

## **The Role of 4-H and FFA Involvement and Gender on Student Success in an Introduction to Animal Science Course**

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### **Abstract**

Students enrolled in Introduction to Animal Science at a non-land grant state university participated in the study and completed identical subjective and objective assessments at the beginning and the end of the semester. Students rated their knowledge of 49 course outcomes and completed a 50-question multiple-choice exam that covered topics discussed in the course. The assessments were completed the first day of class and on final exam day. Demographic surveys were completed as part of the subjective evaluation to provide the information needed to determine how the students performed in the course based on involvement in youth activities and gender.

The statistical analysis was conducted using SAS (1999). A mixed linear model was used to analyze all data (PROC MIXED, SAS, 1999). Least square means and standard errors were calculated for the following: average beginning assessment (ABA), average ending assessment (AEA), average improvement (AI), initial test (ITS), last day test (LDTs), test improvement (TI), final test (FT) and final average (FA). Variable means were compared using the Least Significant Difference (LSD) Mean Separation test at a ( $P < 0.05$ ) significance level by the pdmix procedures of SAS (Saxton, 1998).

Student involvement in 4-H or FFA significantly ( $P < 0.05$ ) affected the average beginning assessment (ABA), average ending assessment (AEA), and initial test score (ITS). The students ranking themselves as very active in both youth organizations ranked their confidence of course topics highest at both the beginning and end of the semester and scored the highest on ITS. Final average (FA) was not significantly influenced by involvement in youth organizations. The ABA, AEA, ITS, and last day test score (LDTs) were significantly ( $P < 0.05$ ) higher for males than females, but FT scores were similar for males and females.

## **Introduction**

Arguably, a major role of the university and its faculty and staff is to prepare students for their future careers and ultimately their economic goals. Ideally, programs of study in agriculture should be similar across universities for students to be competitive for employment in the global agricultural industry or in preparing for further education in graduate or professional school. The knowledge attained by the student should have the breadth and depth to address issues in various agricultural fields or pursuit of an agriculturally related graduate program. In order to determine if a college or university agricultural education program is successful, an effective method of outcomes assessment must be implemented.

A method of determining the success of an academic program is to develop a set of outcomes that are expected for students enrolled in an agricultural program. Outcomes must be clearly defined and a curriculum designed to provide students the opportunity to achieve those outcomes and their measurement must be clearly established. As a component of the outcomes assessment program in the Department of Agriculture at a non-land grant institution, assessment of course outcomes began with the freshman-level Introduction to Animal Science course that is required for all students majoring in any area of agriculture and for pre-veterinary students.

Evaluation of course outcomes may be either subjective, objective, or both. The subjective form of evaluation allows students to self-evaluate their knowledge of various topics at any point in the course. Subjective evaluation may be given at the beginning and the ending of the class. The objective form of evaluation is usually a traditional form of testing course topics. Objective evaluation sets the list of course outcomes into a multiple-choice question format for the student to answer. The questions are used as a pre- and post-test to compare students' progress during a semester-long course.

The knowledge attained by the students in high school classes and extracurricular activities should be reflected in student success in college courses. As a component of the outcomes assessment for the Introduction to Animal Science class, an instrument was developed to collect demographic and high school activity data that could have relevance to the learning activities of students in college level classes. These data were studied in relation to both subjective and objective evaluation of course outcomes.

## **Theoretical/Conceptual Framework**

Various measures of academic ability and previous agricultural experiences may aid in planning academic interventions needed to ensure student success in agricultural classes. By implementing learning experiences to compensate for lack of knowledge or experience in agriculture, the retention rate of students may be increased. The measures used in past studies have included high school grades, standardized test scores (Brashears and Baker, 2003), background of the students, involvement in youth organizations (Ball et al., 2001), gender (Bridges et al., 2002), and preferred learning style of the students (Garton et al., 2000). In

the present study, youth organization involvement and gender were studied to determine their relationship to success in an Introduction to Animal Science class at Western Kentucky University.

**Youth Organization Involvement** --Involvement in youth organizations such as 4-H or FFA may be used by colleges and universities as a predictor of student performance and retention. 4-H and/or FFA involvement impacts numerous educational outcomes including student achievement, skill attainment, and student retention (Ball et al., 2001). The lack of experience in agriculture can be compensated for by involvement in 4-H or FFA for some students. Ball et al. (2001) reported those students who participated in one of the two agriculture youth organizations had a higher mean cumulative grade point average at the end of their freshman year when compared to those students who did not participate (3.1 vs. 2.6). Students who were very active in FFA demonstrated that they had more knowledge of animal science topics at the beginning of the semester than those students who were very active in 4-H and those who were not active in either of the youth organizations (Deppe, 2002). Ball et al., (2001) found that significantly more students who participated in 4-H or FFA returned for their sophomore year of study. The students who were not involved in agriculture youth organizations had an 83.8 percent retention compared to 94.3 percent retention of students who were involved.

