an academic-based scholarship. However, grade point averages do not exist for entering freshman and 85% of the twenty freshmen in the courses had scholarships. Thus, a dummy variable was created to indicate whether or not each student was a freshman and grade point average was used to indicate academic ability for all non-freshmen. The scholarship variable was also tested as a proxy for academic achievement; however results were not significantly different when scholarship was used instead of GPA. Thus Y is estimated as: Y=f(age, gender, freshman, gpa) where age ranges from 17 to 54 years old, gender equals 1 if the student is male and 0 if female, freshman equals 1 if the student is a first semester freshman and 0 if not, GPA is grade point average for students who are not first semester freshmen and ranges from 1.69 to 4.0 on a four point scale.

One of the objectives of this analysis is to determine if a semester of exposure to TBL changes attitudes toward working with peers; therefore, one set of regressions was run using survey statement responses from just APEC 202 and APEC 257 students, for both the beginning of the semester and the end of the semester. For comparison, the 357 classes are pooled with the 200 level class data. One set of regressions was run using just age, gender, a freshman dummy, and cumulative grade point average as explanatory variables. A second set of regressions was run for the start of the semester responses adding two additional explanatory variables. The first is a dummy variable that takes a value of 1 if the student had prior TBL experience that was not positive (rated 4 or less on the 7 point scale). The second is a dummy variable that indicates whether or not the student was familiar with the instructor's teaching style at the start of the semester (rated 5 or higher on a 7 point scale). This variable is used to determine if students' prior experience with the instructor's use of TBL biased their attitudes relative to their peers.

Most of the coefficient estimates are not statistically significant. Expanding the data set from just the 200 level students to also include the 357 students increased the statistical significance of the coefficients on the variable related to prior TBL experience and the variable related to familiarity with the instructor's teaching style. Given that 60% of the students in CRD 357 but only 12% of the 200 level students were familiar with the instructor, and nearly all of the 357 students had some sort of TBL experience, it is not surprising that the significance of these variables increased. Other than that though, the statistical significance of only one other variable in only one equation changed after adding the 357 data, changing from significant at the 10% level to not significant. Adding the two variables related to prior experience did not change the sign or statistical significance of any of the other variables. Interestingly, there were no significant differences in age, gender, GPA, or the percent who were freshman between those with good and those with less than good prior TBL experience. There were also no significant differences in gender or grade point average between those students who were familiar with the instructor's teaching style coming into the class and those who were not.

Given the volume of regressions, only the estimates using all of the data and all of the variables for the beginning of the semester are shown here, in Table 5. (Seventy-two regressions were run. First, regressions were estimated using only 200 level data then using both 200 and 300 level data for beginning of semester responses. This was repeated for each of the twelve survey questions and repeated for each question with the two additional variables related to prior TBL experience. Finally, this was repeated for each question for the end of semester responses with only the 200 level data and again with all the data.) Other results are available upon request. In general, there appear to be few differences related to age or gender in terms of attitudes toward working with others at the beginning of the semester. Age alone was not statistically significant for any of the statements. On the other hand, freshman were less likely to agree that it is a waste of time to work in groups, yet also less likely to agree that group decisions are often better than individual decisions. Males were less positive than females in response to two statements: "The ability to work with my peers is a

valuable skill," and "Solving problems in a group is an effective way to practice what I have learned." In contrast, grade point average was statistically significantly correlated with less positive student responses to four out of twelve of the survey statements (statements 3, 8, 10, and 12).

Having had a less than positive prior group or team learning experience significantly and negatively impacted students' attitudes about working with others, with this variable statistically significant for every statement except, "The ability to work with my peers is a valuable skill" and "In my career, I can be as successful working alone as working with others." Finally, familiarity with the instructor's teaching style before starting the class improved students' attitudes about working with others, with significantly more positive responses to ten of the twelve statements.

End-of-semester regression results suggest even more difference in attitudes related to both demographics and academic ability. Age was statistically significant for three statements, gender for two, and GPA was statistically significant for nine out of twelve statements. Closer inspection of the responses, however, reveals that the attitudes of students across nearly all of these categories became more positive. So while differences may exist at the end of the semester among students of different ages, between males and females, or among students based on grade point average, attitudes improved over the semester for nearly all of these groups. Unfortunately, since survey responses were anonymous and not individually coded, beginning of semester and end of semester responses could not be paired, so it is not possible to determine the significance of these changes using regression analysis. Instead, categorical response averages are reported for each question at the beginning and end of the semester and statistically significant improvements are noted. Indication is also made for statements for which there was a statistically significant coefficient estimate in the probit regression for the category

Table 5. Beginning of Semester Ordered Probit Coefficient Estimates

Statement	Intercept	Age	Freshman	Gender: Male=1	GPA	Not Good Prior TBL	Familiar
1	2.39***	-0.03	0.38	-0.12	-0.05	-0.40*	0.07*
	(3.48)	(-0.99)	(0.84)	(-0.69)	(-0.42)	(-1.89)	(1.84)
2	1.00	0.004	-0.76*	-0.05	0.05	0.51**	-0.10**
	(1.52)	(0.17)	(-1.70)	(-0.30)	(0.43)	(2.51)	(-2.49)
3	4.00***	-0.01	-0.51	-0.40**	-0.39***	-0.87***	0.07*
	(5.19)	(-0.42)	(-1.08)	(-2.17)	(-3.05)	(-3.99)	(1.73)
4	3.12***	0.04	0.10	-0.30	-0.08	-0.20	0.07
	(4.26)	(-1.59)	(0.20)	(-1.55)	(-0.62)	(-0.89)	(1.63)
5	1.38**	0.01	-0.35	-0.06	0.06	-0.26	-0.08**
	(2.18)	(0.59)	(-0.83)	(-0.37)	(0.57)	(-1.35)	(-2.21)
6	2.78***	-0.03	0.02	-0.02	-0.16	-0.45**	0.11***
	(3.99)	(-1.20)	(0.04)	(-0.14)	(-1.29)	(-2.18)	(2.81)
7	3.02***	-0.03	0.36	0.06	0.07	-0.50**	0.07*
	(3.76)	(-1.20)	(0.76)	(0.32)	(0.57)	(-2.28)	(1.67)
8	3.50***	-0.30	-0.32	-0.34*	-0.28**	-0.50**	0.15***
	(4.65)	(-1.14)	(-0.67)	(-1.83)	(-2.20)	(-2.27)	(3.55)
9	2.98***	-0.01	0.34	-0.07	-0.04	-0.59***	0.10***
	(3.94)	(-0.49)	(0.75)	(-0.40)	(-0.35)	(-2.81)	(2.63)
10	2.07***	-0.02	-0.06	0.01	-0.22*	-1.11***	0.14***
	(3.09)	(-0.59)	(-0.14)	(0.08)	(-1.86)	(-5.20)	(8.01)
11	3.23***	-0.01	-1.00**	0.12	-0.14	-0.47**	0.04
	(4.36)	(-0.31)	(-2.27)	(0.72)	(-1.20)	(-2.31)	(1.11)
12	2.07***	0.01	-0.72	0.15	-0.21*	-0.55***	0.08**
	(3.00)	(0.34)	(-1.61)	(0.86)	(-1.75)	(-2.67)	(2.14)

Note: *, **, and *** indicate statistically significant at the 10%, 5%, and 1% level respectively for a two-tailed test.

Table 6. Changes in Attitude by Gender

	Male Students			Female Students		
Statement	Start	End	t-statistic for difference	Start	End	t-statistic for difference
1[a]	4.08	4.28	**2.07****	4.23	4.49	**2.62*****
2[a]	2.21	2.02	**-1.81****	2.14	1.85	**-2.19****
3	3.99	4.18	**2.23****	4.21	4.11	**-0.84**
4	4.37	4.54	**2.24****	4.53	4.61	**0.99**
5	3.02	3.07	**0.35**	2.99	2.96	**0.15**
6	3.97	4.23	**4.06*****	4.05	4.07	**0.44**
7	4.26	4.37	**1.33***	4.27	4.31	**0.38**
8	4.03	4.22	**1.88****	4.25	4.29	**0.44**
9	3.93	4.12	**1.70****	4.04	4.20	**1.46***
10	3.56	3.94	**3.16*****	3.60	3.87	**1.82****
11	3.79	4.24	**4.06*****	3.60	4.05	**3.22*****
12	3.82	4.17	**3.34*****	3.68	4.16	**3.81*****
N =	101	109		81	75	

[a] Gender coefficient statistically significant at the end of the semester: negative and significant at 10% for statement 1 and positive and significant at 10% for statement 2.

*, **, and *** indicate statistically significant at the 10%, 5%, and 1% level respectively for a one-tailed test.

Table 7. Changes in Attitude: Freshmen Versus Non-Freshmen

	Freshmen			Non-Freshmen		
Statement	Start	End	t-statistic for difference	Start	End	t-statistic for difference
1	4.43	4.75	**2.17****	4.11	4.32	**2.80*****
2	1.74	1.60	**-0.87**	2.24	1.99	**-2.77*****
3	4.39	4.40	**-0.04**	4.04	4.12	**1.02**
4	4.61	4.80	**1.22**	4.42	4.54	**2.08****
5	2.61	2.95	**1.03**	3.06	3.04	**-0.21**
6	4.22	4.40	**1.17**	3.97	4.13	**1.99****
7	4.30	4.50	**1.17**	4.26	4.32	**0.98**
8	4.35	4.40	**0.27**	4.09	4.23	**1.75****
9	4.17	4.50	**1.96****	3.95	4.11	**1.84****
10	3.83	4.30	**2.26****	3.55	3.87	**3.19*****
11[a]	3.26	4.00	**4.36*****	3.77	4.18	**3.51*****
12	3.57	4.20	**4.34*****	3.79	4.16	**2.88*****
N =	23	20		159	164	

[a] Frosh coefficient negative and statistically significant at the end of the semester at 1% for statement 11.

*, **, and *** indicate statistically significant at the 10%, 5%, and 1% level respectively for a one-tailed test.

represented in the table. Table 6 shows the results broken down by males versus females. Table 7 shows freshmen versus other students. Table 8 shows responses by age. Table 9 shows responses by grade point average. Note that the starting and ending number of students in each category is not necessarily the same due to adds and drops occurring during the semester resulting in about a seven percent difference between the students answering the survey questions at the beginning of the semester and those responding at the end.

Regression results indicate male students were significantly less likely than female students to agree that they have a positive attitude about working with peers and that solving problems in a group is an effective way to practice what they have learned, yet the attitude of male students became significantly more positive over the course of the semester for all statements except, "In my career, I can be as successful working alone as working with others." While female students started out more positive than male students about working with peers in general, they also became significantly more positive by the end of the semester in response to half of the statements.

While freshmen tended to enter the semester quite positive about working with peers, they nonetheless became even more positive in response to five out of twelve of the statements. Similarly, responses of non-freshmen became more positive in response to nine out of twelve statements. Interestingly, their response to the statement, "I have a positive attitude about working with peers" did not change significantly. The other two responses that did not change were the two related to the importance of collaborating with others in their career. The regression analysis indicated that at the end of the semester, freshmen were less likely than non-freshmen to agree that group decisions are often better than individual decisions, yet their mean response to this question increased from 3.26 to 4.0 out of 5.

While age was estimated to be significant and negative in the end-of-semester regression for statements 1, 3, and 5, every age category response improved significantly over the semester in response to statement 1, about the importance of collaborating with peers for success as a student, with all ending at 4.13 or higher out of 5. The response to statements 3 ("I have a positive attitude about working with my peers") and 4 ("The ability to work with my peers is a valuable skill") also became more positive for every age group over the semester, although not always statistically significantly. Older students were also more likely to agree that they can be as successful in their careers working alone as working with others, with a statistically significant increase in the response for the oldest age group (over 22 years old). In spite of these differences among age groups, all groups tended to respond more positively about working with others at the end of the semester compared to the beginning of the semester, especially the youngest two groups (those under 20). All age groups became significantly more positive about the quality of group decisions and all but the oldest group of students became significantly more positive about the decisions arising from group problem solving, and all ended with responses above 4 out of 5. Four out of five groups were significantly more likely to agree that working in teams in class is productive and efficient and three out of five were significantly more likely to agree that solving problems in a group is an effective way to learn, although responses were more positive for both of these questions for all age groups. Interestingly, the oldest age group started out least likely to agree that collaborating with peers would help them become better students, but ended up second most likely to agree to that statement.

The end-of-semester regression results indicated the higher a student's grade point average, the less positive he/she was likely to be about peer collaborations. However, breaking grades into four categories, 4.0 to 3.5, 3.49 to 3.0, 2.99 to 2.5, and below 2.5 indicates some interesting variation across the grade scale. Those in the highest grade category were more positive by the end of the semester, but not significantly so except in response to the statement that solving problems in groups leads to better decisions than solving problems alone. Students in the next highest grade category, what might be thought of as high-B students, became more positive in response to every statement, significantly so in response to seven

Table 8. Changes in Attitude by Age

	17 to 18 Year Olds			19 Year Olds			20 Year Olds			21 to 22 Year Olds			Over 22 Years Old		
Statement	Start	End	t-stat for difference	Start	End	t-stat for difference	Start	End	t-stat for difference	Start	End	t-stat for difference	Start	End	t-stat for difference
1[a]	4.37	4.73	**2.05****	4.21	4.63	**3.03*****	4.18	4.40	**1.69****	4.14	4.17	**0.25**	3.59	4.13	**1.71****
2	1.89	1.60	**-1.68****	2.16	1.84	**-1.71****	2.16	1.82	**-1.96****	2.24	2.20	**-0.30**	2.53	1.94	**-2.18****
3[a]	4.33	4.40	**0.30**	4.13	4.24	**0.63**	4.12	4.28	**1.18**	3.96	3.97	**0.08**	3.88	4.06	**0.67**
4	4.63	4.73	**0.58**	4.55	4.68	**1.06**	4.50	4.70	**1.98****	4.28	4.40	**1.22**	4.18	4.44	**1.18**
5[a]	2.74	2.93	**0.50**	2.92	2.76	**-0.57**	3.26	3.00	**-1.18**	2.92	3.06	**0.69**	3.12	3.69	**1.51***
6	4.22	4.33	**0.70**	4.11	4.34	**1.62**	4.02	4.16	**0.98**	3.96	4.00	**0.33**	3.53	4.25	**2.15****
7	4.37	4.47	**0.59**	4.39	4.45	**0.42**	4.30	4.36	**0.52**	4.12	4.23	**0.99**	4.12	4.38	**1.04**
8	4.33	4.47	**0.68**	4.08	4.32	**1.39***	4.16	4.20	**0.28**	4.10	4.22	**1.02**	3.88	4.19	**0.94**
9	4.04	4.47	**2.46*****	4.03	4.26	**1.36***	4.02	4.10	**0.49**	3.92	4.11	**1.35***	3.82	3.94	**0.37**
10	3.78	4.33	**2.41*****	3.58	4.08	**2.46*****	3.58	3.88	**1.59***	3.56	3.75	**1.22**	3.35	3.88	**1.52***
11	3.33	3.93	**2.76*****	3.95	4.39	**2.50*****	3.74	4.06	**1.67****	3.72	4.14	**3.04*****	3.65	4.25	**1.78****
12	3.56	4.13	**2.33*****	3.92	4.39	**2.97*****	3.76	4.16	**2.48*****	3.74	4.06	**2.36*****	3.76	4.06	**0.90**
N =	27	15		38	38		50	50		50	65		17	15	

[a] Age coefficient statistically significant for end of semester: negative and significant at 1% for statement 1, negative and significant at 10% for statement 3, and positive and significant at 1% for statement 5.

*, **, and *** indicate statistically significant at the 10%, 5%, and 1% level respectively for a one-tailed test.

out of the twelve statements. Those in the next category, low-B students, were more positive to begin the semester than the high-B students and became significantly more positive by the end of the semester in response to nine out of twelve statements. Finally, students in the lowest grade category started the semester more positive about peer collaboration than most of the other students, but their attitude did not change significantly over the course of the semester.

Table 9. Changes in Attitude by Grade Point Average

	3.5 to 4.0			3.0 to 3.49			2.5 to 2.99			Below 2.5		
Statement [a]	Start	End	t-stat for difference	Start	End	t-stat for difference	Start	End	t-stat for difference	Start	End	t-stat for difference
1	4.13	4.25	**0.75**	4.02	4.24	**1.28**	4.08	4.42	**2.69*****	4.43	4.47	**0.26**
2	2.26	2.27	**0.05**	2.38	1.88	**-2.93*****	2.12	1.89	**-1.60***	2.05	1.99	**-0.63**
3	3.95	3.82	**0.74**	3.89	4.19	**1.99****	4.14	4.29	**1.48***	4.33	4.16	**-0.81**
4	4.55	4.50	**0.44**	4.24	4.55	**2.53*****	4.45	4.58	**1.25**	4.48	4.47	**-0.01**
5	3.05	2.89	**-0.64**	2.93	3.07	**0.57**	3.31	3.16	**-0.67**	2.76	3.11	**1.06**
6	3.92	3.98	**0.32**	3.93	4.14	**1.42***	3.98	4.24	**1.83****	4.24	4.16	**-0.38**
7	4.34	4.30	**-0.34**	4.18	4.24	**0.43**	4.27	4.42	**1.39***	4.33	4.37	**0.17**
8	4.00	4.05	**0.25**	4.07	4.24	**1.22**	4.14	4.36	**1.81****	4.24	4.16	**-0.32**
9	3.84	3.93	**0.46**	3.89	4.10	**1.13**	4.06	4.22	**1.22**	4.24	4.21	**-0.13**
10	3.26	3.43	**0.76**	3.53	3.95	**2.23****	3.75	4.15	**2.68*****	3.76	3.89	**0.44**
11	3.66	3.89	**1.13**	3.67	4.19	**3.09*****	3.80	4.31	**3.06*****	4.14	4.42	**1.18**
12	3.66	3.95	**1.60***	3.71	4.19	**3.19*****	3.80	4.20	**2.70*****	4.10	4.37	**1.05**
N =	38	44		45	42		51	55		21	19	

[a] GPA coefficient is statistically significant and positive for statement 2 and statistically significant and negative at end of semester for all other statements except 4, 5, and 7.

*, **, and *** indicate statistically significant at the 10%, 5%, and 1% level respectively for a one-tailed test.

Discussion

The results of this study indicate that student attitudes toward teamwork are not fixed, but rather can improve significantly over the course of just one semester with these positive attitudes possibly lasting for even longer. In initiating a team-based or collaborative learning environment, it is important to be aware of possible differences in acceptance of TBL across demographic groups. Freshmen in this study tended to enter the semester with a more positive attitude about peer collaboration than older students. These students were all entering their first semester of college and perhaps the prospect of sharing the learning experience with others was less daunting than bearing the full burden by oneself. It is also possible that the idea of getting to know other people through interactive class activities was a welcome concept for these students who were in a new environment, many with few or no friends around. This is not just a phenomenon of excited young freshmen with a positive attitude, though. The older the student was entering the class the less positive he/she was about peer collaboration on average. This attitude difference appears to grow gradually over time, perhaps due to a variety of negative or less than positive experiences in working with and interacting with peers in a variety of settings. On a positive note, students are not steadfast in their opinions, with all age groups showing significant changes over the semester.

Creating teams with a mix of students with different academic abilities based on grade point average can help balance teams in terms of likelihood of success on graded activities, but is also likely to produce a mix of attitudes about peer collaboration in general within each group. While these attitudes change over the semester for many students, it is not very surprising that there is little change in attitude among the top students academically. Students with a grade point average over 3.5 are those students who are likely to succeed in the classroom regardless of the environment or instruction. They are not likely to see collaboration as important to their success when they have a history of succeeding whether or not they collaborate. They likely make good decisions and successfully solve problems on their own, so would not be expected to agree that group processes would be better. In contrast, the lowest grade students started out relatively positive about peer collaboration and also did not change their attitude significantly. Interestingly, the mean responses of these students as a group actually became less positive for five of the statements, although not significantly so. Personal observation and experience suggest that students in this group tend to miss more classes and come to class less prepared, missing out on much of the value of team interactions. TBL appears to have had the greatest impact on attitudes among students in the mid-grade ranges, from 2.5 to 3.49. While there is, of course, a mix of effort among this large group of students, these are students who are not necessarily successful in all their classes, as often getting a mix of A's, B's, and C's as getting straight B's. Very few of the students in the study are majoring in economics, so the courses analyzed here are not the first choice of subject for most of these students, yet are required for about 85% of them. For these students to start with reasonably positive attitudes toward peer collaboration and become significantly more positive by the end of the semester in a course outside their discipline implies that a semester of TBL as implemented in these courses is a positive and attitude influencing experience.

Summary

The ability to work in a team is a highly valued skill which academics can cultivate in students through team-based and collaborative learning. Collaborative learning has also been found to produce significantly greater academic achievement and improved attitudes toward the learning of the material. However, many group activities do not allow time to build team dynamics and trust, and many group projects result in significant free riding and consequent excessive burden on the few students willing to do more of the work. Such experiences are likely to negatively influence student attitudes about working with others and may negatively affect subsequent group interactions. Gains accruing from collaborative learning found by previous researchers are associated with learning structures that promote interaction and encourage both individual and group achievement in pursuit of group goals (Barkley et al., 2005). In analyzing student attitudes in five courses using such a learning structure, this study finds that attitudes can improve over a semester of TBL and that these improvements last beyond the end of the semester. Instructors interested in implementing effective team or collaborative learning into the classroom should take care to learn best management practices in the implementation of such activities to minimize opportunity for free-riding and maximize the opportunity for true collaborative and student-centered learning.

Awareness of demographic differences in acceptance of peer collaboration can also help faculty more carefully design experiences to enhance outcomes. For example, most effective teams will have members with complementary skills but effectiveness may also be enhanced by having a mix of age, grade level, and gender as well. In building teamwork over time, positive attitudes on the part of certain members may help offset initial negative or less positive attitudes on the part of others. Improved student attitudes toward working with peers carries over to subsequent classes, creating positive externalities for the rising number of instructors also implementing collaborative learning in their classrooms.

Finally, this research also suggests that a positive learning experience can enhance attitudes toward working with others, possibly making students more employable upon graduation, having had experience working in teams and having a positive attitude about the experience. Employers consistently rank communication skills and the ability to work with others as highly valued employee skills, and TBL enhances both of these abilities in students, but requiring extensive interpersonal communication and problem solving in class, coordination on short written assignments, and consensus building. Faculty interested in teaching and learning strategies that enhance professional competencies of interpersonal skills, communication, and teamwork along with improving academic achievement should explore team-based and other collaborative learning methods.

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The Effect of Previous Equine Experience on Performance and Effort Required in an Introductory Level Equine Science Class

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Abstract

This study was designed to determine if previous equine experience and level of interest significantly affected performance in an introductory equine science class. A total of 156 students over two semesters were questioned about their level of horses experience (1 to 10 scale). In a follow-up survey at the end of the semester, students were asked about their cumulative GPA to date (on a 4.0 scale), degree major, and were asked to judge their effort put into the class (on a scale of 1 to 10) and if they believed that previous experience helped or would have helped them perform better in the class (on a scale of 1 to 10). Students in one semester were also asked about their future goals with horses and their reasons for taking the course. Data were analyzed to determine if correlations existed between variables and their performance in the class (final grade). A one-way ANOVA was also performed to determine if there was a difference in performance based on if the student's major, future goals or his/her reasons for taking the course. The student's overall GPA had a significant impact on final grade ($P<0.001$) and that previous equine experience had no impact on final grade ($P = 0.590$). However, students with previous experience did not appear to have to work as hard in the class ($P<0.001$). Students in the Department of Animal Science performed better than students outside of the College of Agriculture and Life Science, but students in other College of Agriculture and Life Science majors performed equally well. Students looking for a future with horses performed better than students with no future interest in horses and those students who took the course for a major requirement or general interest in horses performed better than students who simply took the course to meet general education program requirements. These findings of student experience, motivation and performance are of interest to help better prepare both students and faculty for the course expectations.

Introduction

The face of agricultural science is changing as more and more students are coming to these disciplines from non-rural backgrounds (Dyer et al., 1996; Scofield, 1995). This means that more students are coming into their freshmen college year in fields such as animal science with potentially little animal science background. While enrollment in animal science is increasing, particularly for students with an interest in companion animal and equine science (McNamara, 2009; Moore et al., 2008), faculty are challenged to provide material in the classroom that is appropriate to the students' needs.

How students perform in the classroom may affect retention in the discipline (Ball et al., 2001), therefore it is of interest to determine what factors impact performance. Self-efficacy refers to an intrinsic motivation to succeed in the classroom and may be influenced by previous experience or general interest and incentive to take a course within a given field (Joo et al., 2000; Schunk, 1995). This concept is common to fields such as computer science in which previous experience significantly impacts performance in introductory computer science classes (Joo et al., 2000; Wilson and Shrock, 2001). Several studies have also indicated that previous agricultural experience has an impact on performance in agricultural programs as well (Ball et al., 2001; Perkins and Andreasen, 2001).

There is increased interest in fields such as equine science within Animal Science Departments (McNamara, 2009; Moore et al., 2008). As expected, these students may have different levels of background prior to taking courses in such disciplines (Lawrence, 1987). An early study of an equine management class found that previous equine experience had no effect on final grade in the class (Lawrence, 1987). However, the same study found that the student's level of interest, particularly with respect to future career goals had an impact on grade performance in the class, such that students who took the course to prepare them for future career possibilities performed better. It is unknown how previous equine experience impacts performance in an introductory level equine science class.

"Introduction to Equine Science" (ANS 110) is offered as an introductory class within the Department of Animal Science at North Carolina State University. This class is also offered as a general education program (GEP) course for students outside of the department to fulfill a natural science elective. The course, which is offered in traditional format in the fall and spring, averages 80 to 120 students per semester, while a summer distance education version

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averages 20 to 30 students per semester. Past course evaluations are strong, though comments from students appear to indicate that the course may be too difficult for students with no previous equine experience and that students with more experience are at an advantage to perform better. These beliefs extend to the professors as well, who find it difficult to determine an ideal pace for such a wide distribution of students.

Therefore, the purpose of this study was to determine if previous equine experience significantly impacts overall performance in an introductory level equine science class. It was hypothesized that students who had extensive horse experience would perform better in the class, and with reduced effort, in comparison to those students with limited horse background. It was also hypothesized that students with an interest in horses (general interest or major) would perform better than those students with no interest in horses.

Materials and Methods

The course that was examined was a 100-level introductory equine science class; ANS 110, Introduction to Equine Science. The course satisfies the GEP requirements for a natural science course for North Carolina State University, and also serves as a prerequisite for several more advanced equine classes in the Department of Animal Science. Data were collected from students in two semesters taught by the same faculty member; Spring semesters of 2008 and 2009. In 2008, 64 students were represented while in 2009, 92 students were represented.

One the first day of each semester, students were given a survey to complete regarding their equine experience and expectations for the course. Specifically, students were asked to indicate their level of equine experience on a scale of 1 to 10, where a score of 1 indicated no horse experience and a score of 10 indicated extensive equine experience. Students were asked to consider aspects such as riding lessons, horse ownership, work experience (for example as a groom or working with a veterinarian), formal equine background (such as 4H or Pony Club) or previous equine classes. All students were asked for permission to use their results in this study.

In spring 2009, students were also asked to classify their future goals with respect to horses as: 1- Horses as a hobby, 2- Horses as a business, 3- A career with horses such as an equine or mixed-practice veterinarian, 4- Unsure or 5- No horses in their future. Students were asked to select all choices that may apply. These students were also asked to indicate why they were taking the course: 1- Degree requirement (such as a prerequisite for a future course), 2- General interest in horses, 3- Satisfied the GEP requirement but no interest in horses or 4- Satisfied the GEP requirement and an interest in horses.

At the end of the semester, students in both years were given a follow-up survey to complete regarding their experience in the class. Students were asked to gauge their level of effort (Perceived Effort) for the class on a scale of 1 to 10, where a 1 indicated little to no effort and a 10 indicated extensive effort. Students were asked to consider how much time was spent outside of the classroom regularly and in preparation for exams. Students were also asked to indicate if they thought that having previous equine experience gave students an advantage (Perceived Advantage) in the class, also on a scale of 1 to 10. A 1 indicated that a student thought previous experience served no advantage while a 10 indicated that horse experience gave a significant advantage in the class. Students were also asked to express their thoughts on this subject. In the post-survey, information such as the student's GPA and major and minor (if applicable) was obtained.