**Gender**--Student populations in agricultural programs at colleges and universities have changed to include a larger percentage of women. A Texas A&M University study indicated that the enrollment changed from 51 percent women in 1986 to 59 percent women in 1996 (Cleere et al., 2002). With the increased percentage of women enrolled in agriculture comes some differences in the success of males and females and in learning styles related to gender. Bridges and Casavant (2002) showed that women tend to perform better on essay type exams while men tend to excel on multiple-choice exams. The learning rate of men and women tends to be similar (Bridges and Casavant, 2002). However, males tend to perform better on the SAT™ and the ACT™. Bridgemon and Wendler (1991) found that men's scores on the mathematics portion of the SAT™ were significantly higher ( $p < .05$ ) when compared to the scores for women. The study also showed that women had a significantly higher ( $p < .05$ ) grade point average in high school than the male students. Gender score differences on the mathematics portion of the SAT™ may be explained by the test being taken only by those individuals planning to attend college with a larger percent of those individuals being females, and the content of the SAT™ questions may result in score differences found between men and women (Bridgemon and Wendler 1991).

### **Purpose and Objectives**

The purpose of this study was to evaluate and assess student performance in an introductory animal science class at Western Kentucky University. Objectives of the study were to determine if gender and experiences and background in agriculture prior to college influenced student learning in an Introduction to Animal Science class. The ultimate

objective was to determine if special learning opportunities are needed for those students who have little or no previous background or experiences in agriculture.

### **Procedures**

The data for this study were collected during eight semesters and twelve sections of the Introduction to Animal Science course from 1999 to 2003. A total of 649 students completed both the subjective and objective evaluations at the beginning and end of each semester. Data from students who completed only the beginning or the ending evaluations were not included in the study.

The students completed beginning evaluations at the first class meeting each semester. The evaluation consisted of three parts: a subjective course outcomes assessment, a demographic questionnaire, and an objective multiple-choice test. The course outcomes evaluation consisted of 49 course outcome statements and allowed the student to assess his/her prior knowledge of topics. Students rated their knowledge of each statement with a number ranging from 1 to 100 with 1 being the least prior knowledge and 100 being very knowledgeable about the subject. A demographic survey addressed data about student background, the number of college hours completed by the student, his/her prediction on the degree of difficulty of the course, the expected grade from the course and his/her agricultural area of interest. The final portion of the initial evaluation was a 50-question multiple-choice examination that addressed topics on the list of course outcomes.

The final evaluation consisted of the same three parts and was completed on the day of the final exam. The final evaluation was completed in the same manner as at the beginning of the course. The study also included the evaluation of grades received in the course. The score each student received on a 100-question final examination (the first fifty questions were the same as the pretest given the first day of class) was recorded. The final average (FA) recorded for each student was calculated by the following: 30 percent on class quiz average, 20 percent on each of two hour examinations (40 percent total), and 30 percent on the final examination.

The statistical analysis was conducted using SAS (1999). A mixed linear model was used to analyze all data (PROC MIXED, SAS, 1999). Least square means and standard errors were calculated for the following: average beginning assessment (ABA), average ending assessment (AEA), average improvement (AI), average percent improvement (API), initial test (ITS), test improvement (TI), percent test improvement (PTI), last day test (LDTS), final test (FT), final average (FA), lab grade (LG). Variable means were compared using the Least Significant Difference (LSD) Mean Separation test at a ( $P < 0.05$ ) significance level by the pdmix procedures of SAS (Saxton, 1998).

## Findings

The effects of involvement in the 4-H and FFA youth organizations on subjective assessment scores are shown in Table 1. Students who were very active members in both 4-H and FFA rated their knowledge highest ( $P < .05$ ) at both the beginning of the semester (47.0 versus overall mean of 30.1) and the ending of the semester (74.3 versus overall mean of 67.8) as indicated on the subjective assessments (ABA and AEA). Students who were FFA members but did not judge themselves as active and the students who were not a member of either organization compared to the other students rated their opinion of knowledge on course topics the lowest at the beginning of the semester with scores of 27.0 and 28.1, respectively. The opinions of the students who were involved in both 4-H and FFA but were not active had more variation in their scores than the other students at the beginning of the semester ( $SE = 7.58$ ). Students who were FFA members but were not involved had a significantly ( $P < 0.05$ ) lower opinion of their knowledge on the AEA (59.0) when compared to other students included in the study. Despite the differences on the subjective assessments based on student involvement, there were no significant perceived knowledge improvement (AI) differences based on the level of involvement in the youth organizations. Numerically, however, the students deemed very active members in both 4-H and FFA had the lowest amount of improvement on the AEA compared to the score received on the ABA.