The data from the surveys were combined with the students' final grades in the class, which were used to gauge performance. Unpaired T-tests were conducted to determine if there were differences in responses and final grades between the two semesters. There were no significant differences between any of the variables, and so the data for both semesters were combined.

Pearson correlation coefficients were used to determine how variables such as GPA, experience or perceived effort were related to final grades. Relationships between experience and effort were also determined. Finally, the relationship between previous experience and perceived advantage were determined. In addition, one-way analysis of variance was used to determine if performance (final grade) differed between students in the Department of Animal Science, the College of Agriculture and Life Science (CALS; but not Animal Science) or another major. Analysis of variance was also used to determine if there were differences in performance based on the student's future goals or based on their reasons for taking the class. Significance was accepted when $P<0.05$.

Results

The average final grade in 2008 was 89.96 ± 11.09% while in 2009 it was 85.98 ± 10.57%, though these were not significantly different (overall average of both semesters was 87.59 ± 10.93%). The overall average GPA was 3.21 ± 0.54 on a 4.0 scale and the average level of horse experience was 3.98 ± 2.30 out of 10 (with 10 being the highest level of experience).

There was a significant relationship between the student's overall GPA to date and the final grade achieved in ANS 110 ($r=0.610$, $p<0.001$; Figure 1). However, there was no significant relationship between a student's previous equine experience and their performance in the class ($r=0.043$; $P = 0.590$; Figure 2). There was a significant negative relationship between previous experience and perceived effort ($r = -0.441$; $P<0.001$; Figure 3) but no relationship between effort and final grade ($r=-0.007$;

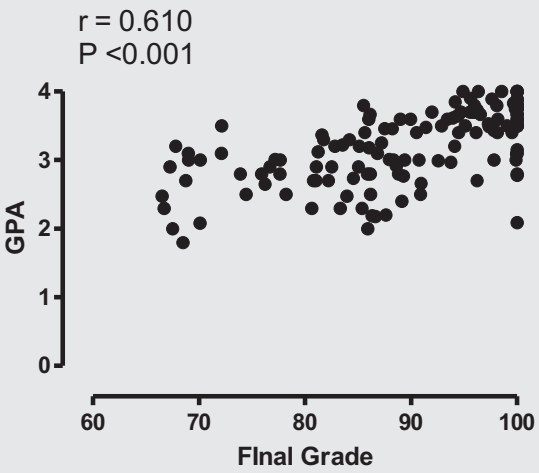

Figure 1. Relationship between the student's overall GPA to date and the final grade in ANS 110, Introduction to Equine Science.

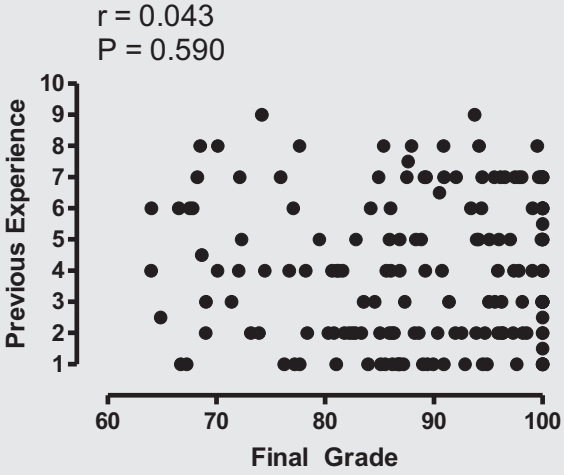

Figure 2. Relationship between the students' previous equine experience and their final grade in the ANS 110, Introduction to Equine Science.

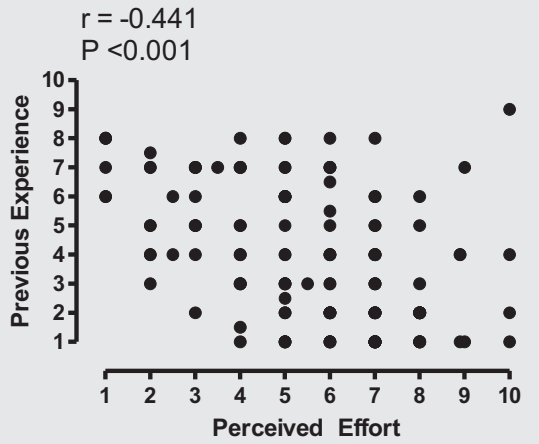

Figure 3. Relationship between the students' previous equine experience and the amount of effort required for the course, ANS 110, Introduction to Equine Science.

P=0.930; Figure 4). There was a weak but significant relationship between final grade and perceived advantage (r=-0.164; P =0.047; Figure 5).

Students in the Department of Animal Science performed significantly better than students in departments other than those in the College of Agriculture and Life Science though there was no difference between Animal Science students and other CALS students (P=0.023; Figure 6). With respect to future goal data collected in 2009, several students indicated two or more of the following options; horses as a hobby, horses as a business and horses as a career, therefore an additional category was created as "multiple future goals with horses." Students selecting multiple future goals with horses performed significantly better than students with no future interest in horses (P<0.05), though there were no differences between other categories. Students taking the course due to a departmental requirement (major, prerequisite) performed significantly better than students solely taking the course to satisfy their GEP (P<0.05). Further, students taking the course to satisfy the GEP requirements but who had an interest in horses, performed better than those taking the course for their GEP but who had no interest in horses (P<0.05).

Discussion

The primary finding of this study was that previous equine experience had no significant effect on final grade outcome in an introductory level equine science class. These findings are similar to another study examining a more hands-on type of equine management course (Lawrence, 1987). There are several reasons to explain this outcome. First, students were asked to gauge their own experience level, and it is possible that students overestimated their background. Second, it is possible that students with extensive experience who hoped to take the upper level equine classes got permission from the instructor to do so without taking the prerequisite, and therefore students with true extensive experience didn't take the course. Third, it is likely that traditional equine experience in the form of horseback riding or horse ownership does not adequately teach students about equine science. The course focuses on elements such as evolution, health management, nutrition and genetics, which are topics that may not be applicable to daily horse care or riding. It is possible that if more precise questions had been asked about horse experience, such as horse ownership vs. programs such as 4-H or Pony Club that are known to cover such topics, an effect on class performance would have been observed. In the future, studies could use a Likert Scale to indicate levels of agreement with more specific statements regarding horse experience.

The most significant factor affecting final grade in this course was overall GPA. It is well established that students who are intrinsically motivated to do

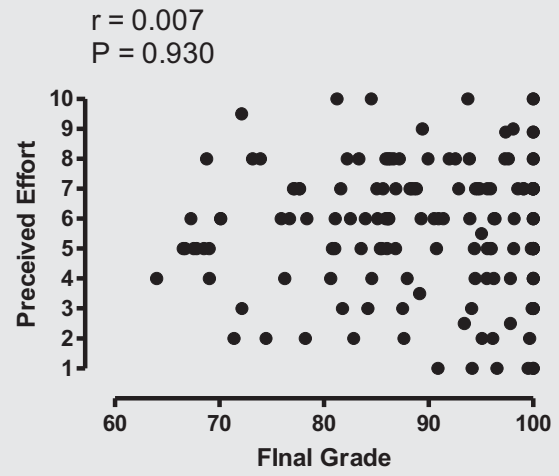

Figure 4. Relationship between the amount of effort required (Perceived Effort) and the final grade in the course, ANS 110, Introduction to Equine Science.

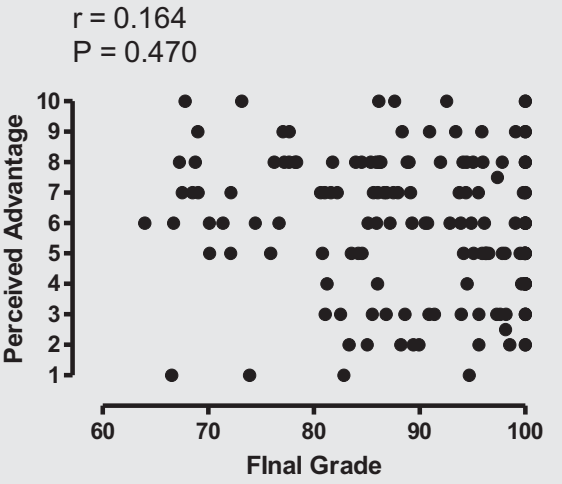

Figure 5. Relationship between the students' beliefs that previous experience gave them an advantage (Perceived Advantage) and final grade in the course, ANS 110, Introduction to Equine Science.

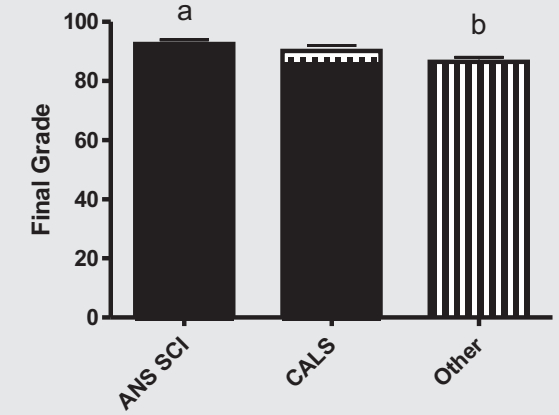

Figure 6. Grade distribution between students in the Department of Animal Science, the College of Agriculture and Life Sciences (CALS) and other departments not in CALS. Groups with different subscripts indicate a significant difference (P<0.05).

well in the classroom perform at a high level, regardless of the subject matter (McKenzie and Schweitzer, 2001). It is likely that students who performed well in their previous university classes have good study habits and high levels of motivation to excel (Devadoss and Foltz, 1996).

Interestingly, there was no significant relationship between perceived effort and performance in the class. Possibly, overestimated their effort, particularly those who did not do very well in the class. Again, more specific questions may have been able to quantify effort more effectively through a less subjective manner. There was, however, a significant negative relationship between effort and previous equine experience, such that students with extensive horse experience did not appear to have to work as hard. Apparently, students with more equine experience do not perform better in the class, but don't have to work as hard to achieve their grades.

Interestingly, students who believed that previous experience was an advantage in the class were also those who had less experience. This may indicate that students with less experience could feel resentment towards students with more experience, or feel that they are at a significant disadvantage compared to students with experience. It was expected that students with more experience would also acknowledge an advantage, though this did not appear to be the case, as even students with extensive experience indicated a lower level of advantage. Some written contributions from students indicated that the class should be split to form a true introductory level class and a class for students with more experience. However, several other students indicated that they enjoyed sharing the class with students with more experience because these students were able to share personal stories and viewpoints on the subject matter.

Apparently, students whose future goals include horses in multiple aspects (for example as a hobby, business or career such as a veterinarian) perform better than students with no future interest in horses. Again, these findings are similar to those of Lawrence with students in an equine management class (Lawrence, 1987). The desire to learn about a topic for future uses likely impacts motivation, which can influence performance. Similarly, students whose only reason for taking the course was fulfillment of the GEP but who had no interest in horses did not perform as well as students taking the course for degree requirements (such as for a prerequisite) or because of a general interest in horses.

Summary

The findings of this study indicate that previous equine experience does not impact performance in an introductory level equine science course. While surprising, these findings may be encouraging to students considering taking the course who have little experience. The findings indicate that students

of all backgrounds can perform equally well in the classroom, though students with less experience may have to work harder. The reason for taking the course (either due to a future with horses, general interest or degree requirements) also affected performance. The faculty teaching such classes should use the different backgrounds of their students to their advantage, perhaps through the use of peer mentoring or group projects.

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Creative Teaching Behaviors: A Comparison of Student and Instructor Perspectives

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Abstract

The purpose of this study was to explain and predict creative teaching behaviors of university instructors in the College of Agriculture, Food and Natural Resources (CAFNR) at the University of Missouri (MU). Creative teaching behaviors were examined using an instrument developed from creativity theories of divergent thinking. The study utilized two populations: undergraduate students and their instructors. Results indicated that students believe their instructors demonstrated creative teaching behaviors. These findings were remarkably similar to the self-perceived demonstration of creative teaching behaviors of instructors. There was also a significant relationship between creative teaching behaviors of experienced and inexperienced instructors when evaluated by students. No differences were observed when the creative teaching behaviors of instructors were compared by sex or teaching discipline.

Introduction

Creativity was described by early philosophers such as Plato and Aristotle and was championed as an important concept of study by John Dewey (Starko, 2005). Guilford's 1950 presidential address to the American Psychological Association (APA) resulted in considerable psychological research focused on creativity (Bleedorn, 2003, 2005; Cropley, 2001; Fasko, 2000-2001; Mumford, 2003; Runco, 1997). Although research on creativity has been a subject of study for decades, concretely defining creativity remains a difficult task (Baker, et al., 2001; Friedel and Rudd, 2005; Hocevar, 1981; Sternberg, 1999; Starko, 2005).

Perkins (1988) described creativity in terms of original and appropriate results. Torrance (1995) suggested creativity is "the process of forming ideas or hypotheses, testing hypotheses, and communicating the results (p. 23)." Starko (2005) defined creativity as a product or idea that is original or novel to the individual creator. Although creativity is challenging to define, many researchers agree that it is comprised of three factors, including: novelty, effective for others, and ethical or beneficial to society (Cropley, 2001; Fox and Fox, 2000; Torrance, 1995).

Given the complexity of defining creativity, it is not surprising the concept has been viewed through differing theoretical lenses. For example, Starko (2005) identified several theoretical frameworks for creativity, including psychoanalytical theories, humanist and developmental theories, behaviorist theories and cognitive theories. Systems theories have also been applied to creativity research and may offer a holistic approach (Starko, 2005). Systems approaches suggest creativity cannot be identified in a vacuum, but rather as an interaction between the environment and the person (Starko, 2005). The environment can determine the type of novelty produced and thus is an active recipient of what creative people offer (Cropley, 2001).

Csikszentmihaly (1988) developed a systems model of creativity that included three aspects: the person, the domain, and the field. Thus, creativity is an interaction between product, person and environment (Starko, 2005). The field includes people who can affect the structure of a domain (Starko 2005). Gardner (1993) suggested individuals are creative, but they create in a specific setting. Perhaps teaching can also be viewed through this setting. The teacher may be evaluated by the field, which could include student evaluations, educational theories, and administrative approval. Can teaching be considered a particular domain where creativity can occur? Systems theories also suggest that the impact of the environment upon creative output inevitably involves human interaction (Starko, 2005). The environment can determine the type of novelty produced and thus is an active recipient of what creative people offer (Cropley, 2001). Education is one environment creativity researchers have explored.

Renzulli (1992) suggested teachers are a key component of developing creativity, both as mentors and role models. Fasko (2000-01) stated, "Creative teaching can enhance learning" (p. 320). Historical references suggested creativity is significantly related to educational achievement (Karnes et al., 1961). Karnes et al., (1961) suggested teachers were most effective in stimulating creativity of their students when they, as teachers, modeled divergent thinking. Cropley (2001) stated, "Creativity offers classroom approaches that are interesting and thus seems to be a more efficient way of fostering learning and personal growth in the young" (p. 28). Creative teaching behaviors may impact student success. However, how do we identify and assess creative

teaching? Would creative teaching differ between disciplines? While men appear to have slightly higher levels of creativity than women (Bleedron, 2003, 2005; Starko, 2005), would differences also occur between sex and creative teaching?

Many types of creativity assessments have been developed to address the numerous and complex models of creativity (Feldhusen and Eng Goh, 1995). Hocevar (1981) concluded creativity is the most difficult psychological concept to measure. Creativity tests may have appeared as early as 1915, and many more were developed between World War I and World War II (Cropley, 1967). Torrance integrated many of these early tests into what is today referred to as the Torrance Tests of Creative Thinking (TTCT) (Cropley, 2001). The latest version of the TTCT, the Abbreviated Torrance Test for Adults (ATTA), measures four components of divergent thinking, including fluency, flexibility, originality, and elaboration (Goff and Torrance, 2002). "To this day, the Torrance Tests of Creative Thinking remains the most widely used assessments of creative talent" (Sternberg, 2006, p. 87). However, not all researchers support using Torrance tests to assess creativity.

Self-reported instruments are one alternate method for assessing creativity. Hocevar (1981) suggested, "A useful way to measure creativity is to simply ask the subject" (p. 459). In addition, past creative behaviors may be used to assess creativity. Past behavior may be the best indicator of future behavior (Hocevar, 1981). Said differently, can past creative behavior predict future creative endeavors? Can self-assessments be used to evaluate creative teaching?

The ability to assess and enhance creativity of teachers has been the focus of some research (Milgram, 1979; Davidovitch and Milgram, 2006). In fact, Davidovitch and Milgram (2006) suggested that determining the creativity of pre-service and in-service teachers and enhancing the creative thinking of these teachers is a worthwhile endeavor. Some researchers have concluded that creative teaching may be subsumed under teacher effectiveness research (Esquivel, 1995). In addition, Milgram (1979) stated, "Although few studies of the relationship exist, creative teacher behavior probably makes for more effective teaching" (p. 125).

Despite the apparent need, research focused on teacher creativity appears to be limited. Torrance (1995) suggested creative teachers are relatively unstudied. Current research focused on teacher creativity appears to be lacking. While some may suggest that creative teaching is effective teaching (Anderson, 2002; Bain, 2004; Bleedron, 2003, 2005; Croply, 1967, 2001; Davidovitch and Milgram, 2006; Esquivel, 1995; Fasko, 2000-01; Renzulli, 1992; Torrance, 1981, 1995), concrete measures that define creative teachers appear to be lacking in the literature. Although a few preliminary creativity studies have been conducted in colleges of agriculture, (Aschenbrener, et al., 2007; Baker et al., 2001; Friedel and Rudd, 2005), a research gap still exists. While some research suggests differences in creativity between sex (Bleedron, 2003, 2005; Starko, 2005), other important distinctions may also exist. Identifying characteristics of creative behavior of instructors is needed to establish the impact of creativity in the classroom environment.

Purpose and Research Questions

The purpose of this study was to explain and predict creative teaching behaviors of university instructors. The following research questions and hypotheses guide this study and identify creativity specifically in the context of instruction:

1. What are the characteristics of college of agriculture undergraduate instructors, including sex, years of teaching experience, age, and teaching discipline?
2. What is the self-perceived level of creative teaching behaviors of instructors?
3. What is the level of creative behaviors exhibited by instructors, as perceived by their students?
4. What is the amount of variance in instructors' self-perceived creative teaching behaviors that is accounted for by their age, sex, teaching experience, and discipline?

Null Hypotheses

1. H_o: There is no relationship between instructors' age and their level of creativity (student perceptions [y_1] and instructor perceptions [y_2]).
2. H_o: There is no difference between instructors' sex and their level of creativity (student perceptions [y_1] and instructor perceptions [y_2]).
3. H_o: There is no difference between instructors' teaching experience and level of creativity (student perceptions [y_1] and instructor perceptions [y_2]).
4. H_o: There is no difference between instructors' discipline (natural/physical science or social science) and their level of creativity (student perceptions [y_1] and instructor perceptions [y_2]).

Methods

This descriptive-correlational study utilized two accessible populations at MU to represent both instructors and students as specified in the research questions. The frame for both populations was developed from electronic mail accounts assigned by the university for students and faculty members. The specific criteria for the instructor population included instructors teaching all sections of undergraduate courses in CAFNR at MU, excluding seminar, research and special problems courses, during the 2007 fall semester (N = 44). Instructors teaching multiple courses or multiple sections of the same course were randomly selected to represent one section of one course.

The population for the student component of the study included all students enrolled in undergraduate courses, excluding seminar, topics or problems courses, being taught by instructors selected as subjects for this study. Frame and selection error were addressed by securing student enrollment in college of agriculture courses through the official MU registration system and elimination of duplicate names.

A time and place sample was utilized for instructors teaching undergraduate agriculture courses during the fall, 2007 semester. The group of 44 instructors included in the accessible population was considered representative of future populations in the college, justifying the use of a time and place sample (Oliver and Hinkle, 1982). Sampling procedures were not imposed, as all members of the accessible population were included in the study.

Probabilistic sampling was obtained from the student population. Because students were considered an intact group, cluster sampling was considered an appropriate sampling technique. Attempting to equate members within each cluster, courses were selected where the cluster represented a minimum of 25 students. Students with multiple classes were only allowed to be a member of one cluster and could only complete the questionnaire for one instructor. An effort was made to assign students with multiple classes to the cluster with the lowest student enrollment to preserve as many clusters as possible. Two criteria were used to ensure the sample approximated members of each cluster. A response rate of 50%, or a minimum number of 30 responses, was required for each cluster to be included. Fifty percent was chosen for smaller clusters (n = 25) unable to meet the target of 30 respondents per class.

A researcher-developed instrument, named the Creative and Effective Teaching Assessment (CETA), was used to assess student perceptions of creativity teaching behaviors and the self-perceived creative teaching behaviors of university instructors. The CETA addressed the four creativity constructs identified on the ATTA, including fluency, originality, elaboration and flexibility. For each construct, four questions were developed. Each response was given a numeric value to be summated to create a total scale score (Ary, et al., 2002). The 16 items were measured using the following seven point Likert scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Slightly Disagree; 4 = Undecided; 5 = Slightly Agree; 6 = Agree; and 7 = Strongly Agree.

Measurement error was addressed by assessing the CETA for validity and reliability. A panel of experts composed of four individuals, including two content experts and two instrumentation experts, established validity for the CETA. The panel of experts reviewed the 16 statements associated with the four creativity constructs identified by Torrance (1995) and assessed the instrument for content, construct and face validity. Reliability was estimated by conducting a pilot test of the CETA instrument on the four constructs of creativity. Following guidelines from Gall et al. (2003), the questionnaire was administered to a sample of 47 students not selected to participate in the study who had characteristics similar to those of the population. The instructor pilot test was conducted by university faculty (n = 29) from colleges of agriculture across the nation. This sample was selected because it closely resembled the instructor population used as subjects in this study.

Cronbach's alpha was computed to determine the reliability estimates of the measured constructs. The student measure of the four creativity constructs resulted in an overall Cronbach's alpha of .96. Each of the four creativity constructs were also evaluated for reliability, including fluency (α = .81), flexibility (α = .87), originality (α = .89), and elaboration (α = .89). Each was deemed to be acceptable. For the instructor measures, the overall Cronbach's alpha for the four creative constructs was .84. Each individual construct was also examined. The reliability coefficient for the instructor pilot included fluency (α = .46), flexibility (α = .74), originality (α = .77), and elaboration (α = .68). Nunnally (1962) suggested that reliability estimates of .50- .60 might be high enough in the early stages of research. The construct of fluency was lower than what is recommended by Nunnally, thus the individual results for each construct was not considered appropriate. The reliability of the entire instrument (α = .84), however, was acceptable.

Data were collected through the use of an online questionnaire given to students at the conclusion of the fall, 2007 semester. Clusters for each class were used to generate a summative measure for each instructor. Specifically, the four construct areas of creativity measured by the questionnaire were summated and a creativity score for each instructor was developed. Instructor data were collected directly from instructors through personal interviews.

Data were analyzed using SPSS 15.0®. The alpha level was set *a priori* at .05. Conventions established by Davis (1971) were used to describe the magnitude of correlations where 1.0 is described as perfect, .70-.99 is described as very high, .50 - .69 is substantial, .30-.49 is moderate, .10-.29 is low and .01-.09 is described as negligible.

Results and Discussions

Results from this study are limited to the accessible population and should not be generalized to other populations. After initial data collection and two follow-up contacts, data were collected from 40 instructors, yielding a response rate of 91%. Sampling procedures identified 44 qualifying classes and a total of 1674 students in those intact groups. Following three follow-up contacts, total students responses (n = 921) yielded 40 student clusters that met the parameters of the study.

The first research question addressed the characteristics of the instructors (n = 40). Specifically, instructors' age, years of teaching, sex, and teaching discipline were examined (see Table 1).

Instructors (n = 40) averaged 47 years of age and the range of ages was from 25 to 77 years. The sample averaged slightly less than 16 years of teaching experience and was predominately male (68%). However, the range in teaching experience was one to 47 years (SD = 10.98). In addition, roughly two-thirds (62.5%) of the instructors taught in natural/physical science disciplines.

The second research question sought to determine the self-perceived level of creative teaching behaviors of instructors. The four constructs comprising the creative teaching assessment included originality, frequency, flexibility and elaboration (see Table 2).

The highest summated mean score for the four areas assessed by the CETA was the elaboration construct (M = 6.18; SD = .61). Originality had the lowest mean score (M = 5.35; SD = 1.15), but the greatest range in scores. The mean score on the self-perceived level of creative teaching behaviors was 5.73 (SD = .72).

The third research question sought to determine the level of creative teaching behaviors exhibited by instructors, as perceived by their students (see Table 3). From the student clusters, the highest mean score derived from summated data associated with the four construct of creativity was elaboration (M = 5.72; SD = .72). The construct of originality had the lowest mean score (M= 5.29; SD = .84) from students. The summated mean for creative teaching behaviors, as perceived by students, was 5.43 (SD = .75).

To address research question four, a simultaneous linear regression analysis was calculated. An intercorrelation matrix was generated prior to conducting the regression analysis to analyze multicollinearity (see Table 4). The intercorrelation matrix contained the independent variables (age, sex, experience, and discipline), and the variable of interest (instructor's CETA). Guidelines outlined by Berry and Feldman (1985) were used to address multicollinearity. Bivariate correlations between the predictor (independent variable) approaching .80 were potential threats and were removed prior to conducting regression analysis. Because age and teaching experience was highly correlated (r = .80), a variable was removed. Age had a higher correlation with the dependent variable than did teaching experience, thus teaching experience was removed from the regression analysis.

Table 5 shows instructors' perceived creativity was the dependant variable and age, sex, and discipline were the independent variables. Approximately 12% of the variance in perceived creative teaching behavior can be explained by the linear combination of age, sex, and discipline. However, the model was not significant (F (3, 34) = .22; p > .05).

The first null hypotheses stated no relationship exist between age and level of creativity (instructor perceptions and student perceptions). Relationships were classified using Davis' (1971) conventions for describing magnitude of correlation coefficients. A

Table 1. Characteristics of Instructors (n = 40)

Characteristic	*f*	%	Mean	*SD*	Range
Age			47.05	10.48	25 - 77
Years of Teaching			15.95	10.98	1 - 47
Sex					
Male	27	67.50			
Female	13	32.50			
Discipline					
Natural/physical Social	25	62.50			
	15	37.50			

Table 2. Summated Scores for Instructors' Self-Perceived Level of Creative Teaching Behaviors (n = 40)

Construct	Mean	*SD*	Range
Summated Self - Perceived Creative Teaching Behavior	5.73	.72	3.00 - 6.89
Elaboration	6.18	.61	5.00 - 7.00
Frequency	5.81	.87	3.00 - 5.00
Flexibility	5.58	.93	2.75 - 7.00
Originality	5.35	1.15	1.00 - 6.92

Note. Scale: 1 = strongly disagree, 2 = disagree, 2 = disagree, 3 = slightly disagree, 4 = undecided, 5 = slightly agree, 6 = agree, 7 = strongly agree.

Table 3. Summated Scores for Students Perceived Creative Teaching Behaviors of Instructors (n = 40)

Construct	Mean	*SD*	Range
Summate Creative Teaching Behaviors	5.43	.75	3.32 - 6.67
Elaboration	5.72	.72	5.00 - 7.00
Frequency	5.41	.73	3.00 - 7.00
Flexibility	5.31	.80	2.75 - 7.00
Originality	5.29	.84	1.00 - 6.74

Note. Scale: 1 = strongly disagree, 2 = disagree, 2 = disagree, 3 = slightly disagree, 4 = undecided, 5 = slightly agree, 6 = agree, 7 = strongly agree.

Table 4. Intercorrelational Matrix for Instructors' Self-Perceived Creativity (n = 40)

Variable	X_1	X_2	X_3	X_4	Y
Age (X_1)	1.00	.43	.80	-.12	.12
Sex (X_2)		1.00	.45	-.01	-.10
Experience (X_3)			1.00	.15	-.02
Discipline (X_4)				1.00	-.29
Instructors' Perceived Creative Teaching Behaviors (Y)					1.00

[a]Sex coded: female = 0, male = 1; [b] discipline: 0 = social, 1 = natural/physical; [c] experience: 0 = ? five years, 1 = > five years.

Table 5. Simultaneous Linear Regression of Self-Perceived Creative Teaching Behaviors (n = 40)

Variable	*R*	R^2	*b*	*t*- value	*p*-value
	.35	.12			
Age			.01	.90	.38
Sex[(a)]			-.25	-.93	.36
Discipline[(b)]			-.44	-1.85	.07
Instructors' Self-Perceived Creativity Teaching Behaviors					
(constant)			5.69	9.90	.01

Note: Adjusted R^2 = .04.
For Model $F(3, 32)$ = .22; p>.05.
[a]Sex coded: female = 0, male = 1; [b] discipline: 0 = social, 1 = natural/physical.

low, non-significant relationship was found between age and creative teaching behaviors, as perceived by students (see Table 6 and 7).

There was not a significant relationship between instructors' self-perceived creative teaching behaviors (p = .47) and their age. Students' perceived creative teaching behaviors and age of their instructors also failed to show a significant relationship (p = .08). Therefore, the null hypothesis stating that no relationships exist (p > .05) between age and level of creativity (instructor perceptions and student perceptions) was accepted.

Null hypothesis two stated that no differences exist between sex of the instructor and the level of creativity of the instructor, as perceived by instructors and students. A non-directional, independent samples t-test was calculated to test the second null hypothesis. Levene's Test for Equality of Variances was conducted. No significant differences in group variances were identified (p > .05), thus equal variances were assumed for each of the variables and evaluated for differences (see Tables 8 and 9).

Instructors' self-perceived creative teaching behaviors (p = .54) and students' perceived creative teaching behaviors of instructors (p = .35) and were not statistically different when compared by sex. Therefore, the null hypotheses stating that no differences exist between sex and level of creativity (instructor perceptions and student perceptions), was accepted.

The third null hypotheses stated that no differences exist between teaching experience and level of creativity (instructor perceptions and student perceptions). Five years was selected to distinguish between experience levels, as this time period is the criteria for tenure and for award recognition in CAFNR. A non-directional, independent t-test was calculated to test the second null hypothesis. Levene's Test for Equality of Variances was conducted and the variances for instructors' self-perceived creative teaching behaviors (p = .45) and student perceptions of creative teaching behaviors (p = .20), as measured by the CETA, were calculated. Due to no significant differences in group variances (p > .05), equal variances were assumed for each of the variables and evaluated for differences (see Tables 10 and 11).

Differences between teaching experience and the creativity measures revealed differences in teaching experience were not significantly different on one of the creativity measures. Instructors' self-perceived creative teaching behaviors were not statistically

Table 6. Pearson Product Moment Correlations for Creative Teaching Behaviors, as Perceived Students (n = 40)

Variable	Student Perceived Creative Teaching Behaviors	*p* - value
Instructor Age	.29	.08

Table 7. Pearson Product Moment Correlations for Instructors' Self-Perceived Creative Teaching Behaviors (n = 40)

Variable	Self-Perceived Creative Teaching Behaviors	*p* - value
Instructor Age	.12	.47

Table 8. Independent Samples t Test between Sex and Instructors' Perceived Creative Teaching Behaviors (n = 40)

Sex	*N*	Mean	*SD*	*t*-value	*p*-value
Female	13	5.83	.58	.62	.54
Male	27	5.68	.78		

Note. Scale: 1 = strongly disagree, 2 = disagree, 2 = disagree, 3 = slightly disagree, 4 = undecided, 5 = slightly agree, 6 = agree, 7 = strongly agree.

Table 9. Independent Samples t Test between Sex and Students' Perceived Creative Teaching Behaviors of Instructors (n = 40)

Sex	*N*	Mean	*SD*	*t*-value	*p*-value
Male	27	5.51	.76	-.95	.35
Female	13	5.27	.73		

Note. Scale: 1 = strongly disagree, 2 = disagree, 2 = disagree, 3 = slightly disagree, 4 = undecided, 5 = slightly agree, 6 = agree, 7 = strongly agree.

Table 10. Independent Samples t Test Between Teaching Experience and Instructors' Perceived Creative Teaching Behaviors (n = 40)

Teaching Experience	*N*	Mean	*SD*	*t*-value	*p*-value
≥ 5 years	31	5.69	.78	-.66	.52
< 5 years	9	5. 87	.44		

Note. Scale: 1 = strongly disagree, 2 = disagree, 2 = disagree, 3 = slightly disagree, 4 = undecided, 5 = slightly agree, 6 = agree, 7 = strongly agree.

Table 11. Independent Samples t Test between Teaching Experience and Students' Perceived Creative Teaching Behaviors of Instructors (n = 40)

Teaching Experience	*N*	Mean	*SD*	*t*-value	*p*-value
≥ 5 years	31	5.56	.65	2.03	.05*
< 5 years	9	5.00	.94		

* *p* ? .05.
Note. Scale: 1 = strongly disagree, 2 = disagree, 2 = disagree, 3 = slightly disagree, 4 = undecided, 5 = slightly agree, 6 = agree, 7 = strongly agree.

Table 12. Independent Samples t Test between Disciplines and Instructors' Perceived Creative Teaching Behaviors (n = 40)

Discipline	*N*	Mean	*SD*	*t*-value	*p*-value
Natural/Physical	27	6.00	.40	1.88	.07
Social Science	13	5.57	.82		

Note. Scale: 1 = strongly disagree, 2 = disagree, 2 = disagree, 3 = slightly disagree, 4 = undecided, 5 = slightly agree, 6 = agree, 7 = strongly agree.

Table 13. Independent Samples t Test between Disciplines and Students' Perceived Creative Teaching Behaviors of Instructors (n = 40)

Discipline	*N*	Mean	*SD*	*t*-value	*p*-value
Natural/Physical	25	6.00	.40	1.88	.32
Social Science	15	5.57	.82		

Note. Scale: 1 = strongly disagree, 2 = disagree, 2 = disagree, 3 = slightly disagree, 4 = undecided, 5 = slightly agree, 6 = agree, 7 = strongly agree.

significant ($p > .05$). Therefore, the null hypothesis stating that no differences exist between teaching experience and instructors' self-perceived creative teaching behaviors was accepted. There was, however, a significant difference between creative teaching behaviors of experienced and inexperienced instructors as perceived by students ($p = .05$). Therefore, the null hypothesis stating that no differences exist between teaching experience and students' perception of instructors' creative teaching behaviors was rejected in favor of the research hypothesis.

The final null hypotheses stated no differences exist between discipline (natural/physical or social science) and level of creativity (instructor perceptions and student perceptions). A nondirectional, independent samples t-test was calculated to test the null hypotheses. Levene's Test for Equality of Variances was conducted and the variances for instructors' self-perceived creative teaching behaviors ($p = .07$) and student perceptions of creative teaching behaviors as measured by the CETA ($p = .38$) were calculated. Due to non-significant variances ($p > .05$), equal variances were assumed for each of the variables and evaluated for differences (see Tables 12 and 13).

Instructors' self-perceived creative teaching behaviors ($p = .07$) and students' perceived creative teaching behaviors of their instructors ($p = .32$) were not statistically significant when compared by discipline. Therefore, the null hypothesis stating that no differences exist ($p > .05$) between disciplines and level

of creativity (instructor perceptions and student perceptions), was accepted.

Summary

The profile of an instructor in the CAFNR at MU is a middle-aged male who has taught courses for nearly 16 years in the natural/physical sciences. These characteristics must be taken into consideration when developing and delivering faculty in-service programs intended to enhance the creativity of instructors.

Instructors believe they are creative in their teaching. Of the four creativity constructs, instructors most frequently report using elaboration in their teaching and are least likely to use originality. Considering the presence of creative teaching behaviors, instructors may value creativity as a component of teaching. However, can we identify specific creative teaching behaviors? Further research should include qualitative methods to observe and record creative behaviors used by instructors. In addition, training to help instructors learn to promote and embrace creative teaching practices may be implemented to increase the occurrence of these creative teaching behaviors.

Students on average perceive that instructors demonstrate creative teaching behaviors. However, the range in scores suggests that students varied considerably in their perceptions of instructor creativity in the classroom. Although past research suggests that assessing creativity is complex, (Hocevar, 1981), students may be able to identify this construct. Students appear to be capable of evaluating creativity in the classroom, given the range of scores associated with student perceptions of instructors' use of creative teaching behaviors. This conclusion is a valuable step in research focused on teacher creativity as documentation of students' perceptions of creative teaching does not appear to be available in previous literature.

Perhaps of equal importance, students agreed with their instructors regarding the presence of creative teaching behaviors. Frequency of teachers' use of elaboration, frequency, flexibility, and originality were rated in the same order by both instructors and students. Instructors reported slightly more agreement with the frequency of creative behaviors than did students. Differences in student and instructor perspectives may be an area for future research. Are creative teaching behaviors related to effective teaching? Would qualitative data support these finding? The CETA could be expanded to include qualitative data designed to determine instructor behaviors that impact student perceptions of creative teaching.

Only 12% of the variance in creative teaching behaviors, as perceived by students, can be accounted for by the linear combination of age, sex, and teaching discipline. This model, however, was not significant. The implication of this finding may be consistent with the ambiguous nature of creativity. What factors contribute to creative teaching behaviors of instructors? What characteristics of instructors account for additional variance in creative teaching behaviors? These questions should be the focus of future research.

Discipline may not be a factor to consider when addressing creativity of university instructors, as both measures of creativity failed to show significant differences. Perhaps creativity does not differ due to the research environment found in both natural/physical and social sciences within the college. Creativity may provide new avenues of understanding between the vastly different disciplines. If creativity does not appear to vary between disciplines, would measures to enhance creative teaching behaviors be effective in both disciplines? All instructors, regardless of discipline, should be addressed in future research. Opportunities to enhance creativity may appropriately target both natural/physical and social science disciplines.

Teaching experience does not impact the self-perceived creativity of instructors. There was a significant difference, however, between students' perceived creative teaching behaviors of instructors and the experience of these instructors. Students suggest instructors with five or more years of teaching experience exhibit more creative teaching behaviors. However, it would seem appropriate to consider all instructors in future efforts to enhance creativity. It is important to consider the differences between instructors' and students' perceptions. Would student perceptions of creative teaching be consistent with creative behaviors identified by instructors? Further research is needed to address the specific behaviors experienced instructors demonstrated in the classroom which led to the significant differences in student perceptions of creative teaching behaviors.

Creativity does not appear to differ based upon the sex of instructors. Sex does not appear to be a significant factor when examining creativity of instructors. This finding differs from previous creativity research which found men displayed greater levels of creativity (Bleedron, 2003, 2005; Starko, 2005). The apparent absence of a gender gap suggests both groups could be addressed by similar professional development opportunities regarding creativity. It is important to note that sex and teaching discipline are the only areas where the two creativity measures appear to have similar rankings for the creativity constructs.

Although considerable creativity research has been conducted, the influence of creative teaching behaviors may offer an opportunity for new insight on teaching and learning. Further research, including replication of this study, should include identifying the value students place upon creative teaching behaviors and identifying specific behaviors students believe lead to creative teaching. Finally, the connec-

tion between creative and effective teaching should be explored.

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Benefits and Costs of Faculty Participation in Extra- and Co-curricular Activities

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Abstract

As students enter the job market, employers consistently demand graduates possess workplace skills, including the ability to effectively communicate, work in teams, solve problems, exhibit leadership and, given the global workplace, value diversity (National Research Council, 2009). Most universities offer extra-curricular and co-curricular activities as learning opportunities for undergraduate students to gain such skills. In agricultural economics departments, these opportunities include academic competitions in marketing, case studies, quiz bowls, and student papers. Other opportunities include independent studies and study abroad where credit may be optional. While direct costs of such programs can be measured, intangible benefits are difficult to document. This research seeks to identify these intangible benefits through surveys of faculty motivation relative to perceived student motivation for student participation. Results show that faculty were motivated by students' improved skills and improved learning of disciplinary principles. Faculty devoted their time mostly for the personal reward of working with students. In contrast, faculty perceived that students participate for fun and travel. Factors common to both groups were personal rewards realized by faculty and networking opportunities with faculty by the students. Respondents also recommended ways to support extra-curricular activities, e.g., having a faculty member dedicated to each student activity; rewarding the activity; offering course credit; having adequate financial support; and publicizing participation.

Introduction

In addition to traditional classroom learning, college undergraduates can participate in a variety of extra-curricular and co-curricular learning opportunities such as student clubs, internships, and service learning activities. External academic competitions and study opportunities often are available to supplement the on-campus experience. Upon graduation, students comment that these extra-curricular activities enhance their college experience (Seidman, and Brown, 2006). Participation requires student and faculty time, and involves financial costs that include registration fees and travel. The benefits take the form of enhanced student performance, but are not easily measured. Opportunities for participation in extra- and co-curricular activities in the field of agricultural economics are provided by national and regional professional associations, specialized associations such as marketing associations, and trade industry associations. Despite the interest on the part of faculty and students, there has been little research on this topic. The objective of this research is to determine and report motivations for, and benefits and costs of, participation in extra-curricular activities; to evaluate the correspondence between motivations of faculty contrasted to students; and to report what faculty perceive to be "best practices" that maximize the net benefit of participation.

This research focuses on student activities called extra-curricular and co-curricular activities. Examples of extra-curricular activities include academic case study competitions and quiz bowls, activities that are supplemental or optional to an academic curriculum. Examples of co-curricular activities include study abroad, internships and related experiential programs-as part of an academic curriculum. Extra-curricular and co-curricular activities are distinctly different, but both can add essential experience and skills to a student's course of study. For that reason, they are considered together in this study and the term extra-curricular is used for both.

Internship and study abroad programs place the student in an actual problem-solving situation. However, there is an increasing set of venues for extra-curricular activities in agricultural economics that either test for knowledge or simulate industry

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challenges. The Agricultural and Applied Economics Association (AAEA), formerly the American Agricultural Economics Association), sponsors an academic Quiz Bowl, where school teams answer questions from categories of economic concepts (http://aaea.org/, 2009). Regionally, the Southern Agricultural Economics Association (SAEA) sponsors a similar academic Quiz Bowl competition with participants from different schools mixed into three-person teams (http://www.saea.org/). In academic case studies, the Food Distribution Research Society (FDRS) hosts a live case study competition where presentations are made by company executives and industry experts, and question/answer sessions are held (http://fdrs.ag. utk.edu/). Teams develop solutions and presentations on-site, then present the following day. In another case study competition, the National Agri-marketing Association's (NAMA) annual student marketing competition asks teams to develop a marketing plan for a product or service based on market research prior to its conference, then present at the conference (http://www.nama.org/).

The primary beneficiaries of extra-curricular activities are students, because their academic and professional skills are enhanced. This enhanced student performance either in class or in later professional life is not easily measured. The dominant cost to students is their time for preparation and travel, which can be substantial. To make these activities possible, faculty must be willing to devote time to support these student activities. Costs associated with faculty participation include registration fees and travel, some of which might be incurred by faculty regardless of the number of students participating. In addition to explicit costs, there may be substantial opportunity costs in other teaching and research activities foregone, or in time spent with family. Thus, faculty incur both explicit and implicit costs. Given constrained budgets, faculty may be asked to justify continuation or expansion of these out-of-classroom educational pursuits.

Benefits of extra-curricular activities are intangible, but there have been attempts at classification and specification. Employers consistently cite the need for graduates to possess effective workplace skills, including the ability to effectively communicate, work in teams, solve problems, exhibit leadership and, given the global workplace, value diversity (National Research Council, 2009). Extra-curricular activities provide learning opportunities for undergraduate students to gain such skills. Dunkelberger (1935) studied the relationship between extra-curricular activities and academic success. He noted suggestions by colleagues that students with poor academic performance be banned from participating in extra-curricular activities, while others felt that students performed better when they were busier. He paired students by class year, gender, and intelligence rating, allowing only the number of extra-curricular activities to vary. Students with inferior academic performance had little or no extra-curricular activities. He concluded that these students might perform better if they were more engaged.

Further emphasizing the importance of non-classroom activities, Litzenberg (1996) asserted that partnerships with industry, such as internships, are essential in preparing graduates for effective agribusiness careers. He noted that benefits accrue to all stakeholders, including students, agribusiness firms, and faculty. Students usually have positive experiences and outcomes in development of their leadership and analytical capabilities and complex problem-solving activities.

Karsten et al. (2004) also examined internships, with a focus on documenting the benefits realized by students from internships in production agriculture. In this research, students interned with producers who used sustainable agricultural practices. Student research projects were guided by an interdisciplinary faculty team. An assessment of learning outcomes indicated that students had enhanced problem-solving abilities, as showcased in descriptive farm case studies and experiential curriculum materials developed.

Over the five-year period from 2001 to 2005, Popp (2006) surveyed students and their faculty advisers who participated in the American Agricultural Economics Association's Quiz Bowl. The objective was to identify factors that affected the number of wins and illustrate the benefits of participation in terms of additional understanding of academic course material. An explanatory model indicated that the likelihood of winning was positively affected by time spent in preparation, grade point average (indicating mastery of subject material), and experience in competitions. Benefits to students included a self-reported increase in understanding of course material from the experience.

Our research builds upon the findings of the above literature on extra-curricular activities. Research methods are presented below.

Methods

To assess the benefits and costs of extra-curricular activities, a survey was developed, pretested and administered. Data were collected to document the level of participation in extra-curricular activities, identify sources of financial support, and assess the benefits and costs of participation to both students and faculty. An electronic survey of individual faculty members in U.S. agricultural economics department was conducted in the spring semester of 2005. (Contact the authors for a copy of the survey.) The target population was faculty with responsibility to work with undergraduate students in roles other than teaching, such as club advisers, team advisers for academic competitions and undergraduate coordinators. Faculty known as active advisers or coaches were contacted directly to encourage participation.

The survey included questions about the type, duration and level of student and faculty involvement in various extra-curricular activities; whether, and how much course credit was offered for these activities; reasons faculty wanted students to participate in activities (perceived benefits); reasons faculty thought students participated; the definition of a successful activity; motivation for faculty participation; negative aspects for students and advisors; identification of funding sources; and recommendations for departments considering offering extra-curricular activities.

When respondents were asked to rate particular items (such as reasons faculty wanted students to participate), a Likert scale (1 to 7, where 1 was not at all important, 4 was somewhat important, and 7 was very important) was used. The instrument was developed by the authors and tested by asking selected colleagues for comment on content and quality of communication. These individuals were asked to share the document with others. Revisions suggested by the test respondents were incorporated to clarify the intent of the survey questions. The instrument was sent electronically to the Agricultural Economics Department Heads' listserve, the AAEA Quiz Bowl advisors' listserve, and the NAMA marketing team advisors' listserve. Department heads were asked to share the survey with their undergraduate coordinator and other faculty who worked with students on extra-curricular activities.

Twenty-seven respondents representing twenty-two departments completed the survey. Multiple responses by departments were expected, given that advising and extra-curricular responsibilities are spread across faculty within departments. When more than one faculty member responded for the same department, the attitudinal responses provided by each individual were incorporated into the dataset. Data that provided departmental information (student numbers and course credit, for example) were entered once for each department.

Descriptive statistics of data collected in the survey are presented in the tables and figures. These take the form of averages of measures that describe respondents' answers to survey questions. For example, averages are provided for factors such as 'why faculty participate,' measured by Likert-style ratings, and tabular comparisons are used to illustrate differences between factors of interest. For selected relationships, correlation coefficients were calculated to assess direction and strength. For the 'best practices' section of the paper, comments of respondents were gathered into common threads for presentation. Survey results are presented below.

Results and Discussion

In regards to extra-curricular participation, just over half (52%) of the responding departments participated in NAMA's student marketing competition; 43% participated in the AAEA Quiz Bowl competition; 9% participated in the FDRS case study competition; and 9% participated in the SAEA regional quiz bowl competition. Another third participated in other competitions such as the AAEA student paper competition or outstanding club award. Among those institutions that participated in one or more activities in the past five years, the activities with the most years of participation and the highest average number of student attendees was dominated by NAMA at 4.78 years and 11.5 attendees, followed by AAEA quiz bowl and SAEA quiz bowl. Sixty-four percent of schools offered coursework as an incentive for students to participate in extra-curricular activities, mostly for NAMA (an average of three credits) and Quiz Bowl (one credit). Seventy-nine percent of departments offered field trips, 79% offered internships, and 65% offered study abroad programs.

Participation Differences and Success Measures

Figure 1 delineates answers to survey questions on motivation for participation in extra-curricular activities. It compares and ranks reasons faculty wanted students to participate in activities (perceived benefits), with reasons faculty thought students participated. Responses to this question are noted in order of declining average ratings of importance to faculty. Faculty were most concerned about preparation and networking opportunities. The general category 'professional preparation' had the highest average rating and was the only category with a value higher than 6 on the Likert scale used here. Coursework credit was lowest in importance and was the only faculty item with an average rating lower than the scale's neutral value 4. Skills that commonly have been emphasized in agribusiness programs (Litzenberg, 1996), including leadership development, networking with professionals, teambuilding, oral communication, and problem solving, followed the top-rated item fairly closely and had relatively high average ratings that ranged between 5 and 6. Other categories rated were between 4 and 5, or slightly above the somewhat important or neutral value, and these included writing and visual communication skills.

In contrast, fun and travel topped the list of reasons that faculty believe students participate (Figure 1). Coursework credit was felt to be very important to students. After that, the high to low ordering of ratings of students' objectives was very similar to that of faculty. One item of note is that faculty thought that writing skills were least important to students.

These ratings are averages across all schools and activities. This procedure resulted in some loss of information. As an example, some skills would be more applicable to specific extra-curricular activities. Market research skills would be particularly applica-

ble to the NAMA competition, and probably would be more highly rated by faculty respondents who have been NAMA coaches, while coaches of quiz bowl teams probably would rate broader measures as more important.

According to the survey, faculty members defined success of student participation in extra-curricular activities through improved skills of students (rating of 6.7), with skills defined broadly as those listed categories. These ratings (Table 1) indicated a belief that through these activities, students do gain crucial skills. Enhanced understanding of economic principles as the result of being placed in settings where they had to recall and/or use those principles was second in ratings. Other factors rated lower in the success profile as a result of participation in extra-curricular activities were that the activities should be fun for students, that there should be recognition for faculty efforts, and winning or placing well in competitions. Monetary support or awards to faculty was least important.

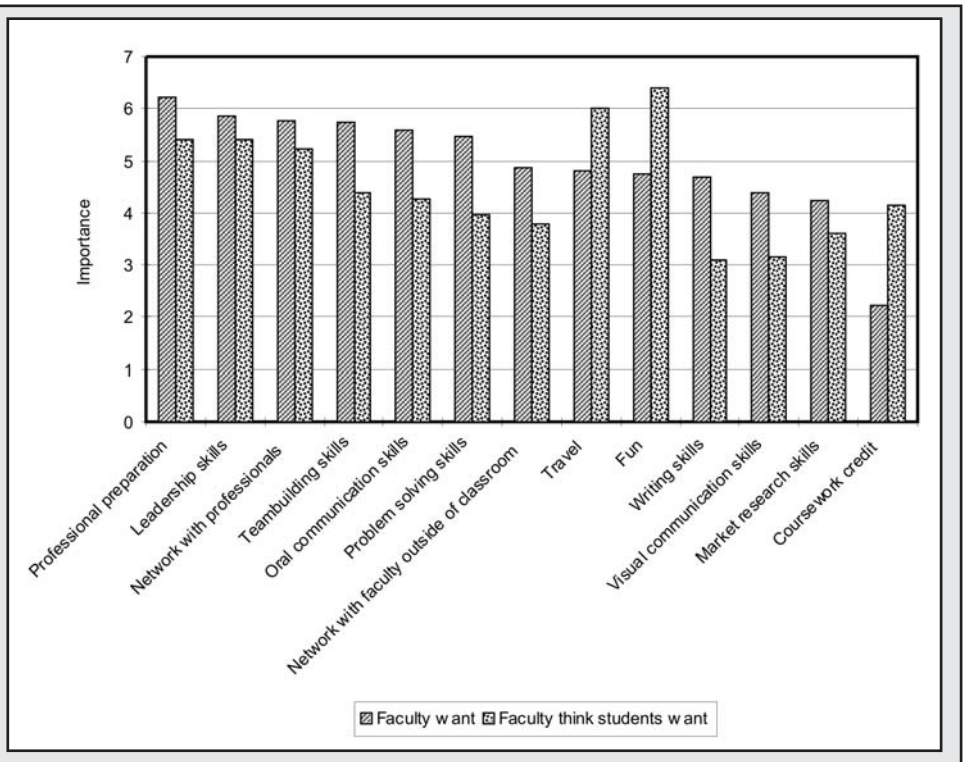

Figure 1: Motivations for Student Participation Based on Student Impacts*
*The survey used a Likert scale where 1 = not at all important; 7 = very important

Table 1. How Faculty Define Success

Success Indicator	Average Rating*
Improved skills of students	6.37
Students learn economic principles	5.67
Students have fun	5.04
Recognition by university/college/ department/professional organization	4.63
Teams placing well in competition	4.31
Securing monetary support and/or awards	3.15

*The survey used a Likert scale where 1 = not at all important; 7 = very important.

Benefits and Costs

Respondents provided insights about the costs and benefits of participation for both students and faculty. The most important benefit, or reason, that faculty devoted time to these activities (Figure 2) was the personal reward from working with students. These competitions and activities were viewed as an enjoyable way to allocate a portion of their teaching/advising responsibility. Recognition by student groups was also relatively important, as indicated by their average rating of more than 4. All other responses, such as developing contacts in the agribusiness industry, recognition by the department/college/university, recognition by peers, reward in the individual's annual review, or enhanced professional development, were rated in the portion of the scale deemed 'somewhat important' to 'not important at all.'

Faculty also reported negative outcomes from participation, the most important of which was its time-consuming nature. The average reported time spent on extra-curricular activities was 72 hours per academic year. Among extra-curricular activities listed above, NAMA demanded most faculty time. Almost all the faculty who worked with NAMA teams indicated a commitment of more than 100 hours per year, with a range up to 160 hours. These responses highlighted the professional opportunity cost of allocating time to student activities. Those hours spent in preparation for competitions were hours not spent pursuing grants and publications. Additionally, some respondents indicated that their commitment to extra-curricular advising reduced time spent with family and on other interests. One respondent commented about the large time commitment and potential for loss of interest in continuing to work with students due to the responsibilities – this respondent referred specifically to 'burn-out.' Overall, the perception was that rewards outside of personal interest in working with students were few, and that the level of professional recognition for this contribution was low. Responding faculty felt there were negative aspects of students' participation. Issues identified were time involved with activities and occasional missed classes, where these factors could lead to lower performance in other classes. But some respondents reported no negative aspects to participation.

Related to the cost of these extra-curricular activities, faculty reported, on average, that funding for extra-curricular activities came from departmental sources (23%), personal (17%), and club (16%) resources (Figure 3). Student fundraisers and industry support accounted for an additional 23%. In terms of total funding from the institution, departmental, college and university monies accounted for over one-third of expenses. This was quite different from proportions reported by Popp, and Rodriguez (2006.)where more than 75% of funding came from departments.

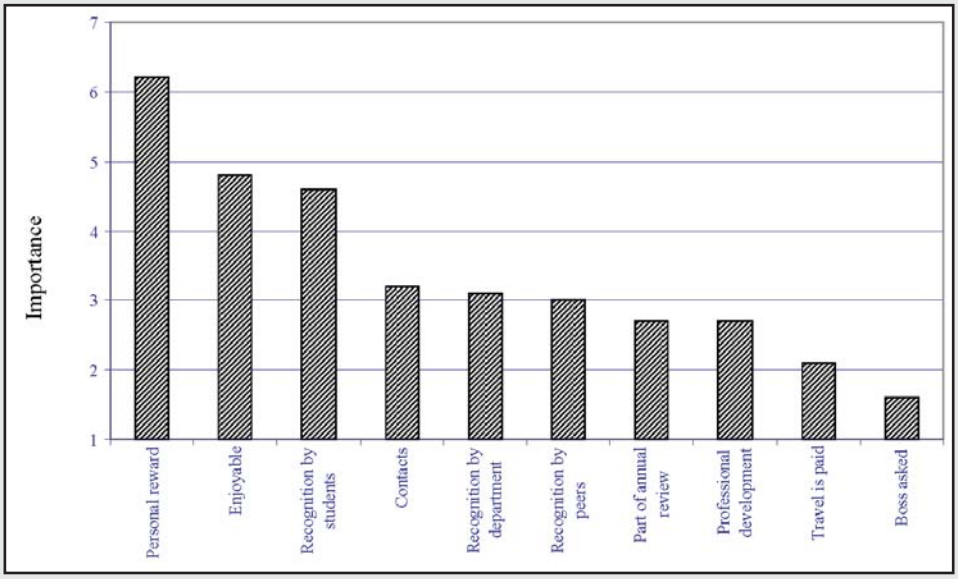

Figure 2: Motivations for Faculty Participation—A Faculty Perspective*
*The survey used a Likert scale where 1 = not at all important; 7 = very important.

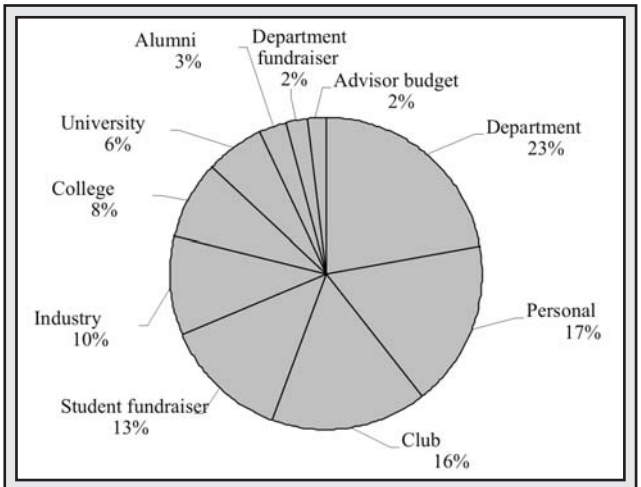

Figure 3: Funding Sources for Extra-curricular Activities

Correlations

Interrelations between variables in the dataset were evaluated through correlation coefficients. The relationships between selected factors that were rated by respondents may provide insight about faculty perceptions. Higher correlation coefficients indicate a stronger linkage between these factors.

Table 2 uses correlations to describe the relationship between why faculty want students to participate and the reasons faculty participate in these activities. The correlations were not particularly high. The largest was a positive association of 0.58 between faculty success as 'personally rewarding' and students having 'networking opportunities with faculty' from other institutions. Almost all other coefficients were less than 0.4. Perhaps as revealing is the pattern of signs on these correlations. As an example, the rating of the 'part of annual review' reason was inversely related to ratings of virtually all the benefits that faculty wanted students to receive. A similar pattern, though the negative relationship was not as frequent, was noted with respect to the factors 'enjoy student interaction,' 'personal reward,' and 'student recognition.' These may be reasons that faculty do not participate in extra-curricular activities. In contrast, a positive relationship existed between most of the benefits that faculty wanted students to receive and 'administrator asked me to do this' and 'develop contacts,' perhaps suggesting these are more important in the choice process of faculty to engage in extra-curricular activities with students.

In Table 2, the student benefits for 'networking with faculty' and 'leadership development' were negatively related to 7 of the 9 reasons that faculty participate, again indicating that higher ratings of these reasons for faculty participation are associated with lower ratings of these reasons that faculty want students to participate. For 'networking with faculty' the larger coefficients are 'part of annual review' and 'make contacts.' However, in most of the columns, the reasons that faculty want students to participate had about the same number of positive and negative coefficients.

Correlations are provided to identify differences in ratings in the relationship between faculty rank and the reasons faculty want students to participate in extra-curricular activities (Table 3). Again, the largest of these correlations was less than 0.4, so by themselves these would provide weak information about possible relationships. However, there does appear to be a pattern of differences in ratings as rank changes from assistant to full professor. (Rank was formatted as a 0,1 variable and correlations with the rating of each reason that faculty want students to participate were calculated.) These coefficients may be interpreted as follows – a value of 0 designated a

Table 2. Correlations among Faculty Motivation for Participation and Desired Student Outcomes

Faculty Motivation	Benefits faculty want students to obtain											
	PP	NP	NF	T	O	W	V	L	P	MR	F	C
AnRev	0.02	-0.31	-0.35	-0.13	-0.37	-0.18	-0.28	-0.12	-0.07	-0.04	-0.38	-0.03
Enjoy	0.02	-0.20	-0.07	-0.32	-0.36	0.06	0.00	-0.41	-0.32	-0.18	-0.39	-0.19
TravSup	-0.06	-0.07	-0.17	0.26	0.13	0.44	0.17	-0.12	0.20	0.12	-0.16	0.43
ProfDev	0.16	-0.41	-0.20	-0.01	-0.04	0.21	0.21	-0.15	-0.24	-0.02	-0.15	0.19
PerRew	-0.23	-0.28	0.58	-0.13	-0.17	-0.23	-0.09	-0.21	-0.32	-0.18	0.11	-0.32
PeerRec	-0.02	0.12	-0.25	0.28	0.12	0.27	-0.01	0.04	0.18	-0.19	-0.23	0.24
StudRec	-0.25	0.25	0.08	0.33	-0.33	-0.23	-0.10	-0.13	-0.26	-0.13	0.02	-0.32
AdmReq	-0.02	0.18	-0.01	0.22	0.33	0.18	0.02	0.17	0.14	-0.16	0.16	-0.06
Contacts	-0.17	0.04	-0.32	0.05	0.15	0.34	0.01	-0.03	0.30	0.32	-0.23	0.55

STUDENT BENEFITS: PP = professional preparation; NP = networking with professionals; NF = networking with faculty; T = teambuilding; O = improve oral communication skills; W = improve written communication skills; V = visual communication skills; L = improve leadership skills; P = improve problem-solving skills; MR = improve market research skills; F = fun; C = receive course credit; FACULTY BENEFITS: AnRev = part of annual review; Enjoy = enjoy student interaction; TravSup = get travel paid; ProfDev = my professional development; PerRew = personally rewarding; PeerRec = peer recognition; StudRec = student recognition; AdmReq = administrator requested; Contacts = I can make contacts.

Table 3. Correlations between Faculty Rank and Desired Student Outcomes

Rank	Benefits faculty want students to obtain											
	PP	NP	NF	T	O	W	V	L	P	MR	F	C
Full	-0.23	0.23	0.37	0.17	0.27	0.22	0.28	0.15	0.14	0.11	0.30	0.18
Assoc	0.14	-0.22	-0.11	0.01	0.09	-0.06	-0.13	-0.01	-0.05	-0.07	0.10	0.01
Asst	-0.16	-0.37	0.15	-0.18	-0.27	-0.28	-0.27	-0.07	-0.34	0.07	0.10	-0.04

FACULTY RANK: Full = full professor; Assoc = associate professor; Asst = assistant professor; STUDENT BENEFITS: PP = professional preparation; NP = networking with professionals; NF = networking with faculty; T = teambuilding; O = improve oral communication skills; W = improve written communication skills; V = visual communication skills; L = improve leadership skills; P = improve problem-solving skills; MR = improve market research skills; F = fun; C = receive course credit.

rank other than assistant professor, and a value of 1 identified an assistant professor. So, being an assistant professor was associated with giving lower ratings to most categories of benefits that faculty wanted students to receive from participation. In contrast, being a full professor was positively associated with higher ratings of these reasons, with the exception of 'professional preparation' of students for the workforce.

Faculty Recommendations

Participants were asked, "If a school was considering offering an extra-/co-curricular opportunity for students, what suggestions would you have?" For faculty, suggestions included: a single, dedicated faculty member for each activity; that faculty members' participation in the activities be recognized and rewarded; a course dedicated to each activity (thus achieving recognition via formal teaching evaluations and a line item on the annual review); financial support from the department or college; results reported in faculty meetings and other outlets; and advisor appointments that rotate over time. For student participation, recommendations included: interested and dedicated student leaders; students feeling ownership of the activity; and students assisting with fundraising.

Conclusions

Faculty advisors have long described the benefits to students from participation in extra-curricular activities. This research examined a set of extra-curricular opportunities presented to agricultural economics students, although the results should be transferable to other disciplines that offer their students similar opportunities. It also identified specific benefits to students that faculty could identify as increases in human capital – better analytical skills, better communications skills, and networking. Success measures were also reported. Faculty were generally pleased with the outcomes in areas considered important in the field. Costs of extra-curricular activities were identified in general categories. Despite the high monetary and non-monetary costs associated with offering and participating in extra-curricular activities, faculty see definite rewards for student participants. Further, they enjoy working with students and pursue these opportunities despite a perceived lack of recognition or reward. As universities seek to enhance student engagement, extra-curricular activities provide a method to achieve this goal. While this study focused on faculty perceptions of student benefits, future research could survey student participants to gain a first-hand account of benefits.

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Evolution of a Liberal Education Course Linking Agriculture, the Arts, and Society

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Abstract

A course in the College of Agriculture and Life Sciences at Virginia Tech was developed to meet the goals of the Creativity and Aesthetic Experience area of the required undergraduate liberal education curriculum. "Agriculture, the Arts and Society" began as a small course designed to improve the perception of the arts among agricultural majors. A one-credit, pass-fail freshman-level course, it was accepted into the liberal education curriculum in 2001. Enrollment in the course currently averages about 120 students per semester, with approximately one half of the students being non-agricultural majors. In addition, about 50% of students in the course are classified as juniors and seniors. Over time, appreciation of agriculture has been stressed more, along with an emphasis on the university's goals of graduating life-long learners who can think critically and creatively, and promoting diversity in the university community. Student perceptions of instruction for the course have generally been very good. They also rated appreciation of the subject matter and discipline field as slightly greater than average (2.23 on a scale of 1-less than average to 3-greater than average), which gives an indication that the course is meeting its primary goal of raising awareness of these topics.

Introduction

One of the most important aspects of a college education is exposure of students to a variety of disciplines and ways of knowing, including aspects of culture they may be unfamiliar with. To that end and consistent with changes in curricula across many universities (Boyer and Levine, 1981; Levine and Nidiffer, 1997), Virginia Polytechnic Institute and State University (Virginia Tech) established a set of liberal education or core curriculum requirements to help all undergraduates achieve a broad base of knowledge and a universal set of transferable skills. The current Curriculum for Liberal Education (CLE) consists of seven areas: 1) Writing and Discourse; 2) Ideas, Cultural Traditions, and Values; 3) Society and Human Behavior; 4) Scientific Reasoning and Discovery; 5) Quantitative and Symbolic Reasoning; 6) Creative and Aesthetic Experience; and 7) Critical Issues in a Global Context. Over the past 30 years, a series of campus-wide task forces and committees worked diligently to shape the CLE into a coherent set of courses that meets the overall and individual area educational goals and is congruent with the university's mission and vision as a comprehensive Research One Land Grant university. Because of the university's desire to gather broad-based support for this curricular endeavor, task force and committee members were drawn from across all colleges. In addition, a decision in the early 1990's opened the CLE to courses outside the traditional College of Arts and Sciences. Consequently, several new and existing courses in the College of Agriculture and Life Sciences are now available for students to meet one or more of their CLE requirements.

The curricular goals for students enrolled in a Creativity and Aesthetic Experience course are to: 1) participate in cultural events and activities on campus, in both popular and classical arts; 2) understand how the artists or designers who produce these events and works have shaped their ideas; 3) examine intuitive and metaphorical thought processes and their relationship to the human imagination and other intellectual abilities; 4) explore the interaction of art and society, including the contributions of diverse groups to cultural life, such as women and members of minority groups; 5) study selected classic works of fine and applied arts; 6) participate in interpretive discussions, lectures, and demonstrations led by artists, designers, architects, musicians, and/or performers; and 7) explore connections between the arts and other forms of design and creativity.

A cultural link between agriculture and the arts is imbedded in the philosophy of agrarianism. Historically, humans have sought grounding for their value systems, including an innate attachment to the land. "People of the earth" are at home while working with the soil and animals. To be productive, farmers must nurture the biosphere's creative capacity. By working in harmony with the land, farmers build a cultural aesthetic that reflects a beautiful relationship portrayed in visual landscapes and drawn upon in painting, literature and song. It sustains a biologi-

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cal connection and promotes a world view larger than ourselves. Working from that basis, therefore, we set forth to develop a course entitled "Agriculture, the Arts and Society" to meet the goals of the Creativity and Aesthetic Experience area.

Although there are examples in the literature of discipline-specific courses being available to non-majors and/or satisfying general education requirements (Bradley et al., 2003; Haque et al., 1988; Kazmer, 1991; Kesler, 1997; St. Hilaire et al., 2009; Stephens and Schmidt, 2004), this course is the only one we know of specifically designed to meet a general education requirement by deliberately connecting agriculture and the arts. Our course was first offered in the 1996 fall semester and has evolved over time from a low enrollment (<20) course primarily populated by students majoring in agriculture to a rather large (>120) course consisting of a diverse population of students enrolled in majors across campus (Figures 1 and 2).

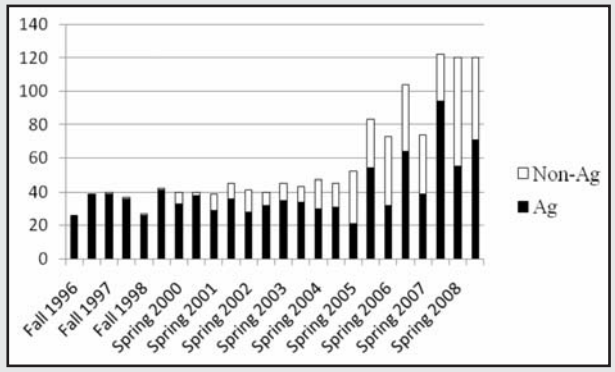

Figure 1. Number of students enrolled in "Agriculture, the Arts and Society" by semester and type of major (Agricultural and Non-Agricultural) from fall semester 1996 through fall semester 2008.

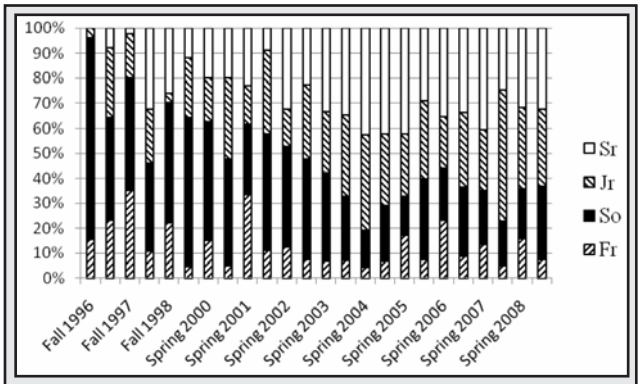

Figure 2. Enrollment percentages in "Agriculture, the Arts and Society" by academic level (Freshman, Sophomore, Junior, Senior) and semester.

Methods

Course Description. "Agriculture, the Arts and Society" is a one-credit (semester) freshman-level course offered Pass/Fail only. Grades are determined by successful completion of assignments, a final exam essay, and class participation. Unlike many CLE courses, it is not designed to provide depth in a specific area of study. Instead, the course serves as an introduction to the relationships among agriculture, society and the arts, all of which are integral components of civilization. The overall goal is to stimulate critical thinking about topics that may be unfamiliar to the students, such as making the connection between agriculture and the arts; exploring how different people react to those connections; and reflecting on what that might mean for them personally and for society in general. Designed specifically for the Creativity and Aesthetic Experience area of the CLE, the course objectives reflect the area goals closely and have changed very little since inception of the course (Figures 3 and 4).

ALS 2984 - SPECIAL STUDY
Creative and Aesthetic Experience: Focus on Agriculture
Proposed Syllabus Spring 1996

Course Objectives
- Participate in cultural events and activities on campus, in both popular and classical arts
- Develop an understanding of how artists or designers shape their ideas into these events
- Explore the interaction of art, agriculture and society
- Study selected classic works of fine and applied arts
- Participate in interpretive discussions, lectures and demonstrations led by artists, designers, architects, musicians, and/or performers
- Understand the connection of agriculture to the fine arts, both in tradition and in contemporary life

Course Outline

Perceiving the visual and performing arts	15%
Musical connections	10%
Theatrical/film connections	10%
Visual art connections	10%
Local experiences	10%
The Will Rogers Follies	
NRV Symphony	
Field trip/paper (Mellon Gallery in Richmond)	20%
Discussion of experiences	15%
The arts and the human experience	10%
	100%

Course Grading
Grades are assigned based on participation in lecture, attendance of events and papers submitted to instructors. P/F only.

Figure 3. Syllabus of the course "Agriculture, the Arts and Society" when it was taught as an experimental course in Spring 1996, edited to omit details on course administration.

ALS 1004 Agriculture, the Arts and Society
Spring 2009

Course Objectives:
Students will:
- explore the interaction of the arts, agriculture and society;
- participate in cultural events and activities;
- study selected works of fine and applied arts;
- develop an understanding of how artists shape their ideas;
- appreciate the connection of agriculture to the fine arts, both in tradition and in contemporary life.

Course Structure:
This course is designed to explore how the arts have reflected the role of agriculture in society over time. It also should give you a better appreciation of how the arts can be part of your life. The focus is on participation in and discussion of selected topics, events and works. The course can be a lot of fun, but it takes your participation to work; therefore attendance and completion of in-class assignments is required, along with outside assignments. The final exam will be an essay on the semester's experiences, how they relate to Area 6 goals, and your reactions to them.

Attendance Policy:
Your grade in this course is based on participation and completion of assignments. You cannot pass the course if you miss more than three class meetings. Please be on time for class: it is rude to our guest speakers to be late.

Textbook:
There is no textbook for the course. You will need to purchase your ticket for *Step Afrika*. Information about assignments, links to interesting events, etc. will be on Blackboard.

CLASS SCHEDULE

January 21	Introduction: Agriculture And The ARTS??
January 28	Thinking Outside The Box
February 4	Drawing On The Right Brain
February 11	Introduction To Stepping: Dr. Elizabeth Fine
February 24	Step Afrika
February 25	I Don't Know Art…
March 4	The Art Of Photography
March 18	Agriculture And Art
April 1	Agriculture And Music
April 8	Photographic Portfolios
April 15	A Way Of Life? Dr. Mike Ellerbrock
April 22	Creativity And Agriculture
April 29	FINAL EXAM—In Class Essay

Figure 4. Spring 2009 syllabus for "Agriculture, the Arts and Society", edited to omit course administration details.

Topical Origins. Two books by R. L. Willham *(The Legacy of the Stockman, 1985; and Taking Stock, 1987)*, written as textbooks for a livestock heritage course at Iowa State University, were influential in defining the concept of "Agriculture, the Arts and Society." The course was organized

(Figure 3) using the model established by the first course accepted into the Creativity and Aesthetic area of the CLE at Virginia Tech. Approximately half of the course consisted of lectures on the visual and performing arts, including music, theater and/or film, painting, sculpture, and photography, using examples that depicted agricultural themes such as planting and harvesting or prize-winning livestock. Another one third of the course focused on locally-available experiences such as art exhibits, symphonies, plays, and other such events, and/or field trips to nearby cities, the goal being to choose events each semester that focused on agriculture. The final 20% of the original course consisted of discussions regarding the assigned event(s). Students also were required to write a short report summarizing the event and reflecting on it.

Course Topics, Assignments and Final Essay. While many topics in the course are taught every semester, each semester the course content is built around one or more campus and/or community cultural events students are expected to attend. We have learned that the best format is a traditional once-a-week class session with fairly independent topics (sessions) scheduled around the required event. One semester, the course was taught as a half-semester course that met two hours a week for eight weeks. Although a number of students liked the shorter time frame (data not shown), it was more difficult to keep their attention for two hours and the topics did not flow as well.

Sessions. "Agriculture, the Arts and Society" begins with a session entitled "Agriculture and the ARTS?!" (Figure 4; January 21) which sets the tone for the entire semester: Open up the box and start thinking outside of it. In addition to simply asking students to keep an open mind, ten notions on teaching (Peterson, 1967) are presented and students are asked to think about questions like, "What possesses people to write poetry about sheep? Or sculpt prize-winning livestock?" and "Can garden design be considered a link between agriculture and art?" As the course evolved and enrollment and diversity increased (Figure 1), the topic was expanded to another session that occurs toward the end of the semester (Figure 4; April 15). The additional session positions the course in the larger context of the university goals of graduating life-long learners who can think critically and creatively, and promoting diversity in the university community. In particular, this session helps break down some of the stereotypes about majors (agriculture vs. performing arts, for example), as students debate values embodied in Thomas Jefferson's agrarian ideology (Knutson et al., 1983).

The second session of the semester (Figure 4; January 28) usually is a lecture on the principles and concepts embodied in the terms *creativity, aesthetics*, and art so everyone is working with the same definitions. Definitions of agriculture were soon added, and for the past several semesters a brief overview of the scope of agriculture in the U.S. has been a part of the lecture. Another session (Figure 4; February 25) is devoted to principles of evaluating works of art: how that evaluation necessarily contains elements of subjectivity as well as objectivity, how tastes in art change over time (both for individuals and for society), and how individuals can appreciate art they may not personally like (Fabun, 1970). Students enjoy debating what constitutes "good art" versus "bad art," and are encouraged to bring examples to class to make their case. Typically, students walk away from this session with a much better understanding of why there are so many differences of opinion about what constitutes art, let alone how to judge its aesthetic value.

In 2001, the topic of right-brain, left-brain thinking (Figure 4; February 4) was added to the early weeks of the semester. Many students who take the course are science and engineering majors and consider themselves to be straight-line (logical) thinkers. This session gives students some insight into why different people have different reactions and thoughts about art and artists. Based on the books *Whole Brain Thinking* (Wonder and Donovan, 1984) and *Drawing on the Right Side of the Brain* (Edwards, 1979), an integral part of the session is an exercise in which students draw a picture upside down to help "turn off" the logical (left) side of the brain, allowing the creative (right) side more freedom.

Three other topics with a direct focus on agriculture that have been a part of the course from the beginning include music, paintings and sculptures, and photography (Figure 4; March 18 and April 1). There are almost limitless examples of agricultural themes in each of these art forms, although they can be harder to find in contemporary compositions than in classical works. The challenge has been to present the topics so that students are interested and engaged, as they are less likely to connect with those classical examples than with examples from "their" music and visual art. The hymn "Bringing in the Sheaves," for example, does not resonate very well with students who do not even know what a sheave is. A recent (2007) course addition is a class session on the creativity and aesthetics of the university horticulture gardens (Figure 4; April 22), which includes a field trip to the garden to find some of those elements (examples include combinations of plantings for texture and color, angles of flower beds inviting visitors to step into the garden, and the sound of water running over rocks in a manmade stream). For a significant number of students, this is their first visit to the garden, which is near the football stadium but on the edge of campus away from the main academic buildings.

Because of the flexibility of the course, it has also been possible to include specific topics on an ad hoc basis. These topics keep the course fresh from an

instructor's viewpoint and often give students chances for unique experiences. Examples of such topics include horticulture and art (floral design), the art of tying flies for fly fishing, poetry about agriculture (e.g., Baxter Black), folk dance (square dancing, for example), arts in the community (a number of artists in our area have strong agricultural ties), corn field sculptures, equine art, and art quilts. When enrollment was smaller and consisted primarily of agriculture majors, a panel of faculty and staff in the College of Agriculture and Life Sciences who pursue one or more aspects of the arts as an avocation illustrated through their personal experiences that it is possible to nurture a talent for the arts, yet pursue a professional career in a different area.

Assignments. Participation in cultural events on campus is one of the CLE goals for students taking courses in the Creativity and Aesthetics area so there is at least one outside assignment each semester, although not necessarily on campus (Figure 4; February 24). For each outside assignment, at least one lecture before or after is devoted to discussion of the event (Figure 4; February 11). When possible, a principal participant is invited to speak to students during that class period. In their required reflection paper, students are asked to include a summary of the event and their reactions to it, as well as observations about the environment in which it took place, how other audience members reacted, and whether or not they identified any direct or indirect references to agriculture. The student response to the last question often changes by the time the in-class discussion of the event ends; many students have no idea how agriculture permeates society, past and present, which means it often shows up in the arts in subtle ways. We have attained one goal of the class if students find themselves looking for those connections.

Outside assignments have included field trips to the Virginia Museum of Fine Arts in Richmond, Virginia, which has a fine collection of livestock sculptures; attendance at a Baxter Black (cowboy poet) performance; on-campus events such as the Theatre Department's productions of Chekhov's "The Cherry Orchard," about the loss of a family's estate to suburban development; and traveling productions of Rodgers and Hammerstein's "State Fair," and "A Streetcar Named Desire" by Tennessee Williams. There are indirect references in "Streetcar" to how changes in southern agricultural systems impacted society in cities like New Orleans but those references must be pointed out to students who are too young and not from that background to pick them up. In 2006, students critiqued works in "Gobble de Art," Blacksburg's entry in the fiberglass art parades (Chicago's "Cows on Parade" and Cincinnati's "Pigs on Parade" were among the first such events). More than 40 Virginia Tech mascot Hokie Bird statues were personalized by various artists and put on display on campus and in town for an extended period of time. Several of the statues incorporated agricultural themes, which provided a nice springboard for discussions in class. Another semester, Dr. James I. Robertson, a renowned Civil War historian and Virginia Tech Distinguished Professor of History, collaborated with the Music Department to present "Music and Memories of the Civil War: A Living Legacy," a multi-media performance that contained many allusions to the agrarian lifestyles on both sides of the conflict. A year later, "Distant Echoes: Black Farmers in America," a traveling photography exhibit, was on campus. Students who attended that exhibit became acutely aware of the decline of black-owned farms, which are disappearing at an alarming rate (Ficara, 2006).

Occasionally students have been asked to attend a performance in Roanoke, Virginia, about an hour from the Blacksburg campus, when there are direct connections to agriculture in the performance. The musical "Oklahoma" is one example. When an on-campus or local artistic event with a direct connection to agriculture was not available, students were responsible for finding and gaining approval to attend and report on an appropriate cultural event. This assignment was not easy to manage even with a smaller class. As class size approached 100, it became necessary to choose one event for all students to attend. Even if it does not directly relate to agriculture, an event may be chosen to generate discussion about the interaction of the arts and society, and how students of varying majors perceive their participation in such events. The semester following the April 16 shootings at Virginia Tech, for example, students attended "A Concert for Virginia Tech" with a discussion of the concert and their reactions to it in the following class period.

One assignment integral to the course is an experiential photography project that allows students to take on the roles of artist, audience and critic. The project consists of four phases: a lecture on basic principles of photographic composition; turning students loose with cameras; an evaluation of the results in the classroom; and a public display of their best photographs. The introductory lecture (Figure 4; March 4) includes a PowerPoint presentation illustrating some basic composition principles used to compose outstanding photographs. These principles include the rule of thirds (try to make sure the object of interest is off center); diagonals (explicit, such as a fence line, and implicit, such as the incline of a hill within the image); common elements (a field of tulips, for example); vertical orientation (turn the camera 90°); and the impact of lighting (back lighting, side lighting, early morning light, sunset, etc.). In addition, students are told to try for at least one creative shot as rules are made to be broken, and to avoid inclusion of people in the images.

When the course started, inexpensive box cameras were provided to students who then turned them in a week later. The film was developed locally, and the prints were given back to the students the

next class period. The quick turnaround time kept the project fresh in the minds of the students, and they always were eager to see how their efforts turned out. To illustrate variation in peoples' reactions, students were instructed to choose their top three picks from among their images, identify them on the back, then shuffle the photographs and hand them to a neighbor. That neighbor was instructed to choose his or her top three picks in the stack then compare those rankings with the rankings penciled in by the photographer. In most cases, there were at least a few pair changes in rankings and sometimes an entirely different set of three photographs was chosen. The primary drawback to this system was that it was difficult to share specific photographs with the entire class since 4x6 inch photographs are difficult to see at any great distance. For the last phase of the project, students were introduced to the concept of public scrutiny by submitting their best image to the class collection that was then placed in a display case outside one of the busiest lecture halls in the college. All photographs were identified with the student-photographer's names, of course.

Beginning with the spring 2004 semester, students were allowed to use their own digital cameras to complete the assignment if they wished, turning in unedited images on CDs. By this time, it also was cost effective to get the box camera film developed into prints and burned on a CD, which made it possible to select images for display to the entire class in a PowerPoint presentation (Figure 4; April 8). In fall 2005, aided by a small grant for the purchase of 15 digital cameras and use of the digital dropbox feature of the Blackboard course software, the photography assignment was based completely on digital images. To deter cutting and pasting of images from the Internet, or of borrowing images from a friend, image files (not the images themselves) are required to have date taken information included under list details, and students must sign a copyright statement indicating that the images they are submitting are their own.

Final Exam. The final exam for "Agriculture, the Arts and Society" is an open-book essay that is written during the last class. Students are told ahead of time the essay should summarize what they learned in the course, and address how well the course met the stated objectives and goals for the Creativity and Aesthetic area. This essay gives students a chance to reflect on and internalize what was accomplished during the semester. The essay also provides the instructor with feedback on student perception of the various topics and how well the topics connected to the course objectives and the Creativity and Aesthetics area goals. Finally, the essays provide information for periodic assessment of the course by the university curriculum committee on liberal education.

Data sources. Enrollment data (numbers of students, gender distribution, majors and academic levels) for "Agriculture, the Arts and Society were available for all terms from fall 1996 through fall 2008. For purposes of determining numbers of agricultural majors, programs in the College of Natural Resources were included as agricultural majors, as were Biological Systems Engineering (BSE) majors. Although technically majors in the College of Engineering, BSE students spend much of their time in the College of Agriculture and Life Sciences. Summaries of anonymous end-of-term student perceptions of instruction (teaching evaluations) were available for each term except spring 2007, when the April 16 shootings occurred. Additionally, there were written comments from the evaluation forms themselves. At Virginia Tech, a standard form is used across all courses to measure student perceptions of instruction. Most questions use a scale of 4=Excellent, 3=Good, 2=Fair, 1=Poor, but others are rated as 1=Less than Average, 2=Average, or 3=More than Average. Students are also given space to provide written comments. In "Agriculture, the Arts and Society" the evaluation forms are filled out at the beginning of the last class period, just before students write their final exam essay. The instructor is not present while students are filling out the forms, nor is the instructor permitted to see the results until after grades are submitted.

Results and Discussion

Enrollment trends. As shown in Figure 1, "Agriculture, the Arts and Society" started as a small experimental course for agriculture majors. It quickly grew to an enrollment of 40, where it was capped until fall semester 2005 when enrollment was allowed to expand because requests for the course far exceeded the seats available. It is now taught in a classroom with a capacity of 130 students; with attrition, enrollment currently averages 120 each term. Given the number of requests for the course (data not shown), it would be possible to increase course size again but management of course logistics becomes more difficult as class size increases. Course policy has already been modified to accommodate class size: class participation is an important component of the grade and attendance is recorded using spot check roll calls in conjunction with in-class assignments that are turned in at the conclusion of each session.

After its acceptance in the CLE in 2001, the number of non-agricultural majors in "Agriculture, the Arts and Society" increased over time, rising as high as 59% in spring semester 2005 (Figure 1). There has been a tendency for a higher proportion of non-agricultural students to be enrolled in the spring than the fall. Fall semester 2007, with only 23% non-agricultural majors, was unusually low. One factor contributing to the increase in non-agriculture majors is that the course is the first one listed in the CLE Guidebook. Another reason, based on comments from both anonymous student evaluations and the final essay, is that students who take the course tell their friends about their experiences. That word of

mouth may also help explain why non-agricultural students enroll in higher numbers in the spring compared to the fall.

In any given semester, students from the professional colleges (Agriculture and Life Sciences, Engineering, Natural Resources, and Business) make up the majority of the class, primarily because they need only one credit from this CLE area whereas students in the other colleges are required to take three credits in the area. For the most part, students from the colleges of Science, Architecture and Urban Studies, and Liberal Arts and Human Sciences are taking the course as a free elective. The mix of majors and personal backgrounds adds a rich diversity of perspective to class discussions. The course syllabus emphasizes an expectation of civil discourse at all times in the class, as embodied in the Principles of Community posted in the room and available on the web (Virginia Tech, 2005).

Class enrollment over time by academic level (Freshman, Sophomore, Junior and Senior) is shown in Figure 2. The first time the course was taught, the requirement for the Creativity and Aesthetic Experience was being phased into the curriculum and seniors were exempt. In addition, the course was taught as a special study, so most students were not aware of it. Over time, the proportion of upperclassmen steadily increased; since spring semester 2003 juniors and seniors have made up at least 60% of the enrollment of the freshman-level course except for one term. At least two factors contribute to this distribution. First, because the course fills each term, some students must try several times before they get a seat. Second, as borne out in surveys of student perceptions of the importance of the arts as part of their undergraduate education (data not shown), fulfilling this requirement is not the highest priority for many students and each semester, the course includes several graduating seniors. These upperclassmen often make excellent contributions to class discussions, but they also can be very difficult to reach as they are in the class simply to fulfill a requirement they do not really care about.

In recent years, freshman enrollment has tended to be higher in spring compared to fall (Figure 2). This appears to be a function of course demand. Returning students can request the fall course in the spring and it often fills before freshmen begin signing up for courses during the summer, forcing them to rely on the drop-add process to enroll in the course. During registration for spring semester, freshmen are on an equal footing with everyone else.

Student perceptions of instruction. As indicated in Table 1, student perception of instruction for "Agriculture, the Arts and Society" has generally been very good. Even in the larger sections, students perceive that they are treated as individuals. They also perceive on average that the out-of-class assignments (attending a cultural event and the photography project) are good to excellent. As might be expected in a freshman-level pass-fail course, they also rate the time and effort required for the course to be less than average. On the other hand, given that, in general, students rate appreciation for the arts as less important than many other aspects of their undergraduate careers, the fact that they rated appreciation of the subject matter and discipline field as slightly greater than average gives an indication that the course is meeting its primary goal.

Table 1. Student Perceptions of Instruction for "Agriculture, the Arts and Society" Averaged over Selective Periods During a 12-Year Time Frame

Item	1996-2008[x]	2005-2008[y]	All College Courses[z]
Concern and respect for students as individuals (1=Poor; 4=Excellent)	3.68	3.70	3.63
Overall rating of this instructor (1=Poor; 4=Excellent)	3.63	3.62	3.4
Educational value of out-of-class assignments (1=Poor; 4=Excellent)	3.31	3.25	3.30
Time and effort required (1=LT Avg; 3=GT Avg)	1.29	1.27	2.20
Appreciation of the subject matter and discipline field (1=LT Avg; 3=GT Avg)	2.23	2.13	2.41

[x]Averages of student perceptions of instruction from fall semester 1996 through fall semester 2008.
[y]Averages of student perceptions of instruction from fall semester 2005, which is when class size began increasing, through fall semester 2008.
[z]Averages of student perceptions of instruction for all courses taught in the College of Agriculture and Life Sciences from fall semester 1996 through fall semester 2008.

Evolution of the course. "Agriculture, the Arts and Society" began as a small course designed to improve the perception of the arts among agricultural majors. The goal was to explore how the arts have reflected the role of agriculture in society over time. The idea was that relating the arts to their chosen profession would give agriculture majors a positive experience in an area most of them avoided. The course was an experiment that had its genesis in the lead instructor's interest in the arts, and the convergence of changes in university policy with a fortuitous link between faculty in the College of Agriculture and Life Sciences who also happened to be talented photographers, musicians and painters. Once begun, it became easier and easier to show the connections between agriculture and the arts, as well as agriculture and society, providing impetus to turn the special study into an approved CLE course and giving students a better appreciation of how the arts and agriculture can be part of their lives. For some students, this is simply a better ability to recognize that different people like different art and that there are viable careers in agriculture. For others, it is almost literally permission to practice their avocations for the arts even as they pursue a professional degree.

As courses often do, "Agriculture, the Arts and Society" has also changed over time to better meet students where they are and draw them into the conversation. With enrollment of non-agricultural majors reaching 50% in recent years (Fig. 1), appreciation for agriculture has been stressed more: the course has increasingly served as a brief introduction to the role of agriculture in today's society. For many of the students enrolled in the course, this may be the only direct positive exposure to agriculture they will receive during their undergraduate careers.

Additionally, more explicit emphasis has been placed on the university's stated goals of graduating life-long learners who can think critically and creatively, and promoting diversity in the university community. We also have been very fortunate in identifying outstanding guest speakers among faculty and staff throughout the university community, and from the larger community beyond campus. Some of these speakers have become regular contributors to the course; others directly impacted only one set of students but their contributions continue as the course continuously evolves.

From a pedagogical standpoint, evolution of the course is particularly evident in the increased time devoted to classroom participation and discussion of selected topics, events and works in lieu of traditional lectures. Of course, it has been necessary to focus on quality rather than quantity to attain these goals. For example, in the session on art and agriculture, a large set of slides depicting agricultural themes in paintings over the centuries has been replaced with a smaller set of carefully chosen examples that can be used as part of a class discussion on the depiction of agriculture by artists in different eras. It also has been difficult at times to engage students; many of them would rather sit and listen (or text or check e-mail) than actively participate. However, even in a large classroom with fixed seats, small group discussions are possible, and students are sometimes asked to "vote with their feet": the entire class has been asked to literally stand up and place themselves along the wall on a continuous scale from extreme dislike to extreme like of a particular topic under discussion. Other ways of encouraging participation include short answer assignments that are turned in at the end of the class, and requesting that all electronic devices be turned off during class. A spot check of the roll also encourages students to attend class.

Where will this go in the future? A few existing courses in the College of Agriculture and Life Sciences have been added to the CLE in other areas, and Floral Design was a welcome addition to this area, but there has not been much interest in developing agriculturally-oriented general education courses at Virginia Tech. Part of that may be lack of ease or agreement with the goals of the CLE, but most of that reluctance is probably because of lack of resources to develop and teach new courses that meet specific goals in a particular area of the CLE. Indeed, the opposite is true: in the past two years there have been more requests university-wide to remove courses from the CLE than to add to it. It has been almost 10 years since the last comprehensive review of the CLE and that process is now getting underway so there may be changes to the CLE in the next five years or so. The odds, however, are that any changes to the CLE will not impact this course in the foreseeable future. There are no plans to discontinue the course but there are also no plans to increase class size unless new ways of utilizing technology are incorporated. Electronic clickers have become more and more popular as a way of stimulating class participation but the systems still have glitches and it is hard to justify asking students to pay for something that will be used a maximum of 15 times in a one-credit P/F course. As discussed earlier, the photography project is now 100% digital but it still takes a lot of time to sort through 120 sets of images and get them into a PowerPoint presentation. An electronic photography gallery that could permanently display students' work would be a nice addition to that project but we are still working on that aspect. Scholar, which will soon replace Blackboard as the university's online system for learning, holds some promise in that regard.

Summary

"Agriculture, the Arts and Society" was developed to help students in agriculture see connections between their chosen profession and the arts. It has since expanded to include non-agricultural majors. It reinforces the evolutionary principle that domestic agriculture enabled the birth of the arts and culture among primitive societies, leading to the diversity of aesthetic values and creative experiences we know today. Academically, it reflects our institution's wisdom in opening the CLE to courses outside the traditional arts and sciences departments. Because it was designed specifically to meet the educational goals for the Creative and Aesthetic area of the CLE, "Agriculture, the Arts and Society" was one of the first courses in the College of Agriculture and Life Sciences to be accepted as a new course into the university's CLE. Its success, as measured by student demand and student perceptions of instruction, indicate that students enjoy the material and the way the course is taught, and that they leave the course with a better understanding of the connections between agriculture, the arts, and society. Results of these efforts show that non-traditional courses can be developed within agriculture that integrate those topics deemed important from a broadening perspective. More courses like this should be considered when meeting liberal education objectives in the future, but the issue of resources must be addressed.

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Determining the Professional Development Needs of Faculty in a College of Agriculture

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Abstract

Even in difficult fiscal times it's essential for institutions to invest in faculty development to provide faculty with the necessary skills and training to advance them professionally, especially their teaching, which students consider the most important job of faculty. This study examined the professional development needs of faculty in the College of Agricultural Sciences and Technology at California State University, Fresno. It looked at their perceived level of teaching skill and their interest in teaching improvement. Faculty indicated "good" levels of skill in performing traditional teaching practices; however, in over half of the educational technologies examined faculty reported little to no skill. Respondents expressed at least some interest in improving on all of the instructional activities. Less interest was shown in further training related to the educational technology areas. The Borich needs assessment model was used to establish priority areas for future faculty development. The instructional priority areas were, using alternative teaching methods, effectively evaluating student learning, discovery learning methods, improving student reading and writing skills, and faculty self-evaluation of teaching effectiveness. The educational technology priority areas were, creating and editing digital videos, using interactive teaching technology, using multimedia tools, using Internet discussion groups, and utilizing video conferencing technology.

Introduction

A university's reputation and prestige is largely based upon the perceived quality of the institution. Although there are many factors that contribute to perceptions of an institution's quality, none may have as great an impact as the university's faculty. With this in mind, institutions typically invest in their faculty providing them with opportunities to develop new skills and knowledge in order to further them professionally and build on the perceived quality of an institution.

Even during this current period of fiscal difficulty it is important for faculty to continue to advance professionally. This investment is especially important within the scholarship of teaching, which according to students is considered to be the most important job of a faculty member (Wiedmer, 1994). Teachers must be well informed and have a deep knowledge of their field. The teaching methodology and procedures used by faculty must be carefully planned, continually evaluated, and should directly relate to their subject matter (Boyer, 1990).

In an effort to maximize the impact of precious professional development funds greater attention and focus should be given to those areas where the need for improvement across an entire college is the greatest and where funds can be used most efficiently. This approach differs from that traditionally taken by California State University, Fresno, where faculty have primary responsibility for teaching undergraduate courses, but professional development activities have historically been focused on attendance at professional and/or research related conferences and meetings. Herein lies the motivation for this action research, which will attempt to provide the leadership of the college with a greater understanding of the professional development needs of faculty.

Conceptual/Theoretical Framework

Boyer (1990) stated that teaching is "a dynamic endeavor" (p. 23) which requires the use of analogies, metaphors and images to build a bridge between the teacher's understanding and student learning. However, some view teaching as a rather routine task that almost anyone can do (Boyer, 1990). Adding support for such a belief is a shift in priorities that has occurred over the past few decades in American higher education. Once seen as institutions whose primary mission was undergraduate education, universities have shifted their focus towards research and graduate education. In spite of Boyer's (1990) challenge to reexamine the definition of scholarship and view teaching, service, and research equally; tenure and promotion procedures still reflect the increasing pressure for faculty to publish research.

Graduate degree programs which are required for university faculty positions do provide students with preparation and experience conducting research, however these programs provide little to no instruction in the practice of teaching (Ely and Ragland, 1989). This begs the question, "Where do faculty acquire the training and experience necessary to be effective in the classroom?" University faculty find themselves in a situation where they feel competent within their technical field; however, their technical competency may not prove to be adequate preparation for teaching (Bowman et al., 1986). This results in most new faculty finding they have a strong need for professional development in order to build and improve their teaching effectiveness.

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Typically, providing faculty with professional development opportunities requires financial resources. In higher education, these financial resources are precious which demands greater efficiency when allocating such funds. Decisions on how to invest in faculty development must be based on effective needs assessments to best address priorities for continued development of the academy (Witkin, 1984). This has led to a paradigm shift in which higher education has moved away from the traditional professional development activities of sabbatical leaves and attendance at professional conferences. Greater attention has been given to opportunities to increase teaching effectiveness and improved methodology (Lawler and King, 2000).

In an effort to determine the greatest areas of need for improved teaching effectiveness and methodology, researchers in colleges of agriculture have examined the professional development needs of faculty. In 1998, Kirby, Waldvogel, and Overton examined the educational technology professional development needs of faculty at North Carolina State University. These researchers reported faculty expressed a need for additional training related to using multimedia tools, constructing web pages, and computer and presentation graphics.

More recently, Wingenbach and Ladner (2002) examined the differences between the professional development needs of faculty in the College of Agriculture and Life Sciences and College of Education at Mississippi State University. Both groups reported higher ratings in the traditional teaching methods than in using new and emerging educational technology. Several differences were found between the two groups, particularly in student-centered activities.

In an effort to guide this investigation, the researcher utilized Knowles (1984) theory of andragogy as the theoretical framework. Knowles (1984) emphasized that adults are self-directed and they expect to take responsibility for their learning decisions. Four principles provide the foundation for Knowles' theory, 1) adults need to be involved in the planning and evaluation of their learning activities, 2) experience, which includes mistakes, provides the basis for adult learning, 3) adults are most interested in learning content that has immediate relevance to their job or life, and 4) adult learning is problem-based rather than content-oriented (Knowles, 1984).

An effective faculty development program begins with the process of preplanning, which according to Lawler and King (2000) focuses attention on organizational goals, needs and climate, as well as the faculty's needs and experience. Faculty and administrators might have thoughts about what they think the areas of need are, however these are usually based on impressions or on observations of only a few persons who may not be representative of the entire faculty.

The Borich (1980) needs assessment model was used as a conceptual basis for this study. This model has been found to add validity to the process of determining the professional development needs of agricultural educators (Waters and Haskell, 1989). Beginning with Barrick, Ladewig, and Hedges in 1983, the Borich model has been used in several studies to measure the inservice education needs of secondary agriculture teachers (Edwards and Briers, 1999).

Barrick and his colleagues (1983) found using a direct assessment model to be less reliable than the Borich model. The difference between the models being that the direct assessment model uses only one factor to determine the inservice education needs of subjects while the Borich model uses two or more factors to form conclusions about the needs of the subjects. Later, Waters and Haskell (1989) and Newman and Johnson (1994) would provide support for the conclusions of Barrick, et al. (1983).

The Borich needs assessment model (1980) consists of five steps. To implement the model a researcher must first establish a list of competencies. Competency statements typically reflect effective teaching practices or the objectives of the professional development program. Once the competency list has been composed, a questionnaire is developed and administered. Subjects are asked to rate their perceived level of competency and also their current level of attainment of each competency. Once data are collected, the competencies are then ranked by the ratings submitted by the subjects. Rankings are established by calculating discrepancy scores, which are based on differences between the perceived importance and perceived level of attainment of each competency. Discrepancies with the highest rank order would then have the highest priority in an improvement program. Next the existing or proposed professional development program is examined to determine if the high priority areas are receiving adequate attention. If deemed necessary, modifications are made to provide additional resources, training, or materials to better address the subjects' professional needs related to each competency area.

Purpose and Objectives

The purpose of this study was to examine the professional development needs of faculty in the College of Agricultural Sciences and Technology at California State University, Fresno, specifically looking at their perceived level of teaching skills and their interest in teaching improvement. The following research objectives guided this study:

1. Describe faculty based on rank, years of teaching experience, and selected demographic characteristics.

2. Describe the faculty's perceived level of teaching skills and interest in teaching improvement related to selected instructional activities.

3. Describe the faculty's perceived level of teaching skills and interest in teaching improvement related to selected educational technologies.

4. Determine priority areas for faculty development based on the Weighted Mean Discrepancy Score rankings for selected instructional activities.

5. Determine priority areas for faculty development based on the Weighted Mean Discrepancy Score rankings for selected educational technologies.

Methods and Procedures

This descriptive census study focused on a target population of all full-time faculty in the College of Agricultural Sciences and Technology at California State University, Fresno during the 2007-08 academic year. With the assistance of the dean's office a list of full-time teaching faculty was established for each of college's seven academic departments. This allowed the researcher to identify the target population, which consisted of 45 full-time teaching faculty comprised of seven lecturers, 11 assistant professors, 10 associate professors and 17 full professors.

The data were collected using a questionnaire developed by Wardlow and Johnson (1999) used to assess university teaching faculty's perceived level of teaching skills and interest in teaching improvement. Wardlow and Johnson (1999) established content validity of their instrument through a review by a panel of experts, which included teaching faculty from across their college. A test-retest procedure was conducted with 11 graduate students in a teaching course at four week internals to establish a coefficient of stability of .68. Additionally, a factor analysis was performed following the collection of the data to establish construct validity. In doing so, Wardlow and Johnson found that the 20 items in the Teaching Activities construct accounted for 63.5% of the variance, while the 12 items in the Educational Technology construct explained 72.2% of the variance in the data.

For this study, the Wardlow and Johnson (1999) questionnaire was modified for online delivery and the educational technology items were updated. The 79 item instrument was administered online and participation was requested via email to all faculty in the population. After an initial email request was sent to faculty directing them to the questionnaire website, two follow-up emails were sent at two-week intervals to the non-respondents. A total of 39 usable instruments were received, resulting in an 87% response rate.

To address the possibility of possible non-response error, a comparison of early to late respondents was conducted (Miller and Smith, 1983). As recommended by Lindner, et al., (2001) the latter half of respondents (n = 20) were compared to the early respondents (n = 19) on their Mean Weighted Discrepancy Scores for both Teaching Activities and Educational Technology categories. Analysis of the data found no significant statistical difference on any of the 34 items. Given these findings, it was concluded that results were generalizable across the entire population of this study.

Descriptive statistics were used to analyze data for Objective 1. For Objectives 2 and 3 interval data were reported as means and standard deviations. Objectives 4 and 5 were accomplished by calculating and ranking the Mean Weighted Discrepancy Score (MWDS) for each item as outlined by Borich (1980). To calculate the Mean Weighted Discrepancy Score, one must first determine each individual's discrepancy score for each construct item by subtracting their numerical response on the "Level of Skill" scale from their response on the "Interest in Improvement" scale. For example, if a respondent indicated on a 5 point scale their interest in improvement to be a "4" and their skill level a "1" their discrepancy score would be 3.00. In the second step, weighted discrepancy scores were calculated for each respondent by multiplying the individual's discrepancy score on each item by the overall mean of that item on the "Interest in Improvement" scale. So from the last example, the individual discrepancy score of 3.00 would be multiplied by that item's overall mean on the "Interest in Improvement" scale. At this point each respondent has a weighted discrepancy score for each construct item. The final step was to calculate the mean for each item by dividing the sum of the weighted discrepancy scores by the total number of observations. This calculation yields the Weighted Mean Discrepancy Score for each item within the construct scale. These scores were then sorted from highest to lowest to establish the item's ranking.

Results/Findings

Of the responding faculty, 15.4% were lecturers (n = 6), 28.2% were assistant professors (n = 11), 20.5% were associate professors (n = 8), and 35.9% were full professors (n = 14). The university teaching experience of the respondents ranged from 1 to 39 years with a mean of 13.97 (SD = 10.16). Nearly three-fourths of the respondents were male (74.4%, n = 29). The average age of the respondents was 48.9 years (SD = 9.41) and ages ranged from 30 to 64 years.

In objective two, the researcher set out to complete two tasks. The first being to describe the faculty's self-perceived level of skill on selected instructional activities. Secondly, to describe the faculty's level of interest in improving on their skills related to these instructional activities. Based on the findings displayed in Table 1, the faculty reported they possessed the greatest level of skill in instructional activities related to developing course syllabi (M = 4.18), lecture delivery (M = 4.13), designing and/or revising courses (M = 4.10), motivating and creating student interest (M = 4.08), and encouraging students to think critically (M = 4.05). Respondents felt they possessed the lowest skill level in activities such as, conducting observations of their

peers (M = 3.61), assisting students in improving their reading and writing (M= 3.51), using discovery learning activities (M=3.38), conducting case studies (M=3.31), and lastly, utilizing alternative teaching methods (M=3.18).

When examining the level of interest in skill improvement (see Table 1), faculty reported being most interested in improving their skills related to motivating students and creating student interest (M=4.30), evaluation of student learning (M = 4.23), encouraging students to think critically (M=4.15), using problem solving activities (M=4.11) and developing effective student assessments (M=4.08). The activities that faculty expressed the least interest in improvement were demonstrations (M=3.67), design and revision of courses (M=3.64), using case studies (M=3.56), peer observations of faculty (M= 3.36), and preparation of course syllabi (M=3.10).

With the third objective, the researcher sought to describe the faculty's self-perceived level of skill related to selected educational technology and faculty's level of interest in improving on their skill level using those technologies. Table 2 shows that respondents reported the greatest level of skill for educational technologies related to the use of computers and data projection systems (M=4.22), presentation software, such as PowerPoint® (M = 4.13), use of digital still cameras (M = 3.97), using digital scanners (M = 3.74), and digital video cameras (M = 3.30). The faculty recorded the lowest skill levels in the following educational technologies: digitally editing and producing video (M = 2.32), utilizing online discussion groups (M = 2.08), using video conferencing technology (M = 1.92), teaching via distance education (M =

Table 1. Faculty's Perceived Level of Instructional Skills and Interest in Improvement

Instructional Activities	Level of Skill		Interest in Improvement	
	M^z (rank)	SD	M^y (rank)	SD
Preparing course syllabi	4.18 (1)	.82	3.10 (18)	1.07
Lecture	4.13 (2)	.73	3.69 (13)	1.13
Designing / revising a course	4.10 (3)	.64	3.64 (15)	1.01
Motivating students / creating interest	4.08 (4)	.66	4.30 (1)	.81
Encouraging critical thinking	4.05 (5)	.76	4.15 (3)	.99
Preparing instructional materials	4.03 (6)	.60	3.74 (11)	.99
Demonstration	4.03 (6)	.81	3.67 (14)	1.20
Hands-on exercises / activities	4.00 (7)	.76	3.97 (8)	.93
Developing effective tests / assessments	3.92 (8)	.74	4.08 (5)	.97
Problem solving activities	3.87 (9)	.83	4.11 (4)	.97
Preparing effective lesson plans	3.87 (9)	.89	3.74 (11)	1.02
Discussion-based instruction	3.74 (10)	.78	4.03 (6)	.96
Evaluating student learning	3.67 (11)	.90	4.23 (2)	.99
Cooperative learning / group projects	3.64 (12)	.81	3.72 (12)	.89
Evaluating my teaching	3.62 (13)	.82	3.95 (9)	1.03
Faculty peer observation	3.61(14)	.92	3.36 (17)	1.06
Improving student reading / writing skills	3.51 (15)	.97	3.97 (8)	.97
Discovery learning activities	3.38 (16)	1.02	3.90 (10)	1.02
Case studies	3.31 (17)	1.15	3.56 (16)	1.25
Alternative teaching methods	3.18 (18)	1.10	4.00 (7)	.95

[z]Scale: 5 = Excellent, 4 = Good, 3 = Fair, 2 = Little, 1 = None
[y]Scale: 5 = High, 4 = Moderate, 3 = Some, 2 = Very Little, 1 = None

Table 2. Faculty's Perceived Level of Educational Technology Skills and Interest in Improvement

Educational Technology	Level of Skill		Interest in Improvement	
	M^z (rank)	SD	M^y (rank)	SD
Computer / data projection systems	4.22 (1)	.85	3.18 (7)	1.32
Presentation software (i.e. PowerPoint®)	4.11 (2)	.79	3.39 (4)	1.33
Digital still cameras	3.97 (3)	.89	3.10 (8)	1.29
Documents or image scanners	3.74 (4)	.95	3.23 (5)	1.25
Digital video cameras	3.30 (5)	1.27	3.21 (6)	1.26
Course web pages (i.e. Blackboard or WebCT)	3.29 (6)	1.33	3.21 (6)	1.17
Teaching web enhanced courses (some course materials and/or assignments online)	2.74 (7)	1.41	3.00 (10)	1.28
Computer multimedia materials (i.e. computer simulations and games	2.42 (8)	1.22	3.56 (3)	1.19
Interactive technology-based instruction (i.e. student response systems)	2.34 (9)	1.24	3.64 (2)	1.09
Digital video editing and production	2.32 (10)	1.16	3.72 (1)	1.21
Internet course discussion groups (i.e. live chats or threaded discussions)	2.08 (11)	1.17	3.05 (9)	1.27
Video conferencing technology	1.92 (12)	1.10	2.89 (11)	1.49
Teaching via distance education	1.89 (13)	1.16	2.76 (12)	1.34
Teaching online courses (totally online)	1.76 (14)	1.15	2.72 (13)	1.49

[z]Scale: 5 = Excellent, 4 = Good, 3 = Fair, 2 = Little, 1 = None
[y]Scale: 5 = High, 4 = Moderate, 3 = Some, 2 = Very Little, 1 = None

1.89), and teaching courses entirely online (M = 1.76).

Regarding the level of interest in education technology skill improvement (see Table 2), results showed that respondents possessed the greatest interest in improvement of skills such as, digital video editing and production (M = 3.72), using interactive instructional technology such as student response systems or clickers (M = 3.64), multimedia simulations and games (M = 3.56), using presentation software (M = 3.39), and use of digital document and image scanners (M = 3.23). The activities that faculty expressed the least amount of interest in improvement were using Internet discussion groups (M = 3.05), teaching web enhanced courses (M = 3.00), using video conferencing technology (M = 2.89), teaching via distance education (M = 2.76), and teaching online courses (M = 2.72).

Objective four sought to determine the professional development priority areas of the faculty based on respondents MWDS rankings of the 20 instructional activities (see Table 3). After calculating the scores the instructional activity with the greatest score was using alternative teaching methods (MWDS= 3.28), followed by evaluating student learning (MWDS = 2.39), discovery learning activities (MWDS= 2.00), improving student reading and writing skills (MWDS = 1.88), and evaluation of teaching (MWDS = 1.32). The instructional activities with the lowest rankings were preparing instructional materials (MWDS = -1.01), demonstrations (MWDS = -1.32), lecture (MWDS = -1.61), designing and revising courses (MWDS = -1.68), and finally, preparing course syllabi (MWDS = -3.34).

The final objective of the study was to determine the professional development priority areas of faculty based on the MWDS rankings of the 14 educational technology areas. Examination of Table 4 shows that the highest ranking for educational technology was digital video editing and production with a MWDS of 5.13, followed by interactive instructional technologies (MWDS = 4.60), computer-based multimedia

Table 3. Instructional Activities Professional Development Priority Areas by Rank

Instructional Activities	*MWDS*	*SD*	Rank
Alternative teaching methods	3.28	5.41	1
Evaluating student learning	2.39	5.88	2
Discovery learning activities	2.00	5.13	3
Improving student reading / writing skills	1.88	5.03	4
Evaluating my teaching	1.32	5.61	5
Motivating students / creating interest	1.16	4.92	6
Discussion-based instruction	1.13	4.79	7
Problem solving activities	.99	5.25	8
Case studies	.91	5.27	9
Developing effective tests / assessments	.64	6.11	10
Encouraging critical thinking	.43	5.36	11
Cooperative learning / group projects	.29	9.94	12
Hands-on exercises / activities	-.10	5.27	13
Preparing effective lesson plans	-.47	5.43	14
Faculty peer observation	-.80	4.09	15
Preparing instructional materials	-1.01	4.29	16
Demonstration	-1.32	4.72	17
Lecture	-1.61	5.72	18
Designing / revising a course	-1.68	4.24	19
Preparing course syllabi	-3.34	4.23	20

Table 4. Educational Technology Professional Development Priority Areas by Rank

Educational Technology	*MWDS*	*SD*	Rank
Digital video editing and production	5.13	5.77	1
Interactive technology-based instruction (i.e. student response systems)	4.60	5.65	2
Computer multimedia materials (i.e. computer simulations and games	3.93	5.95	3
Internet course discussion groups (i.e. live chats or threaded discussions)	2.97	4.84	4
Video conferencing technology	2.66	4.53	5
Teaching online courses (totally online)	2.43	3.88	6
Teaching via distance education	2.16	3.74	7
Teaching web enhanced courses (some course materials and/or assignments online)	.63	5.54	8
Digital video cameras	-.08	5.63	9
Course web pages (i.e. Blackboard or WebCT)	-.25	6.03	10
Documents or image scanners	-1.61	5.65	11
Presentation software (i.e. Powerpoint)	-2.29	6.24	12
Digital still cameras	-2.69	5.54	13
Computer / LCD projection systems	-3.35	5.89	14

simulations and games (MWDS = 3.93), Internet course discussion groups (MWDS = 2.97), and video conferencing technology (MWDS = 2.66). The lowest areas of need for faculty professional development activities related to educational technology were course web pages (MWDS = -.25), document and image scanners (MWDS = -1.61), presentation software (MWDS = -2.29), digital cameras (MWDS = -2.69), and lastly, computer and LCD projection systems (MWDS = -3.35).

Conclusions/Recommendations/ Implications

The purpose of this research was to examine the professional development needs of faculty in the College of Agricultural Sciences and Technology at California State University, Fresno. This study looked specifically at the faculty's perceived level of teaching skills and interest in teaching improvement. Additionally, a ranking of priority areas for future professional development efforts was established.

The first objective of this study sought to describe faculty based on their rank, teaching experience, and demographics. Based on the faculty rank of respondents it can be concluded that each rank was adequately represented with at least 80% of the total possible number of faculty responding from each rank. On average, the respondents were primarily male (75%), approaching 50 years of age and possessed significant teaching experience (14 years). The range of age was 34 years while teaching experience range was even greater at 38 years. This wide range of experience may have important implications for those planning professional development activities for faculty. Given respondents range of experience levels and different career stages, differentiated faculty development programs may be required to fully address the needs of all faculty in the college. Further study may be warranted to examine the specific professional development needs of faculty within each rank and based on their level of teaching experience. This recommendation does however create a question, "Is this type of program feasible given our current financial situation?" The college's administration will need to consider if the benefits of such an effort will outweigh the additional cost associated with providing faculty with training opportunities specific to their professional development needs.

For objective two, faculty rated their level of skill and interest in improvement related to various instructional activities. Faculty indicated they perceived their level of skill to be at least "good" (4.00 or higher) for 8 of the 20 instructional activities. When examining these activities, they were found to be traditional teaching activities required of all faculty, such as, preparing syllabi, lecturing, and preparing course materials. Overall the respondents felt they possessed at least a "fair" level of skill (3.00 or higher) for all 20 of the instructional activities.

Examining the levels of interest in improvement on the instructional activities found that although faculty perceived themselves to be fairly skilled at these activities, they still possessed at least "some" interest (3.00 or higher) in additional training for all 20 of the activities. For seven of these activities faculty expressed at least "moderate" interest (4.00 or higher) in development activities. Given these conclusions, it is apparent that overall the faculty in the college believe they possess adequate skills in using the different instructional activities examined in this study. However, even with adequate skills faculty were still interested in and believe that additional professional development activities are justified to further strengthen their teaching effectiveness and methodology. This interest in additional training should be cultivated by those in administration to ensure that faculty continue to improve their effectiveness in the classroom. Even in these difficult economic times, institutions of higher education should not abandon their efforts to improve teaching effectiveness on their campuses. Ultimately, the implications of such as decision would impact the quality of instruction in the future and the students who value it the most over any other form of scholarship (Wiedmer, 1994).

Objective three sought to describe the level of skill and interest in improvement for use of 14 different types of educational technology. Results on this scale show that overall the level of skill of the respondents using educational technology to be lower than that of the instructional activities. The data showed that in 57% (8 of the 14) of the educational technology areas respondents reported possessing no more than "little" levels of skill (2.99 or less). These types of technologies primarily dealt with teaching via the web and through distance education, using multimedia and interactive technology tools, as well as the production and editing of digital video. The only two areas faculty felt they possessed "good" skills (4.00 or higher) were in using computer and LCD projector systems and using presentation software, such as PowerPoint®.

Given the low level of skill reported by the respondents, one might expect to see high levels of interest in improvement using these technologies. On the contrary, examination of the levels of interest indicated by the faculty finds that for all 14 technology areas faculty expressed no more than "some" interest (3.99 or less) in improving. Furthermore, in three areas related to teaching online, distance education, and video conferencing respondents had "very little" interest (2.99 or less) in further training to improve their skills level in these areas. This information differs from the findings of Wingenbach and Ladner (2002) at Mississippi State University where faculty showed a strong level of interest in learning more about educational technology. This begs the question, "Why do faculty in the present study exhibit low levels of interest in additional training although they rate their skill levels to

generally be less than adequate?" Even with increasing demand for online and distance education opportunities why would faculty not recognize the need for improvement in this area? This information may be valuable to administrators should they decide to increase the college's offering of courses and degree programs delivered online and via distance education. These findings suggest that administrators may find many faculty being resistant to such change. This matter definitely desires greater attention in a future study to investigate the likelihood of faculty resistance to the adoption of online and distance education delivery methods.

Objectives four and five were to determine the priority areas for faculty development activities related to instructional activities and educational technology. After calculating the MWDS rankings for the items on the instructional activities scale the following were found to be the top five areas to be targeted for professional development activities for this group of faculty: 1) using alternative teaching methods; 2) how to effectively evaluate student learning; 3) using discovery learning methods; 4) how to improve student reading and writing skills; and 5) methods for faculty to evaluate their teaching effectiveness. On the educational technology scale the top five priority areas were: 1) creating and editing digital videos; 2) using interactive teaching tools, such as student response systems or clickers; 3) using multimedia tools, such as computer simulations and games; 4) using Internet discussion groups; and 5) utilizing video conferencing technology.

Given these priority areas, administrators in the College of Agricultural Sciences and Technology at California State University, Fresno, can utilize this information as they consider new ways to more efficiently use the limited financial resources available for faculty development. Revisions may be made to the current professional development program and new activities implemented accordingly. These modifications and additions will open the door for additional research to further examine the merits of the needs assessment model established by Borich (1980). Additionally, this study may serve as a guide for replication at other institutions as they strive to better understand the professional development needs of their faculty leading to more efficient utilization of limited professional development funding.

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Effectiveness and Student Demographics of Peer-Led Study Groups in Undergraduate Animal Science Courses

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Abstract

Peer-led group tutoring has been identified as a best practice approach to increase retention and graduation for undergraduate college students. This study examined the efficacy, student demographics and participation rates, of peer-led undergraduate animal science study groups. Of the 718 students enrolled, 49.6% participated in at least one study session. Participating students attended an average of 4.0 + 3.6 sessions per class. There was no statistical difference in participation between: males vs. females; first generation vs. non- first generation college students; low income vs. moderate and above income; and students with documented disabilities vs. students without disabilities. A positive correlation existed between study group attendance and course grade ($r = 0.24$, $p < 0.001$), cumulative grade point average (GPA) ($r = 0.22$, $p < 0.001$), and graduation ($r = 0.12$, $p < 0.01$). Additionally, a strong correlation emerged between prior academic performance (GPA) and course grade ($r = 0.73$, $p < 0.001$), and graduation ($r = 0.44$, $p < 0.001$). The study also found a weak positive correlation between tutor and course grade ($p < 0.01$). Regression analysis of study sessions and course grade indicated that for each study group attended there was a +0.08 change, on average, in course grade.

Introduction

The Ohio State University Agricultural Technical Institute (Ohio State ATI) is an open enrollment institution where students pursue associate of applied science (AAS) degrees or associate of science (AS) degrees. The institute is organized within the College of Food, Agriculture, and Environmental Sciences at the Ohio State University, whose main campus is located 90 miles south of Ohio State ATI's rural Wooster campus. Each student must successfully complete carefully sequenced technical and general courses as prerequisites for upper level courses which are required for degree completion. Students earning AAS degrees are expected to apply learning from their coursework to required internships. Students earning AS degrees must gain a strong academic foundation before they transfer directly into baccalaureate programs at the main campus.

Students enrolled in animal science curricula at Ohio State ATI must successfully complete specialized technical courses that combine rigorous science coursework in traditional classroom settings with "hands on" learning at Ohio State ATI's 1,700-acre farm laboratory. The combined curricula are designed to help students learn how to transfer scientific concepts into practice in the animal science field. However, many animal science students at Ohio State ATI struggle with the heavy science core of their courses. Most entering students at Ohio State ATI are traditional college freshmen. Student orientation program responses indicate that approximately sixty-five percent are first generation college students, and many did not plan to attend college or take college preparatory courses in high school, leaving them ill-prepared for college-level coursework. Records from ATI's Office of Disability Services indicate that students with disabilities make up ten percent of the institute's enrollment, much higher than the national average. Many students with disabilities are attracted to the "hands on" learning at Ohio State ATI but wrestle with learning in a structured college environment.

To address students' difficulty in historically challenging animal science courses, Ohio State ATI, through a U.S. Department of Education Title 4 TRIO grant, provides formally structured study groups. The study groups are led by peer leaders who coordinate the group's activities with the classroom faculty. Group peer tutoring is considered a best practice for retaining first generation, low income college students (U.S. Dept. of Education, 1997). Ohio State ATI's study groups resemble peer-led team learning, a model program first developed at the City College of New York (Woodward et al., 1993). Peer-led team learning has improved math and science course grades for undergraduate students with disabilities (Washington University, 2009). Researchers found peer-led team learning to improve students' grades in college botany courses (Lord, 2007), freshmen engineering courses (Loui and Robbins, 2008), general chemistry courses (Hockings et al., 2008), and organic chemistry courses (Wamser, 2006). Although research addresses the impact of peer-led learning groups for general science courses, it does not show the effects in specialized technical courses. This study examines the efficacy of peer-led learning

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groups in animal sciences courses at Ohio State ATI. Our research also studied student demographics and student participation rates within these study groups.

Materials and Methods

Twenty- two classes derived from five animal science courses over 10 years were selected for peer-led instruction. Courses identified for peer-led instruction were those with historically poor student performance, larger enrollment, and a high percentage of first year students. A total of 718 students were eligible to participate in study groups. Faculty and staff selected peer instruction leaders based on past academic performance, organizational and communication skills, and perceived leadership ability. Study group leaders were paid for their effort through a Title IV TRIO educational grant. Group leaders received training at the beginning of the quarter and met weekly with the Student Success Services Tutoring Coordinator. In addition, group leaders were provided with instructional materials and were encouraged to meet weekly with course instructors. Students voluntarily participated in study groups that convened at least weekly, for approximately one hour, with most groups meeting twice a week. Meeting times changed quarterly and were selected to coincide with enrolled students' availability. All group sessions were held on campus. Faculty course instruction remained consistent over the ten year study, as did tutor training.

Student demographic data collected included; gender, family income, documented physical or other learning disabilities, and if students were the first in their family to attend college. Gender, first generation status, and family income were obtained from student orientation program responses and financial aid records respectively. Student disability status was obtained from disability verification records through the Office of Disability Services. Student participation in study group sessions was tracked by student peer instructors and reported to the Student Success Services Office weekly. Student course grades were provided by instructors and cumulative grade point averages and graduation status were obtained from the Office of Academic Affairs. Graduation was measured as completion of the degree program requirements with no specified time frame.

Correlation of the number of study sessions attended, G.P.A., course grade, and graduation was analyzed using Pearson Correlation. Additionally, the variables degree, income level, first generation college student and student disability were correlated (Pearson Correlation) with number of study sessions attended. Least square means were used to analyze differences in study group attendance rates within the discrete variables of first generation, income level, and students with disabilities. ANOVA was used to examine the effect of tutor on course grade. Impact of study session attendance on course grade was determined by Linear Regression analysis. Chi-Square test was used to test for differences in study group attendance between; gender, income level, first generation college students, and disability. All statistics were performed using SAS (SAS Institute, 2002).

Results and Discussion

Student Demographics

Peer-led group tutoring has been identified as a best practice approach to increase retention and graduation for disadvantaged undergraduate college students (U.S. Dept. of Education, 1997). Several factors have been identified that contribute to undergraduate academic achievement, including parental education level/experience, family income (Snell, T. 2008; Ting, S. 1998), and other physical and learning disabilities (Murray et al., 2000). One of the purposes of the present study was to characterize the demographics of students that voluntarily utilized peer-led study groups. Student demographic data is summarized in Table 1.

Over the course of this 10 year study, 718 students were eligible to participate in peer-led study groups. However, only 356 (49.6%) participated in at least one study session. Despite lower than anticipated attendance, this figure was considerably higher than that reported by others. Moore (2008) examined student attendance at optional help sessions in an introductory biology course and observed attendance levels of only 26%. Although there was a disproportionate number of male (n = 262) to female (n = 456) students in the current study, there was no significant difference in participation rates of male (47.7%) and female (50.6%) students. This gender imbalance was likely due to the larger female enrollment in equine studies classes. Similarly, there was no difference in participation rates among first generation college students (50.5%) and students of parents with college experience (47.3%). The slight numerical

Table 1. Demographics of Students Eligible to Participate in Peer-Led Study Groups

	Number of Students Attending Study Groups	Number of Students Not Attending Study Groups
Male	125	137
Female	231	225
First Generation College	259	253
Second Generation or Above	97	108
Low Income	139	142
Med.-High Income	217	219
Learning/Physical Disability	26	27
No Disability	330	334

difference may reflect student perceptions of familiarity with collegiate expectations based on parental experience. Zheng et al., (2002) identified parental education as a key predictor to academic success in college freshman. Moderate to high income students were just as likely in this study to utilize peer-led study groups as were students from low income families, both with participation rates of approximately 49.5%. Surprisingly, only 49% of ATI students with documented learning/physical disabilities attended at least one peer-led study group. Students with learning/physical disabilities may have been reluctant to participate in study groups, for self-conscious reasons. However, Blake and Rust (2002) reported that self-esteem and self-efficacy were not different among college students with and without learning disabilities. An alternative and more plausible explanation may be that these students were receiving individualized tutoring and assistance through the Student Success Services Office.

Students enrolled in the (AAS) program at Ohio State ATI were slightly more likely than the (AS) (transfer) students to participate in peer-led study groups, (52.5 % vs. 46 %) respectively. Additional analysis revealed that a student's cumulative G.P.A. was a better predictor of study group participation than other variables examined. Students with G.P.A. > 2.0 participated in more study group sessions (2.3 + 3.4 sessions) than students with G.P.A. < 2.0, (1.1 + 2.3 sessions), ($r = 0.22$, $p < 0.01$). Intuitively, students with demonstrated academic success seem to understand course and collegiate expectations and the pathway to academic achievement. Additionally, motivation is an intrinsic factor to academic success (Bye et al., 2007; Vansteenkiste et al., 2004; Neber and Schommer-Aikins, 2002; Pintrich and Schunk, 2002). Students with a G.P.A. > 2.0 have previously demonstrated the motivation and capability for a successful academic career.

Effectiveness of peer-led study groups

Peer-led study groups are just one method of supplemental learning designed to improve academic performance, enhance cognitive skills, and foster student relationships. Unfortunately, the current study found that almost half of all students eligible to participate in free peer-led study sessions elected not to do so. Many factors likely influence student decisions to attend study groups including: an understanding of the value of the session, time, employment, and peer pressure. The average student that participated in peer-led study groups attended an average of 4.0+ 3.6 study sessions (Figure 1). Even though the mean attendance was 4.0 study sessions, students predominately attended only one. It was noted that attendance was greatest immediately prior to examinations.

Student participation in a minimum of one peer-led study group was weakly but positively correlated with course grade, cumulative G.P.A., and graduation (Table 2). Stronger correlations were found between course grade and cumulative G.P.A. and graduation (Table 2). This suggests that many other factors influence academic success leading to graduation. Many non-cognitive psychosocial and attitudinal variables have been identified by other researchers as important predictors of academic success (Zheng, 2002; Ting, 1998). However, these were beyond the purview of this study.

Linear regression analysis showed a + 0.08 change in grade for each study session attended (Figure 2). Given that Ohio State University grading system incorporates the chromatic variants + and –, a student would need to attend a minimum of four

Table 2. Correlation of Study Session Attendance and Academic Achievement

	Study Group	Course Grade	G.P.A.	Graduation
Study Group	1	0.24 P = <0.01	0.22 P = < 0.01	0.12 P = < 0.01
Course Grade		1	0.73 P = < 0.01	0.48 P = < 0.01
G.P.A.			1	0.44 P = < 0.01
Graduation				1

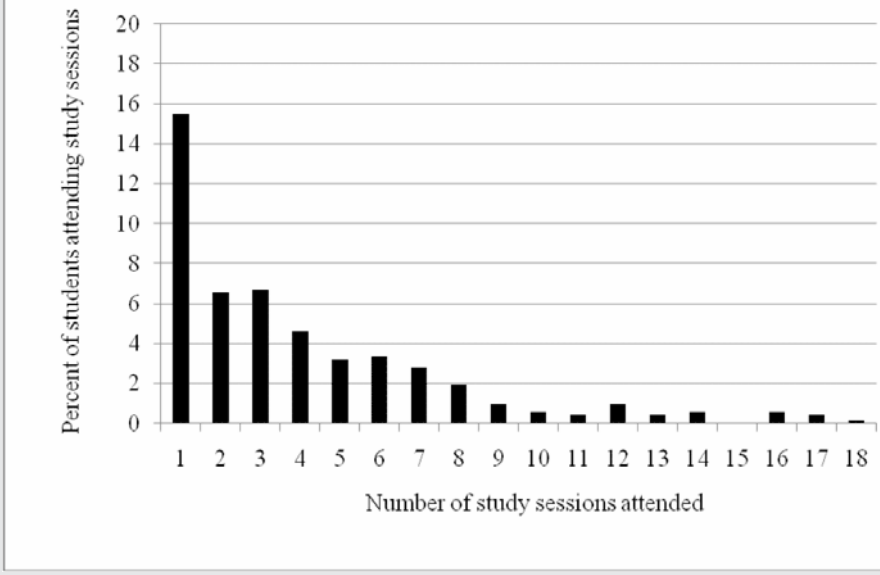

Figure 1. Frequency distribution for student attendance in peer-led study groups.

study sessions on average to realize a change in course grade. This effect appears to be additive (Figure 2). Jeffreys (2001), described similar academic improvement in nursing students participating in a peer mentor/tutoring program.

Grade distribution analysis showed a high frequency of below average course grades for students attending less than six peer-led study group sessions (Table 3). Of particular interest was the observation that 97% of the students attending six or more study sessions received a passing grade. This is roughly the equivalent of attending one study session every other week. Figure 3 depicts the distribution of non-passing grades based on the frequency of attendance in courses which had peer-led study groups. Students not attending any study groups were twice as likely to earn a non–passing grade compared to those participating in at least one study session. The authors believe this minimal time commitment is well worth the return in academic improvement.

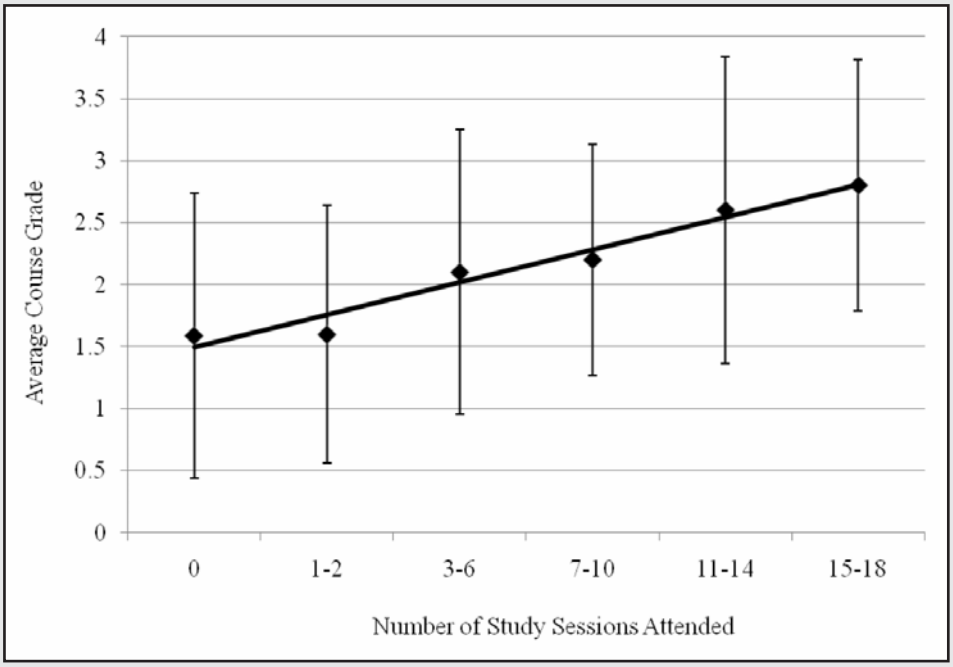

Figure 2. Effect of peer-study session attendance on course grade (A = 4.0) in undergraduate animal science classes. For each study session attended there was a 0.08 increase in course grade ($p < 0.01$).

Table 3. Effect of Study Session Participation on Course Grade

Course Grade	Number of Study Sessions Attended					
	0	**1-2**	**3-5**	**6-8**	**9-12**	**13-18**
A	8	1	4	4	2	0
A-	11	5	5	3	2	4
B+	16	6	9	4	2	4
B	27	12	12	10	2	2
B-	19	11	11	3	0	0
C+	31	11	5	4	1	2
C	49	25	17	11	6	1
C-	34	11	8	6	2	0
D+	20	19	7	3	1	2
D	63	31	8	9	1	0
E	83	26	16	1	2	0

Proper tutor selection is integral to the success of any peer-led instructional program. Reichert and Hunter (2006) outlined a four-tiered tutor selection process aimed at assuring tutor quality and retention. The tutor selection process utilized in this study incorporated many of these elements designed to insure tutor quality. Because proper tutor selection is critical to the success of such a program we were interested in examining the correlation between tutor and course grade. Not surprisingly, there was a weak ($r = 0.10$), positive ($p < 0.01$) correlation between tutor and course grade (Figure 4). The effect on course grade could be caused by a number of variables including: number of study sessions attended, tutoring strategies, and tutors' depth of understanding of the subject matter. It does not appear that attendance was a major contributor as study group attendance was low to moderate for several tutors whose students earned the highest course grades. Anecdotally, tutor preparation and presentation differed among tutors, with some incorporating fun and interactive learning strategies, whereas others tended to exhibit a knowledge-telling bias as described by Roscoe (2007).

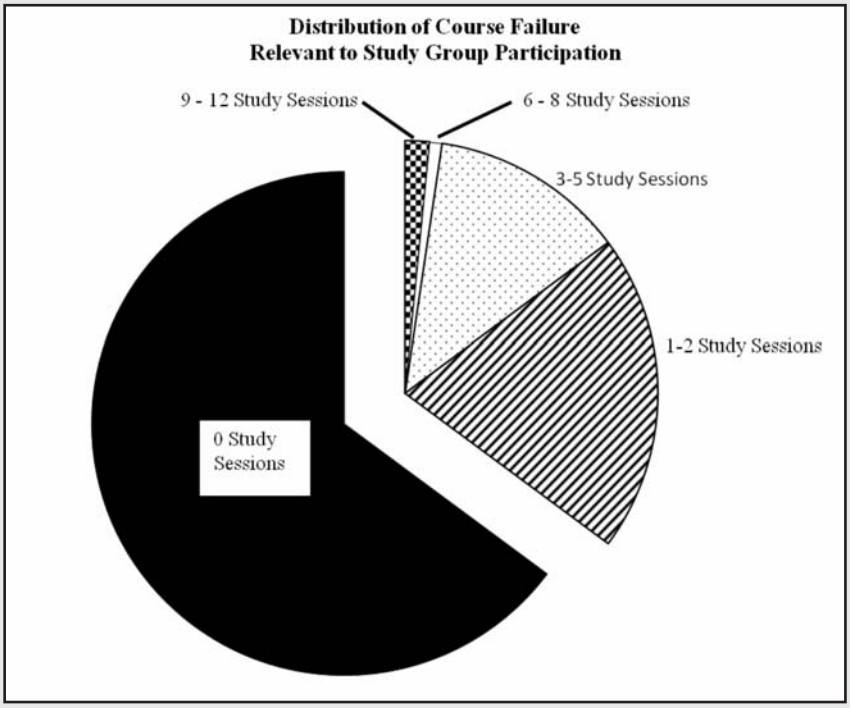

Figure 3. The additive benefits of participating in peer-led study sessions on successful course completion. Students attending more than 12 study sessions never failed the course.

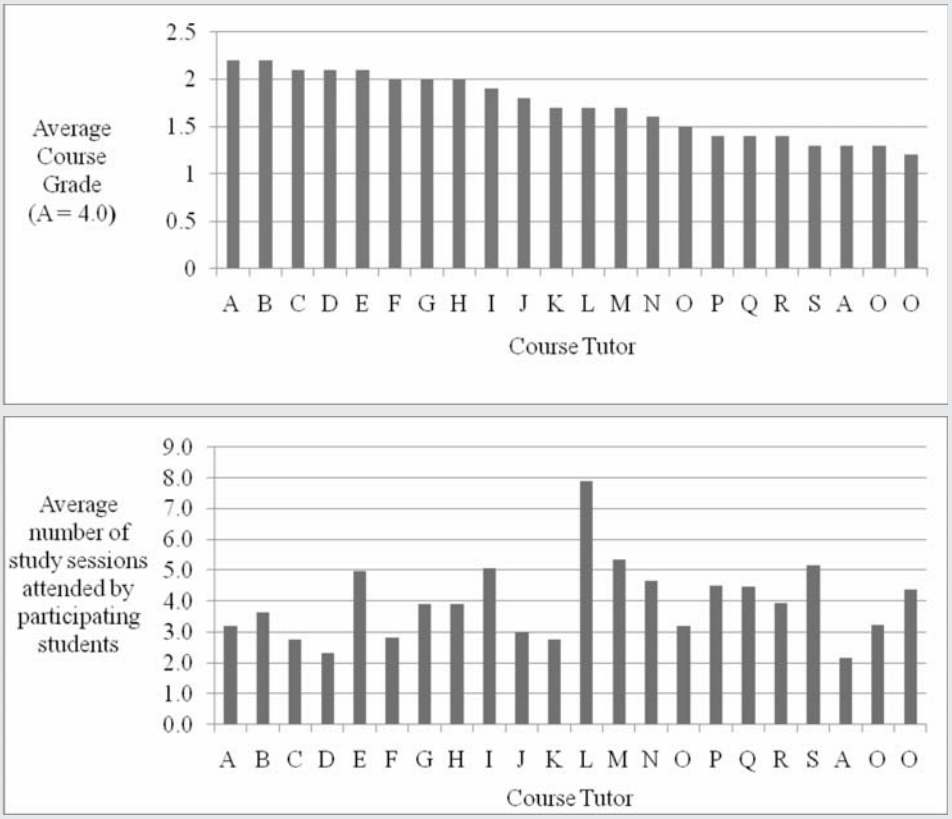

Figure 4. Tutor effect on course grade and participation. A positive correlation was found between tutor and course grade (r = 0.10, p < 0.01). Note: some tutors (A, O) led multiple study groups.

Although we have no empirical evidence to indicate which tutoring style was most effective, clearly some tutors' sessions were more preferred as can be seen in Figure 4. Average student attendance by tutor varied from approximately two to a high of almost eight, indicating that some tutors were able to attract attendees consistently. However, it is important to note that student participation was not consistently linked to the highest course grades (Figure 4). Tutors A and L for example had low to moderate attendance and high attendance respectively, yet average course grade was not consistent with increased attendance (Figure 4). Motivating students to attend study groups appears to be the first challenge in implementing an effective peer-tutoring program, but attendance in and of itself was not alone sufficient to increase course grade consistently.

Summary

Peer-led study groups have been shown to be an effective supplemental learning method. Improvement in course grade and cumulative G.P.A. leading to a higher graduation rates are just a few of the benefits of student participation in peer-led study groups. Ultimately the success of a peer-led tutoring program is dependent on many variables. Tutors must be selected carefully for their leadership and communication skills as well as their knowledge base in the subject matter. We also recommend a well designed and continuous tutor training program as was implemented here. Students must be strongly

encouraged to participate regularly in order to maximize the full potential of the program.

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Bachelor of Applied Sciences Degree Program: A New and Innovative Collaboration between a Land Grant University and Community Colleges

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Abstract

The College of Agriculture, University of Wyoming (UW), in collaboration with the UW Outreach School and the state's community colleges, developed a new and innovative Bachelor of Applied Sciences Degree (BAS) program. The online-only program serves a new audience, students who earned an associate of applied science (AAS) degree and have a minimum of two years work experience. Prior to the BAS, these community college graduates had no opportunity for professional advancement within their chosen professions if a baccalaureate degree was required. The BAS degree program was designed to utilize appropriate course credits and fill the gaps toward completing a four year university degree and to serve place bound professionals. The process for doing so was highly collaborative, involving all of Wyoming's community colleges, several UW academic departments and colleges, and support staff university-wide. The program has successfully enrolled students from a broad array of professional disciplines and produced its first graduate in the brief time span of two years. The systems view of organizing such a program and the curriculum described herein may serve as a model for other universities striving to meet the forecasted higher national demands by non-traditional students for online education in their professional fields.

Literature Review

No one disputes that there are benefits to having a four-year degree. Day and Newburger (2002) noted that over their work lives, individuals who have a bachelor's degree will earn about a third more than workers who did not finish college and nearly twice as much as workers with only a high school diploma. Carnevale et al. (2009) asserted that post-secondary education is needed more than ever because:

Every year more than a third of the entire U.S. labor force changes jobs.

Every year, more than 30 billion Americans are working in jobs that did not exist in the previous quarter.

Many of the occupations workers have today did not exist five years ago.

Current research shows that most of the high-paying jobs of the future will require a bachelor's degree or higher and many will reside in health care, high tech, education, office, and energy-related jobs (Carnevale et al., 2009; Dohm and Shniper, 2007).

At the close of the 20th Century, Eastmond (1998) stated, "Rapidly changing societal and work environments demand continuous learning, and nontraditional students …are the new majority, pursuing education for career development, job security, upward mobility, recareering, and other professional and personal reasons" (p.33). With an ever-increasing frequency, students who are classified as nontraditional are accessing higher education (Kilgore and Rice, 2003; Schuetze and Slowey, 2002), bringing with them unique learning needs. Nontraditional students have been defined in many ways: adult students aged 24 or older, those with vocational and/or work experience leading to an unconventional educational background, ethnic minority or immigrants, first-generation students, those from remote or rural areas, and other underrepresented groups (Donaldson and Townsend, 2007; Holder, 2007; Merriam and Caffarella, 1991; Schuetze and Slowey, 2002).

Of particular interest to this paper are those nontraditional students who fit the definitions above, hold an Associate of Applied Science (AAS) degree, and have a desire to continue their education. The AAS degree, primarily delivered at community colleges, is intended for students majoring in occupational fields who do not plan to transfer to a four-year institution. It is considered to be a terminal degree because it "consists of occupational or technical courses that are not required and thus are not transferable into conventional academic baccalaureate degrees" (Arney et al., 2006). Critics of the AAS state that these programs do not prepare students with the higher-level skills necessary for management or other higher paid career paths (Brint and Karabel, 1989; Dougherty, 1994). While this position

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might be contested, UW has recognized the need to provide students who hold the AAS with a career path through the development of a BAS distance degree program.

A BAS degree is designed to fit the needs of employees in today's complex economic climate. According to Townsend (2009), "The applied baccalaureate is a bachelor's degree designed to incorporate applied associate courses and degrees once considered as terminal while providing students with the higher-order thinking skills so desired in today's job market (104)." As such, it allows technical courses to be transferred to a four-year degree. Donaldson and Townsend (2007) showed that many states are supporting the development of a BAS to meet the needs of adult learners. Research indicates that BAS degree programs fit today's needs for workforce development (Bragg, 2001; Ignash and Kotun; 2005; Siladie, J., 2007; Townsend and Bragg, 2001) and are a "logical extension of career pathway curricula that emphasize initial entry into the community college and extend the educational pathway…(105)" (Townsend, 2009).

There are key differences between a BAS and the traditional Bachelor of Arts (BA) or Bachelor of Science (BS) degree programs. Students with an AAS desiring to access a BS or BA lose 50 to 60 hours of course credit, since their technical coursework is not accepted. All accredited coursework transfers into the BAS, significantly reducing the amount of time it takes to earn a bachelor's degree. In a BAS, the bulk of a student's coursework in their area of specialization is taken at the AAS level. Only the few general education classes needed to obtain a two-year degree are taken at the community college. Once the student transfers into a BAS program, coursework emphasizes critical thinking skills, a deeper understanding of the major through targeted electives, general electives, and upper division coursework to fulfill the university's general education requirements. This can be categorized as an inverted major. UW's entirely distance delivered coursework for the BAS is somewhat unique, allowing working adults to access the needed coursework for their degree without having to arrange time away from their jobs and families to come to campus.

History and Creation of the Program

The idea for the University of Wyoming's BAS degree program originated with the Wyoming Community College Commission, the governing body for the seven community colleges in the state. They perceived a need to serve their alumni that had entered the workforce with an AAS degree, and had not originally planned to complete a four year baccalaureate degree because their goals were strictly vocational. However, many of these AAS graduates found themselves in jobs that provided professional advancement only if they had a four year degree. Hence, the community colleges saw an opportunity for the university to meet the needs of a new audience by allowing them to complete a baccalaureate degree and to do so via online delivery, thus accommodating their site bound status and full time occupations.

The Commission's concept was communicated to the UW Office of Academic Affairs, which in turn brought it before UW's college deans for their consideration and potential adoption within their college. The UW College of Agriculture ultimately agreed to sponsor the program with some adaptations. According to Associate Provost and Dean of the Outreach School M. Murdock, "The BAS was a new direction for UW – we've not previously given much attention to the applied science degrees students earn from Wyoming's community college. Thus, we wanted to make sure that we found a BAS model that integrated well into UW requirements, that met accreditation standards (note the emphasis on general education), and that met Wyoming community college expectations. The role of the UW College of Agriculture in embracing this degree and making it an effective choice cannot be overstated." (personal communication) While the timeframe for developing the initial concept and structure was lengthy, it only took six months for the actual program to be developed, approved by the UW Board of Trustees, and delivered to the first group of students. By the end of the program's first year 26 students had matriculated and the first student graduated from the program in December 2008.

The genesis and development of this program was remarkable not only for the condensed timeline but also for the excellent collaboration among multiple partners, principally the Community College Commission, the UW College of Agriculture, and the UW Outreach School. As B. Pickett, Director of the UW Casper College Center and one of the initial members of the development team stated, "The creation of the bachelor's of applied science represents, for me, how community college—university partnerships can be productive and beneficial not just for institutions of higher education, but for the region that they serve. It was community college people in Wyoming who initially urged UW to work with them in creating this degree program. Now community college AAS graduates have a new degree option, after working in their respective fields for a few years, and the university has yet another way that it is serving the people of our state." (personal communication) A. Wiedmann, now Coordinator of Special Projects for Outreach Credit Programs and a key member of the original BAS coordinating team, in correspondence with E. Boenisch, Deputy Director, Wyoming Community College Commission (6-19-07) wrote, "I am most sincerely inspired by the potential of serving Wyoming's workforce. Returning adult students with professional experiences are so valuable in any learning environment, and to have this degree program as part of the Wyoming partner-

ship among our public colleges and the University is wonderful." The Community College Commission is to be credited for having the vision for the program and delivering a proposal to the University for implementing.

The UW Office of Academic Affairs made the critical decision to forward a proposal to the UW college deans and urge sponsorship of the program, knowing that the program was unlike any other baccalaureate degree program on campus. One of the unique features of this program is the recognition of the AAS degree for admission into a baccalaureate program. Prior to the BAS, only Associate of Arts or Science (AA and AS) degrees from community colleges fulfilled general education requirements. Prior to the BAS, AAS degrees were viewed as purely vocational/technical degrees, not applicable to a bachelors program. Associate Vice President for Academic Affairs R. Abernethy took the lead in advancing the program and explained, "The BAS proposal fulfills our expectations for a baccalaureate degree from UW; our general education requirements are met, and students are required to engage in upper-division coursework sufficient to provide focus and depth of learning. Students admitted and completing this degree program will have earned the baccalaureate without question." (personal communication)

The next pivotal decision was that by the College of Agriculture to sponsor the program. It did so largely because of what it perceived as a natural fit with the land grant university philosophy and commitment to meeting the needs of the citizens of the state. Furthermore, it seemed like an appropriate match academically, because many of the college programs were applied in nature. Like the Office of Academic Affairs, the College of Agriculture sought assurances that the integrity of its baccalaureate degrees were not compromised.

Collaboration with the UW Outreach School was integral to the broad-based collaborative effort. It played the important role of providing the infrastructure and support for the delivery of this totally online program and because of its widespread network throughout the state, communication among partners, announcements to the public, and program marketing was enhanced.

Lastly, implementation of the program was also facilitated by collaborative work with the UW Offices of Admissions, Financial Aid, and the Registrar, all of which were instrumental in establishing the necessary day to day operations and maintenance of a new degree program.

One of the early steps in the program's development was an inventory of existing distance-delivered course at UW that were appropriate for the BAS degree. When gaps were identified, measures were taken to either develop the necessary course, as was the case with the BAS cornerstone course, or to solicit new distance delivery course proposals from various academic units. In most instances, new courses were not required, but rather a commitment to contribute an existing course to the curriculum or to develop an online version of an existing course. Once an adequate number of courses were identified, they were organized into the curriculum and assigned to one of four program components. The major was designated as Organizational Leadership.

Staffing for the program came from existing personnel in the College of Agriculture and the Outreach School. An adviser from Outreach volunteered to add BAS students to her advising load, another Outreach staff member led the communications and marketing efforts, and an Outreach instructor from the College of Education agreed to develop a new and required cornerstone course as part of her teaching load. Staff in the Office of Academic and Student Programs accepted office support roles, the Associate Dean J. Wangberg acted as the program's lead administrator, and the Office of Academic and Student Programs was designated as the "home department." The Head of the Department of Family and Consumer Sciences, College of Agriculture, with significant experience in distance education programs, K. Williams, assisted with administrative duties. Within the first year the Trustees approved the creation of a BAS Director position and she assumed the role.

A special inaugural launch for the program occurred in October 2007 and was videocast live from the UW Casper Outreach Center, Casper, Wyoming. News media, university news and public relations personnel, and outreach centers, connected from throughout the state facilitated the official announcement to the public. At the time of the official announcement the program was already underway with four student majors.

Program Description and Degree Requirements

This degree is designed for individuals with some work experience who have completed or are completing an AAS degree at a Wyoming Community College or other accredited institution. The degree is especially relevant for those who need or desire additional breadth in skills, knowledge, and professional expertise to enhance their capabilities in their own careers and in the organizations in which they work. To better serve place-bound individuals, many of whom are currently working full time, the program can only be completed through distance delivery methods. It is not available on campus at the UW, although students are not prohibited from taking classes face-to-face if they live in proximity to Laramie.

Students apply through the UW Admissions Office. Students are required to send official transcripts from all institutions attended, indicating proof of an existing AAS degree. To be considered for the BAS program, an applicant's AAS degree has to

include 16 hours of preliminary general education/University Studies courses, including freshman composition and a college-level math class. Students are also required to submit a current resume with proof of two years work experience.

The fundamental philosophy of the BAS degree is that the student must complete the general education requirements expected of all UW bachelor's degrees and must engage in upper-division coursework sufficient to provide focus and depth of learning. Following this philosophy, the BAS has four basic components: university studies, career specialty, professional concentration, and electives. The fundamental elements of the baccalaureate degree are provided by the general education core (University Studies Program) and the upper division professional concentration. All students graduating from UW must have 48 hours of credit at the junior and senior level; 30 total hours in the degree program must be completed through UW. Currently, over 20 departments contribute coursework to the BAS.

The **University Studies Program (USP) Component** consists of a minimum of 30 credit hours. Students with an AAS degree from a community college will normally matriculate with 16 to 20 hours of credit that count toward this component. The remainder may be acquired as part of the student's UW coursework, including the Professional Concentration or Electives coursework.

The **Career Specialty Component** is fulfilled with the AAS degree. This component consists of a minimum of 40 credit hours in the major.

The **Professional Concentration Component** is the advanced component of the program and the courses are selected by the student and the advisor. The specifics may vary according to the student's program, community college, interests, and career aspirations. However, all students are required to take a range of courses from the prescribed areas of concentration within this component. This component provides the breadth and depth of learning necessary for a baccalaureate degree. It consists of 36 to 40 upper division or articulated equivalent credit hours. The following table illustrates courses used for the professional concentration:

Table 1. Coursework for the Professional Concentration Portion of the BAS

Area of Concentration	Sample Courses
Discovering and Utilizing Ideas and Information	AGRI 3000: Discovering and Utilizing Ideas and Information
Communicating in Writing and Speaking	ENGL 4010: Technical Writing in the Professions
	COJO 3010: Business and Professional Communication
	COJO 3190: Cross-Cultural Communication
Analysis and Problem Solving	FCSC 3110: Personal Finance
	A & S/AGRI 4990: Organizational Problem Solving in the Social Sciences
	ENR 4500: Risk Analysis
Organizational Leadership	
Option A	AGEC 4660: Community and Economic Development
	FCSC 4117: Community Leadership: Working with Services and Systems
	FCSC 4985: Seminar – Development in Community Leadership
	POLS 4710: Special Topics -Non-Profit Management and Leadership
	POLS 4710: Special Topics -American Political Issues
	PSYC 4070: Motivation
	SOC 3650: The Community
	SOC 4020: Sociology of Work
Option B	MGT 3110: Business Ethics
	MGT 3210: Management & Organizations
	MGT 4410: Human Resource Management
	MKT 3210: Introduction to Marketing
Contemporary Society	A & S 3105: From Gilgamesh to the Bomb
	ANTH 3500: Gender & Society
	COJO 3160: Theory of Language and Society
	ENR 4890: Special Topics
	HIST 4340: History of American Women
	HIST 4490: Modern America -1960-present
	HIST 4545: Multicultural West
Career Electives	Individualized recommendations

The **Elective Component** consists of the credit hours needed (after completing the other three components) to complete the minimum total credit hours (120) required by the College of Agriculture. This component also provides an opportunity for each student to individualize their learning to fit their career aspirations. Adviser, Dianne Davis, noted, "The career electives were developed to support the student's specialty area from their AAS degree or to enhance their future goals. Having choices for most major requirements as well as three career electives enables each student to tailor their degree to meet their personal interests."

As of spring 2009, the BAS program had 33 majors. The first student graduated in December of 2008. Males and females are fairly equally represented in the program with 18 females and 15 males. The average student is 39 years old; the youngest is

21 and the oldest is 56. While 21 students obtained an AAS degree from a Wyoming community college, the program has become national in scope with students from Colorado, Pennsylvania, New Mexico, Utah, Illinois, and Washington accessing the BAS. Students come to the program with a wide variety of AAS degrees, and in some cases multiple degrees. These include:

Table 2. AAS Degrees Earned by Current BAS Students

AAS Degree	#	AAS Degree	#
Accounting	3	Fire Protection/Fire Science Technology	3
Administration – Medical	1	General Technology	1
Administration/Management/Office-Business/Secretarial	5	Human Services	1
Ag Business	1	Machine Tool Technology	1
Automotive Technology	2	Paralegal	2
Criminal Justice	1	Park Ranger Technology	1
Denturist	1	Phlebotomy	1
Emergency Management/Planning	1	Radiography	4
Emergency Medical Services	1	Water Quality Management Technology	1
Engineering Technology/Drafting	4		

In all cases, students indicate that they have a desire to broaden their career opportunities or obtain a degree that will allow them to advance in their current job setting.

Learning Measures and Facilitating Student Success

Assessing student progress and ongoing evaluation of curriculum are attributes of all quality degree programs. The BAS at UW is no exception. During the first year of delivery, the BAS team created learning objectives and assessment measures that were then posted on the web page, making expectations visible to current and prospective students.

The following student outcomes were established by the BAS team:

- Goal I. To develop proficiency in accessing, evaluating and utilizing information and ideas.
- Goal II. To develop proficiency in communicating information and ideas effectively and responsibly.
- Goal III. To gain an appreciation for civic engagement as a mechanism for individual, organizational, and community problem solving.
- Goal IV. To demonstrate the ability to acquire, evaluate, and utilize information and data.
- Goal V. To demonstrate an understanding of organizational design, behavior, ethical practices, and effective managerial and supervisory practices.
- Goal VI. To gain an understanding of social, cultural, economic, and environmental contexts essential for effective leadership and the management of change.

Assessment of Learning Outcomes

The following strategies are used to assess student outcomes:

1. Data from AGRI 3000: student comments to instructor, grades, instructor feedback on the major research paper, and content analyses of threaded discussions. (Goal I, II, and IV)

2. Student Exit Interviews: completed electronically or through digitally recorded phone interviews for all program graduates. Student objectives/personal goals stated in their applications and emails to their adviser are compared with exit interview data. (Goals III, V, and VI)

3. Student final papers from WC course with attached faculty grading rubric. These will also be scored by the BAS team to look at all six goals. (Goals IV and VI)

While administrators of all degree programs and institutions of higher learning would agree that student services are integral to student success, the distance delivery of the BAS program presents inherent challenges. The UW BAS program emphasizes student support, and has done so in both conventional and unconventional ways. This is in keeping with the motto proudly displayed in the College of Agriculture: Students – The Reason We're Here. Valuing students is a thread that runs through all of the following:

Advising. The BAS program has an adviser that works with all student majors, helping each student choose and register for courses each. A unique piece is the adviser's involvement in program assessment, design and implementation, meeting face-to-face and by conference call with the BAS team several times per semester.

Student Services. Distance students have online and email access to the Writing Center through the Ellbogen Center for Teaching and Learning; to a library consultant and access to all library search engines through Coe Library; to financial aid, career planning and disabilities support services through Student Educational Opportunities; and to the UW Bookstore.

Project LeaRN. Students entering the BAS face many adjustments and come with expectations that may not be accurate. It is common for students to think that online courses will be easier than face-to-face classes, will operate in the same way as independent study courses that are self-paced, or will be delivered much like the training modules they are exposed to in industry. These expectations can set students up for failure.

Students in the BAS program are the first online students to have a dedicated Supplemental Instruction (SI) component. Piloted in the 2008 to 2009 academic year with financial support from the Outreach School, C. Boggs, instructor for AGRI 3000:

Discovering and Utilizing Ideas and Information partnered with Al Heaney, director of Project LeaRN to create an online SI. April hired and trained a graduate student to be a mentor to the two experienced BAS students who served as the SI facilitators. They and the students worked together to develop and deliver the curriculum that would support AGRI 3000 students in their learning. Preliminary data indicates that students who participated in the SI had higher grades, higher levels of course satisfaction, and a greater retention rate.

According to Boggs, "Due to the unique background of the students accepted into the BAS program some of them have fairly low writing skills and can feel disconnected from the academic nature of a college course. The SI component gives them a chance to polish their skills, get feedback on drafts and interact with their fellow students. I feel that this really helps them be successful in the class. So far, after two semesters of SI I can say that the students who participate in SI often receive the best grades in the class and their assignments are usually a much higher quality." (personal communication) Heaney concurs, adding "In addition to helping students learn specific skills, the SI sessions bring students together (without the teacher's presence) to create their own space. The online forum allows students to go back and read information and discussion later (after the session) and refer to it throughout the semester. Because online students have far fewer opportunities for leadership and mentoring, this program allows students to experience academic leadership who might never have explored this kind of opportunity. The leadership experience raises students' confidence, increases their own skills (through planning and teaching others), and in some cases shapes their future goals." (personal communication)

Summary and Future Directions

One key in developing this collaborative program was understanding the state's higher education system and having an appreciation of the personal and professional interrelationships among what would become the BAS program's principal players.

Our approach mirrors the systems thinking approach to organizing popularized by Senge (1990). Systems thinking emphasizes spotting interrelationships and interdependencies among educational actors and activities and understanding how what goes on in one course or program relates to other courses or programs, or to a larger systemic whole (Smith, 2001).

Systems organizational theory began to be applied to higher education in the 1960's (Peterson, 2007). It is an organizational approach scholars have found to be most helpful in understanding the strategies and methods of operation in distance education (Moore and Kearsley, 2005). Farad Saba (2007), noted that a systems view of distance learning describes well the variety of elements and processes that operate when distance learning occurs.

Applied to the case of the BAS program at UW, systems thinking highlights the importance of collaborations with community colleges in developing the program, considering the philosophies of student support involved in operating the program, and the cross-functional cooperation between the university's Academic Affairs Division, the College of Education, and the Outreach School. We should note that systems thinking was not consciously part of the planning team's original strategy. However, we think that the theoretical framework, considered in conjunction with this report/study, suggests that awareness of systems thinking concepts is helpful for those considering the development of similar programs. Not only may systems thinking help uncover interdependencies and interconnections between actors, programs, and ideas, but this thinking provides a strategy for others as they conceptualize, develop, and implement new and innovative programs. We would encourage its use from the inception for new programs being developed by other institutions.

As with any program, quality and continuous improvement are important. Courses will continue to be delivered online with real-time chat sessions that fit the students' schedules. However, the BAS program is looking at 6 to 8 week blocked courses to better fit the needs of working students. This would allow the students to focus on one course at a time while still making progress toward degree completion. In addition, we would like to bring all of the instructors who deliver coursework for the BAS together. A strength of other UW distance programs is a community of teachers who mentor each other, share teaching strategies, and work toward insuring that their course delivery fits the program philosophy. Even thought the BAS program draws from multiple departments, such a faculty community would strengthen program delivery. The shared philosophy that could be strengthened would draw from Cooperative Extension: Take students where they are and build from there while delivering quality content and skills.

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Assessment of Experiential Education

J. F. Fenwick and S. J. Gartin

Abstract

One hundred twenty one former interns and 78 cooperators returned a survey to determine the effectiveness of the internship program at Colorado State University. The students considered the practical knowledge gained and an increase in self-assurance and maturity as the most beneficial aspects of the internship. Thirty-five percent indicated they were currently employed by the same firms or similar firms as their internship cooperator. Characteristics found by cooperators to be most lacking by CSU students were: related work experience, business and management skills and communication skills. The value of the internship was considered positive by both the student and cooperator and was ranked as an important criteria for selecting an employee.

Educating students in agricultural sciences for careers in today's agriculture demands greater technical skills plus a more holistic perspective of agriculture and its interaction with society. Providing opportunities for technical background development can be accomplished in several ways. However, internships with specific companies and organizations provide the most effective learning method for experiential education (Moser and Flowerday, 1983).

Additional hands-on experiences for urban, non-farm students interested in agriculture are needed to acquaint the student with production agriculture. Mayer (1980) and Seals and Armstrong (1983) suggest utilizing university and college faculty and resources to provide hands-on learning activities. An employer assessment of graduates by Broder and Houston (1986) indicated that Colleges of Agriculture should provide greater opportunities for leadership and internship experience in their degree programs.

This paper reports the results of a survey to determine the effectiveness of the internship program at Colorado State University as viewed by both the former students and the employer cooperators.

Program Description

The CSU internship program consists of the intern (student), the cooperator (employer) and the university coordinator (faculty member). The academic credit, additional income, practical experience, application of the "academic knowledge" to the "real world" are a few of the reasons mentioned by interns for participating. All are positively interacting in specialized career development. The student and faculty coordinator plan with a cooperator the internship program that best meet the needs and goals of all parties. An agreement that outlines the program is then signed. The cooperator may be from farming or ranching, agricultural businesses, research programs or state and federal agencies.

The faculty member supervises the internship program and plays a key role in the success of the experience for both the student and cooperator. The student submits periodic progress reports describing the work and the learning taking place along with any problems or concerns. Visitations by the faculty are encouraged but difficult to achieve. The student submits a final report and a self evaluation to the faculty coordinators along with an evaluation by the cooperator. These are then used to determine the final grade.

Survey Method

In the summer of 1987, 321 surveys were mailed to former intern students who had graduated from 1982-1985. Fifteen were returned as not deliverable. From the 306 delivered, 121 or 40% of the questionnaires were returned from former students. Three hundred and two surveys were mailed to the internship cooperators. Seventy eight usable responses were returned for a response rate of 26%.

Background of Interns

Eighty one percent of the interns indicated they had agricultural experience prior to the internship. Thirty-two percent had less than three years and 47% had more than eight years experience. Eighty two percent of the respondents reported they had one internship whereas 18% indicated they had two internship experiences. Eighty percent indicated their internship lasted for nine to 12 weeks.

Survey Results -- Former Interns

When former interns were asked how their internships were arranged, 50% indicated they personally had assumed much of the responsibility for the arrangements and 40% indicated they had some faculty assistance. Ninety-five percent indicated the arrangement was satisfactory with them.

Concerning the reports submitted by the interns, 88% indicated the reports were adequate in keeping the on-campus coordinator informed of their progress and 93% indicated the final report was adequate in concluding the internship. In general the faculty coordinators do not visit the students while on the internship. Thirty-eight percent said that was satisfactory however, 55% indicated they should have been visited by the faculty.

The survey also asked if the internship increased or decreased student interest in their major. Forty percent indicated it increased greatly and 43% said it increased somewhat with a combined total of 83%. Consequently 90%

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indicated they did not change their major nor their concentration or emphasis within the major. However, 9% said they did change.

In response to a question concerning the workload assigned to them during the internship, 81% indicated it was "about right" while 8% thought it was too much and 11% thought it was too little. Following is the ranking in importance of the program characteristics considered most beneficial by the interns.

1. Practical knowledge gained
2. Self-assurance, maturity increased
3. New methodology learned
4. Interest in major increased
5. Contacts made for future employment
6. Personal weaknesses highlighted
7. Academic credit earned
8. Travel and cultural experience gained
9. Chance to use equipment not found at CSU
10. Financial benefits

The former interns were asked how the program could be improved. The following six items were listed and respondents were asked to check as many as they felt appropriate:

1. More communication between school, cooperator, and student before internship begins.
2. Allow more academic credit
3. Allow less academic credit
4. Better screening of potential cooperators
5. More visits to your place of work by an on-campus coordinator
6. Encourage cooperators to work with students more often in the capacity of "teacher".

Sixty percent indicated the College should encourage cooperators to work with students more often in the capacity of "teacher" and 45% indicated more communication between school cooperators and the student before internship begins. The remaining areas were checked by 20% or less of the respondents.

The survey asked four questions concerning employment in relation to their internship experience. Thirty-five percent indicated they were currently employed by the same firm or similar firm as their internship cooperator. Another 29% said they were employed in agricultural related areas and 17% were employed by a non-agricultural related firm. Thirty-three percent said they were offered a job by their cooperator. Of the 67% that indicated they were not offered a job by their internship cooperator, 30% said the firm was not hiring people at that time, while 6% said they were not satisfied with the firm.

Respondents were asked to give reasons they declined offers from the cooperating businesses. The highest, 21% said they had been offered a job by another firm that sounded better. Eleven percent declined because they were not satisfied with the firm and another 11% indicated they were returning to a family business or were self-employed. Eight percent declined because of low pay and another 8% declined because of job location. The remaining answers were scattered: those attending graduate school, "didn't like the type of work offered" and no response.

The interns were asked how valuable internship experience was to their current job. Thirty-seven percent indicated extremely valuable, 31% said fairly valuable and 19% said slightly valuable. Overall, 95% would recommend a similar experience to future students, 3% indicated, probably not and no one indicated definitely not.

Background of Internship Cooperators

Relating to the size of the organization, 37% of the internship cooperators indicated they had one to five year round employees, 20% percent said they had 5 to 10, 15% had 10 to 20 and 28% had 20 or more full-time employees. Thirty-five percent of the cooperators said that 75 to 100% of their employees were college graduates. Fifty-six percent of the cooperators were located only in Colorado however, 12% said they were national or international in scope. Fifty-eight percent said they work with one intern per year whereas 25% had three or more per year.

As far as the years involved with an internship program, 24% had been working with interns for four to five years, 24% six to ten years and 20% had been working with interns for 10 years or more.

Survey Results -- Cooperators

Locating Students

The cooperators were asked how they located students, 46% indicated they were initially contacted by the student seeking an internship, 28% work directly through a faculty member, 17% sent advertisements to the University and 9% went through formal interviews on campus. Ninety-seven percent said the method they used was satisfactory with them.

Time of Year for Internship

Forty-seven percent said during the summer, 27% spring, 14% winter and 12% during the fall was the best time to utilize an internship. Twenty-two percent indicated this time period was too short for maximum benefit.

Cooperator Ranking of Program Contributions

The cooperators ranked in order of importance items they considered valuable related to their cooperation with the CSU intern program. The following are the four most significant items.

1. The opportunity to help train and prepare students for future agricultural employment
2. The opportunity to hire a higher quality employee on a temporary basis.
3. The opportunity to keep in contact with academia and keep abreast of new developments through contact with student interns.
4. Economics -- The opportunity to hire a student intern that is not as costly as a full-time employee.

Following is the ranking in descending order of the program characteristics the cooperators considered most beneficial to the student.

1. Practical knowledge gained
2. Self-assurance, maturity increased
3. New methodology learned
4. Contacts made for future employment

5. Academic credit earned
6. Personal weakness highlighted
7. Chance to use equipment not found at CSU
8. Financial benefits
9. Travel and cultural experience

Future Employment Possibilities

When considering factors influencing employment, 30% indicated they often offer the intern permanent employment, 47% seldom and 23% said they never offer the intern permanent employment. Eighty-seven percent said they felt that CSU students were being adequately educated for careers in agriculture.

Following are the characteristics found most lacking by CSU students along with the percent of cooperators choosing that characteristic:

1.	Related work experience	31%
2.	Business and management skills	21%
3.	Ability to communicate	20%
4.	Technical knowledge	13%
5.	Personality traits	9%
6.	Computer knowledge	6%

The order of the characteristics considered most important when employing a CSU graduate is as follows:

1. Personality
2. Related work experience
3. Communication skills
4. Leadership experience
5. Courses taken at College
6. References
7. Grade point average

The following experiences considered most important when hiring a CSU student are ranked in descending order with one being most important:

1. Employment/internship experience with you, the cooperator
2. Employment/internship experience with another employer in a related area
3. Rearing in an agriculturally oriented environment
4. Part-time employment while going to college
5. On-campus laboratory experience
6. Field trips

When asked how the internship program could be improved, 41 percent indicated more communication between school, cooperator and student, 25 percent indicated more visits by the on-campus faculty coordinator, 18 percent said the cooperator needed to work with the intern more in the capacity as "teacher" and 16 percent said allow students more academic credit. One hundred percent of the cooperators indicated their opinion of the CSU internship program was positive and wanted to continue working with the CSU student interns.

Summary

The internship program provides hands-on opportunities to a career related experience. Each internship is unique and individualized. Consequently, the most beneficial aspects of the program as noted by the student interns was the practical knowledge gained and the self-assurance and maturity that developed during the experience.

Results of the survey indicate that 31% of the interns were offered jobs by their cooperator. Both Cessna (1977) and LaProd (1977) had reported 56% of the interns were offered jobs by the firms that had hosted the internship. The fewer job offers may be that job opportunities have decreased. Thirty-three percent of the cooperators participating with the interns were not hiring full-time employees. A substantial benefit to the intern is the probability of full-time employment with the cooperator.

The opportunity to help train and prepare students for future agricultural employment and hiring high quality employees on a temporary basis were primary reasons the firms cooperated with the CSU internship program. As perceived by the cooperators, the program characteristics considered most beneficial to the students were also those identified by the interns. The importance of the practical knowledge gained and the self assurance and maturity developed by the interns are considered the most important of nine different characteristics.

Obtaining related work experience, developing business and management skills and learning to communicate more effectively were the three characteristics found most lacking in the CSU interns. The internship program, by providing hands-on experience gives the student an opportunity to strengthen these three areas.

When employing a CSU graduate, personality, related work experience, communication skills and leadership experience were considered most important by the cooperators participating in this survey. Employment/internship experience with the cooperator or another cooperator in a related area is considered more important than being reared in an agriculturally oriented environment. This points out the value of an internship for students both rural and urban, especially when most of the cooperators are in the "service" portion of agriculture and not in production agriculture.

Overall this survey substantiated the unique value an internship plays in supplying experiential education to the student. The first hand knowledge of a potential career facilitates a smoother transition from the campus and classroom activities to the future career. The value of this experience was not only viewed positively by the intern but was ranked as an important criteria for selecting an employee as determined by the cooperators. This experience not only provides the hands-on learning for both rural and urban students, but enhances specific skill development for all students that facilitates job placement.

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Writing across the Disciplines

In the one-room school houses of our country's early educational system, the "Three R's," reading, writing, and arithmetic, was deemed to be the most important skills to learn. Nothing has changed. Today, all learning that occurs in all fields of science and art are based upon having these basic skills in a learner's tool kit. First we must learn to read, and then we start learning to count and use basic mathematics and writing skills. But as we learn higher levels of reading and math, we often neglect learning how to write better. This is true even though most will agree that being able to communicate is essential for success in nearly all careers.

A "writing across the disciplines" (aka: "writing across the curriculum") regimen will help students 1) improve the quality of writing projects; 2) develop important research skills; 3) develop the practice of using writing as a mode of learning; and 4) expand use of new educational technologies. As college level instructors, we all know that it does not matter how much you know until you able to communicate it. Although our students are reluctant to write out anything (and prefer "multiple guess" examinations), it is imperative that they develop good writing habits.

Basics of Writing across the Disciplines

We use different kinds of language (genres) when we speak to different people. For example, we speak differently to a child than we would to our supervisor, colleague, instructor, or our student. If you had to explain the importance of education to a young child or had to explain the same thing to an 18-year old, you would use different choices of words and phrases. An explanation of the importance of education to a person who has a Ph.D. with huge amounts of debt and a resentful attitude towards their personal experience would require a different way of telling him/her. In each situation, the tone of the conversation (or genre) changes.

Writing falls into four categories: 1] personal writing; 2] creative writing; 3] academic writing; and 4] professional writing. These four genre are used at different times depending upon the purpose and intended audience.

Personal Writing

Personal writing occurs when students and other writers are generating new ideas. This is an emotional and personal account of the subject matter. There is an informal use of grammar (or lack thereof) and dialects (including slang and colloquial expressions). This method of writing uses very few definitions or explanations, are written in first person, and may use sentence fragments. It will usually read as if one is speaking in person-to-person conversation. Journals are one way students learn by writing, and they are encouraged to be reflective in their writing. Journals should only be graded on the basis of having been written with sufficient care and focus upon content rather than structure

A recent example might have occurred when a manufacturer might have said: "Light bulbs need to be replaced – permanently! They break easily, burn out too often – and, often at the worst possible time. Also, they use too much energy to produce enough light. Maybe a new product like LED's can produce lighting better at less cost to consumers and taxpayers. They should sell like hotcakes!"

Popular or Creative Writing

This kind writing invites students to be creative and attempts to entertain readers. It can be used in many ways and in various courses. It calls on students' imagination and on their perceptions of both the hypothetical writer and the potential reader. This genre is one that is clearly understood by those outside of the field. There is a limited use of technical terms and they are well-defined when used. It reads fluently and does not use slang, first person, or colloquial expressions.

A possibility is that students might assume the personality of one writer writing to another person in a different time period in response to having read something from a third time period. An example may include Benjamin Franklin taking on the personality of Thomas Edison during the present time while LED's are replacing the light bulb.

Academic Writing

Almost all writing assignments in colleges and universities fall into the category of academic writing, which is writing that asks students to assume the role of students writing to the instructor. The information flow is reversed from typical communication in which the writer is instructing the reader; the students are displaying their knowledge and are being scrutinized by someone who is more knowledgeable on the subject. Technical terms are used frequently but often explained, when more advanced, and are sometimes illustrated through examples. Terminology is used extensively, and terms standard to the discipline, are neither defined nor explained. When writing in this genre, the author assumes that his audience is educated in the field.

Examples are students who write term papers about: Benjamin Franklin, Thomas Edison, the invention of the light bulb, or how LED lighting is replacing the light bulb. In each case, the student is attempting to prove that he/she is knowledgeable about the topic and is able to communicate that knowledge. For instance: "An accidental discovery announced in October, 2005, has taken LED lighting to a new level, suggesting it could soon offer a cheaper, longer-lasting alternative to the traditional light bulb. The breakthrough may eventually make Thomas Edison's invention of the light bulb obsolete. LED's are already used in traffic lights, flashlights, and architectural lighting. They are flexible and are less expensive to operate than traditional lighting."

Pseudo or Real Professional Writing

Professional writing is written in the format that professionals in the field write. Professional writing assignments may be appropriate in upper division courses and usually involve "real-life" situations. Assignments need to include the kinds of writing a professional will encounter while on the job. Sometimes, familiar topics are abbreviated in a sort of scholarly 'slang'. Often assignments are given in the form of a memo from a supervisor to an employee.

An example may include an employee's memo to his/her supervisor explaining about how the LED might save the company money by replacing light bulbs in certain applications. For instance, the employee might write: The company might save about $4,354 per year by switching all incandescent lighting in each company manufacturing facility to LED lighting. Since there are 12 facilities, the total savings are estimated to be over $50,000.

College instructors who want their students to turn in better written papers might ask that the academic style in their classes for all assignments unless otherwise requested. Further explanation might include: 1] Using the personal style would demonstrate that the student may not know anything about the topic that you are writing about. 2] Using the popular style would demonstrate that the student does not know all the details and that he/she may not have studied enough. 3] Using the academic style would demonstrate that the student has studied and understands the material. 4] Using the professional / technical style would demonstrate that the student not only has studied and understands the material well but also has organized his/or her thoughts using the professional style common for that field of study and has therefore moved to a higher level of organization.

How to Set up a Writing Assignment

An effective writing assignment consists of the following: 1] a suitable assignment sheet; 2] a schedule that asks students to write a first draft, to have it critiqued, and to revise it; 3] materials to help students complete the assignment; and 4] an explicit scoring rubric or description of expectations.

Students often complain that they don't know what the teacher wants. Even though we may be quite explicit in describing the writing assignment, students will tend to forget details unless the assignment is in print. If it is a creative writing assignment or an academic writing assignment, then the assignment sheet should spell out:

1. the kind of writing expected (including examples)
2. the scope of acceptable subject matter or research questions
3. the length requirements
4. the source or citation requirements (if appropriate)
5. the documentation form expected (if appropriate)
6. the formatting requirements
7. target dates for completion of drafts or sections, for critiques, and for final draft submission
8. penalties for failing to meet basic requirements and deadlines.

If the assignment is a professional document, then the assignment sheet should be in the form of a memo that establishes the teacher's persona as supervisor and the student's persona as employee. The sheet should contain the same kind of information as that listed above, but it should be phrased as it would be in a memo instead of in an assignment sheet.

Write down the subdivisions of an assignment sheet for an assignment you want to give and make brief notes reminding yourself of what you want to put in each section.

Support Materials

Students may still claim that they don't know what the teacher wants. Although it is not always necessary to do so, it is a good idea to give students one or more of the following kinds of support materials:

1. an outline of the paper
2. an example of a successful paper to serve as a model
3. editing and style requirement specifications
4. a series of questions that might help guide students' thinking or research
5. a peer critique guideline.

Sketch out an outline of a paper you want students to write or jot down a series of questions for them to consider.

A Scoring Rubric

Students should know what the characteristics of a good paper are. Sometimes these rubrics can be created by the whole class in response to a fifteen

minute discussion based on the question, "What makes one paper better than another?" Generally, papers can be judged on quality of these aspects of the whole:

1. the depth of content and development of ideas
2. the organization of the whole and the coherence of the parts of the paper
3. the readability of the writing style
4. the mechanical and grammatical correctness of the text (students need to quit relying on spell-checker and grammar checker in MS-Word®).

If a table is used, a complementary sheet describing the qualities of each of these characteristics can be supplied.

When preparing a course involved with "Writing across the Disciplines," remember to teach students that writing is a learning process. It is important that our students learn these concepts in order to be successful in both upper level courses and study and in their careers.

Resources for Writing Across the Disciplines

Bean, John C. Engaging Ideas: The Professor's Guide to Integrating Writing, Critical Thinking, and Active Learning in the Classroom. San Francisco: Jossey-Bass, 1996.

Colorado State's WAC Clearinghouse. This is a site for all things WAC, from creating writing assignments to tips on handling the grading. http://wac.colostate.edu/intro/

Hacker, Diana. A Writer's Reference. 5th ed. Boston: Bedford/ St. Martin's, 2003.

Manhattan College's Writing Across the Curriculum web pages provide written guidelines for developing writing assignments in all disciplines and it has a narrative guide for responding to student writing. http://www.manhattan.edu/services/wac

Purdue University's Online Writing Lab. Writing Across the Curriculum and Writing in the Disciplines. http://www.owl.english.purdue.edu/handouts/WAC

University of Hawaii Manoa Writing Program's website explores, in illustrative detail, writing assignment design, assessment and teaching field-specific forms of writing. http://mwp01.mwp.hawaii.edu/wm1.htm

University of Maryland University College's Characteristics of Effective Writing Assignment. http://www.umuc.edu/ugp/ewp/characteristics.html

University of Toronto's website gives examples of writing assignment sheets and guidance on grading student writing. http://www.utoronto.ca/writing/comm.html

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NACTA Yesterday

50+/- Years ago (Vol V, No 2, 1961)

Lloyd Dowler, Dean of Agriculture at Fresno State College is looking forward to the NACTA convention to be held in Fresno, March 18, 19, 20, 1962. Arrangements have been made with the Hotel California to set aside a sufficient number of rooms to take care of delegates, contestants, and special guests.

The executive committee, under the direction of President John T. Carter has come up with an outstanding program that will give every participant a feeling of having gained something worthwhile. There will be livestock, dairy cattle, and land judging contests. Ralston-Purina is providing very beautiful trophies to high teams in the livestock and dairy contests, and the California Association of Soil Conservation Districts will present a trophy for the high team in land judging. These presentations will be made Tuesday night, March 30, at the awards banquet. Mr. R. J. Bell, Chairman of the Fresno Animal Science Department will be in charge of the livestock contest. Mr R. J. Selkikr, Professor of Dairy Husbandry, will chair the dairy cattle contest. Professor W. C. Strong will have charge of the soils contest.

Several faculty members from Departments will report on topics of general interest. Dr. Winston Strong will present a paper on sprinkler irrigation and Mr. O.M. Braun will discuss new developments in the citrus industry. Mr. Jesse Bell will talk on swine nutrition, and Dr. Floyd Hixson will discuss certain aspects of high energy rations in commercial egg production. A panel is being planned on the "project program" with representatives from California junior and state colleges participating. Dr. George Mehren will be the featured speaker on some phase of agricultural economics. Another panel will bring together our tri-partite committee in agriculture where junior college, state universities, and university personnel will be represented.

NACTA has a national agricultural honorary society referred to as Delta Tau Alpha. DTA is a national organization that recognizes scholastic achievement which is tremendously important to every school offering agriculture. All colleges are encouraged to bring along one or two students to attend the DT meetings that run concurrently with our professional meetings.

"*This is an insight into the meeting format in the past and illustrates the change that has occurred over the past 50 years.*"

30 Years ago (Vol. XXIV, No 1, 1980)

W. Burger and D. C. Brandenburg published an article entitled: "Student Views About Increasing Non-Farm and Female Enrollment in Agronomy Courses." Fifteen students from each of 49 responding colleges of NASULGC were asked to give their views regarding the potential impact of increased urban and female enrollments on their academic training and future employment. Most non-farm males and females seek farm experience training to help them prepare themselves for jobs in agronomy because more than one-third of them feel disadvantaged compared to farm males and females. Over three-fourths of agronomy enrollees consider the question of farm vs city background an important problem in job placement whereas fewer than half of these students consider the question of sex (male vs female) an important problem in getting a job. Class sizes in the Northeast states especially are restricting students opportunities to receive individual aid e.g..field trips, teacher-student interaction.

" *I find it interesting how issues stay with us and how long we have been dealing with them.*"

20 Years ago (Vol. XXXIV, No. 1, 1990)

John C. Mertz, NACTA Vice President conducted a membership survey and presented the results. His survey was based upon 85 responses. Some of his responses follow:

I have been a member of NACTA for:

Response	N	%
2 years or less	8	9.41
3-5 years	28	32.94
6-10 years	33	38.82
11-15 years	5	5.88
Over 15 years	11	12.94

I was influenced to join NACTA by (mark all that apply)

Response	N	%
A friend who was member	48	36.63
A campus recruiter	16	12.21
Attendance to a conference	16	12.21
NACTA Journal	37	28.24
State affiliate of NACTA	5	3.82
Other	4	3.05

The most important benefit to me being a NACTA member is (rate in order 1-5):

Item	Score
Journal	399
Teaching Awards	200
National Conferences	197
State Affiliate Conferences	123

"*It would be interesting to see if this has changed much over the last 20 years.*"

10 Years ago (Vol. 44, No. 1, 2000)

Amy K. Gortner and Carl R, Zuland published an article entitled "The use of Undergraduate Students." Data on the use of time were collected via on-week time diary from 136 students enrolled in three agricultural economics courses at Ohio State University. Average hourly use of time per week for these students was: sleeping (55.3), studying (21.3), planned recreation/leisure (19.0), in-class (16.4), job (12.3), travel (10.7), TV (10.3), eating (8.1), personal hygiene (7.1), student activities (3.6), telephone (1'4), and other (2.6). This time profile generally is similar to that of the American population, except that "being a student" is the primary job. Time spent on academics (in-class and studying) exceeded other uses of time, excluding sleep. This suggests school was a top priority.

"*I would like to know if the hours spent on the telephone have increase significantly in the past 10 years.*"

Jim McKenna
NACTA Historian

The Viking in the Wheat Field: A Scientist's Struggle to Preserve the World's Harvest

By Susan Dworkin, 2009, Walker & Company, NY, hard cover, $26.00, 229 pages, ISBN 0-8027-1740-3

This is a story of passion, the unfolding drama of one scientist's dedication to his work and his personal contributions to feeding the hungry of the world. Danish plant breeder Bent Skovmand drew early encouragement from two major role models in his field, first from plant pathologist E.C. Stakeman at University of Minnesota and later from Norman Borlaug at the International Center for Maize and Wheat Improvement (CIMMYT) in Mexico. From these giants in science, Skovmand developed his own unswerving quest to improving cereal yields that would help farmers, especially in the developing world, and through them to feed people. This was a lifelong dedication that ended too soon with his early death, and the biography serves as a lasting tribute to Skovmand's work. The book is also an impressive model of what an astute and thorough biographer can do in telling a thrilling story of an ambitious and committed scientist.

More than a chronicle of his several professional positions in the international arena of crop improvement, this superb story by Susan Dworkin delves into Skovmand's family history, his early work on the farm, and his studies at University of Minnesota. There is vivid description of his series of unlikely moves from Denmark to the U.S. to Mexico to Turkey, back to Mexico and then to Sweden, as well as an untold number of trips collecting germplasm and working with cereal scientists around the world. The biography is a story of a scientist, but also a description of a personal journey through successes and defeats, the challenges of zealous dedication, and the exacting toll of travel and life style of international research on relationships, families, and health. Having worked in a similar international center (CIAT) for seven years, I can personally attest to the validity of the biographer's observations of people and families.

Ms. Dworkin describes the arrival of Bent Skovmand in CIMMYT as a post-doctoral researcher where Skovmand quickly fell under the influence of Borlaug and colleague Glenn Anderson. He worked on Triticale, one of few human-made cereals, that is a hybrid of wheat and rye. He later moved into other responsibilities with the wheat breeding program. The complex history of wheat improvement provided here gives the reader a rich background within which we can place the breeder's contributions. His dedication to practical results and open access to the world's germplasm was formed in part by an experience in a Danish folk high school, where he added broader experience to his personal farm background and participated in what could be called the democratization of Danish farming.

Shortly after his divorce and new marriage with a colleague in Mexico, Skovmand moved to Turkey, the center of origin of wheat, to work with the national breeding program and continue to take dangerous collecting missions in the field. A nice historical section on the importance of collection of germplasm and the pioneering work of the Russian explorer Vavilov provides a foundation for Skovmand's return to Mexico to head up the gene bank for wheat and other cereals. Here he innovated with the concept of prebreeding, or crossing and selection of wheat collections to make them more immediately useful to plant breeders around the globe. An exciting barley collecting trip to Tibet describes both the adventure of plant exploration and the overwhelming political influence on science, as the accessions meticulously collected and catalogued in the field somehow disappeared into the Chinese bureaucracy, never to be seen again.

An outstanding trait that was continuously displayed by Bent Skovmand was an ability and willingness to accept new technologies. In the fields of biochemistry, genomics, and information technology, he was quick to seize on the capabilities of colleagues and to encourage them to seek immediate and practical applications of their sometimes theoretical work. In spite of the dedicated work and long hours, the budget for germplasm preservation rapidly declined along with Skovmand's health. Years of long hours, neglect of his own health, and personal habits took a physical toll on this scientist's ability to carry out his work. Due to budget constraints, he was fired from CIMMYT, but immediately began a new career as head of the Nordic Gene Bank with an office in Alnarp, Sweden. This last endeavor was to lead to his active endorsement and hard work to establish the "doomsday bank" on Svalbard, Norway, where the world's genetic treasures could be kept safely for an indefinite time. Along with the work in wheat, this may be his greatest legacy to science and to the future of our species.

While Bent Skovmand's passion and dedication to others through his work with cereals and germplasm is clearly described throughout this well-written book, one cannot ignore the passion of the biographer. In an important epilogue to the Skovmand legend, Susan Dworkin provides editorial comments on the

importance of germplasm and of planning for the future. Writing as a parent and grandparent, she implores her readers to take the Skovmand story to heart and makes a strong political appeal for us all to continue his work by lobbying for more support to save the world's important genetic legacy. She appeals to the non-farm public to learn more about food and where it comes from, and why we must preserve the biodiversity that has evolved for millennia. This book is a wonderfully well-written biography about an important figure in the development of new crop varieties. It is also a valuable history of cereal breeding, carefully researched and documented, and should be required reading for students in plant breeding as well as other agricultural sciences. The book is a must read for those who consider working in the international research and development arena.

Charles Francis
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The Academic Portfolio: A Practical Guide to Documenting Teaching, Research, and Service

By Peter Seldin and J. Elizabeth Miller, 2008, Jossey-Bass, San Francisco, CA, paperback, 384 pages, ISBN: 978-0-470-25699-2

This comprehensive book focuses squarely on academic portfolios, which may prove to be the most innovative and promising faculty evaluation and development technique in years. The authors identify key issues, red flag warnings, and benchmarks for success, describing the what, why, and how of developing academic portfolios. The book includes an extensively tested step-by-step approach to creating portfolios and lists 21 possible portfolio items covering teaching, research/scholarship, and service from which faculty can choose the ones most relevant to them.

The thrust of this book is unique:

• It provides time-tested strategies and proven advice for getting started with portfolios.

• It includes a research-based rubric grounded in input from 200 faculty members and department chairs from across disciplines and institutions.

• It examines specific guiding questions to consider when preparing every subsection of the portfolio.

• It presents 18 portfolio models from 16 different academic disciplines.

Designed for faculty members, department chairs, deans, and members of promotion and tenure committees, all of whom are essential partners in developing successful academic portfolio programs, the book will also be useful to graduate students, especially those planning careers as faculty members.

NACTA Journal Editor

Crop Rotations in Organic Farming: A Planning Manual

Editors Charles Mohler and Sue Ellen Johnson,.2009, Natural Resource, Agriculture, and Engineering Service, NRAES-177, Cooperative Extension, Ithaca, NY, paperback, 156 pages, $24.00, ISBN 978-1-933395-21-0

While there are numerous books that include research results and recommendations on crop rotations for organic farming and horticultural crop production, there are few that are completely dedicated to the practical details of rotation design. In Crop Rotations in Organic Farming, editors Charles Mohler at Cornell and Sue Ellen Johnson from the New England Small Farm Institute bring university research and farmer experience together into a practical volume that will prove useful to students and farmers alike.

Based on a three-day intensive retreat with 12 experienced organic farmers, two of the chapters describe how rotations contribute to soil health, pest management, soil tilth, and robust diversity in the soil microbial community. These enhancements through rotation can lead to reduced production costs, diversity in the field environment as well as the product mix, and both biological and economic resilience. The farmers also provided details on their specific rotations with four- and five-year sequences of vegetable crops. There are two examples of three- and five-year rotations of field crops. All of these are proven models that have given good results in the field.

One useful component of the book that emerged from the retreat was a series of figures and charts that describe the sequence of decision making on the farm, starting with the goals of the farmer and family and moving through logical steps of assessing available labor and facilities, plus exploring markets, toward the sequencing of crops and decisions on how to bring the pieces together. The farmers emphasize the importance of scouting out markets for organic vegetables and grains before planning the field implementation steps, since it is essential to have a good handle on the marketing and economic dimensions before making needed investments in organic rotations.

In a key chapter on the important processes in crop rotation, several researchers explore the details and mechanisms of how and why rotations work well in the field. These include the restorative power of grass and legume sod crops and the all-valuable cover crops that can be planted between cash crops. Ways that rotations of non-similar species interrupt weed, insect, and pathogen reproductive cycles are described, along with emphasis on sequences of legumes with cereals, summer with winter crops, and perennials with annuals. Although there is a science foundation to the chapter in each section, the lan-

guage is accessible and explanations clear for those with minimal science background.

A number of specific examples of rotations and how to plan them for the long term provide practical guidance to a person with limited experience in organic farming and horticulture. Examples of work tables for planning what species to include, what areas of each to plant, planting and harvest dates make this a useful "cookbook" with several "menus" for how to proceed with the all-important preparations for a profitable and environmentally sound organic system.

Special attention is given to the conversion process, a three-year period in the U.S. to move from conventional to organic production. New to many readers will be the chapter on different types of intercropping, where two or more species can overlap in their growth cycles or be planted together in the same field. The combinations of crops that are most compatible are listed in a table. Of particular value to farmers and students of agriculture in the Northeast U.S. are the appendix tables of crop characteristics, problems that can occur with some crop sequences as well as rotations that promote success, sources of inoculums for common pathogens, crop pathogens that are most frequently found, characteristics of common weeds in this region, and a useful list of references.

For researchers seeking a technical treatment of any of these characteristics and mechanisms of rotations, there is much greater depth in the primary literature. For the student or farmer who wants a single source of practical information on how and why rotations should be developed, this is an ideal resource to have on the shelf. The book is practical, easily understood, and based on solid research as well as farmer experience. It can be highly recommended for an introductory course in agronomy, and especially for the study of organic farming.

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