*Table 1.* Least squares means ( $\pm$  Standard Error) for Average Beginning Assessment, Average Ending Assessment, and Average Improvement for students categorized by their high school involvement in 4-H or FFA before enrolling in Animal Science 140 at Western Kentucky University

Activities	N	ABA <sup>1</sup>		AEA <sup>2</sup>		AI <sup>3</sup>	
		LSM	$\pm$ SE	LSM	$\pm$ SE	LSM	$\pm$ SE
Not a member	242	28.10 <sup>c</sup>	4.45	66.98 <sup>b</sup>	3.72	39.87	5.71
4-H Member-Not Active	31	29.18 <sup>bc</sup>	6.30	69.66 <sup>ab</sup>	4.76	41.58	7.47
4-H Member-Very Active	28	32.28 <sup>bc</sup>	6.71	69.48 <sup>abc</sup>	5.59	35.22	8.86
FFA Member-Not Active	58	26.97 <sup>c</sup>	5.41	58.95 <sup>c</sup>	4.37	34.97	6.78

Activities	N	ABA <sup>1</sup>		AEA <sup>2</sup>		AI <sup>3</sup>	
		LSM	±SE	LSM	±SE	LSM	±SE
FFA Member-Very Active	147	36.31 <sup>b</sup>	4.95	68.12 <sup>b</sup>	4.06	34.81	6.23
4-H and FFA Member-Not Active	19	33.44 <sup>abc</sup>	7.58	68.38 <sup>abc</sup>	5.97	36.38	9.50
4-H and FFA Member-Very Active	82	47.01 <sup>a</sup>	5.43	74.27 <sup>a</sup>	4.35	28.48	6.76

Means within a column with different superscripts are different (P<.05)

<sup>1</sup>Average Beginning Assessment = ABA

<sup>2</sup>Average Ending Assessment

=AEA

<sup>3</sup>Average Improvement = AI

Table 2 shows the effect that 4-H or FFA involvement had on the objective test scores. The students who were very involved in 4-H and FFA scored significantly higher (P<0.05) on the ITS than all groups except the non-active members of both organizations (39.9 versus group mean of 35.9). The students who were either non-members of either organization or were FFA members but were not active performed the lowest on the initial objective test with scores of Table 2. Least squares means (± Standard Error) for Initial Day Test Score, Last Day Test Score, Test Improvement, Final Test Score, and Final Average for students categorized by their high school involvement in 4-H or FFA before enrolling in Animal Science 140 at Western Kentucky University

Activities	N	ITS <sup>1</sup>		LDTS <sup>2</sup>		TI <sup>3</sup>		FTS <sup>4</sup>		FA <sup>5</sup>	
		LSM	±SE	LSM	±SE	LSM	±SE	LSM	±SE	LSM	±SE
Not a member	242	33.09 <sup>c</sup>	2.08	63.55	2.19	29.53	3.70	61.2 7	2.26	69.44	2.62
4-H Member-Not Active	31	33.85 <sup>bc</sup>	2.88	64.76	3.19	28.12	4.72	63.5 8	3.03	71.86	3.47
4-H Member-Very Active	28	33.55 <sup>bc</sup>	3.07	60.54	3.93	28.69	5.23	60.4 7	3.45	66.63	3.86
Activities	N	ITS <sup>1</sup>		LDTS <sup>2</sup>		TI <sup>3</sup>		FTS <sup>4</sup>		FA <sup>5</sup>	
		LSM	±SE	LSM	±SE	LSM	±SE	LSM	±SE	LSM	±SE
FFA Member-Not Active	58	32.77 <sup>c</sup>	2.47	63.19	2.70	28.88	4.20	60.9 5	2.69	71.82	3.12
FFA Member-Very Active	147	36.60 <sup>b</sup>	2.30	62.17	2.38	23.79	4.07	61.2 7	2.47	71.85	2.87
4-H and FFA Member-Not Active	19	34.92 <sup>ab</sup> <sub>c</sub>	3.38	60.32	4.19	24.46	5.59	61.4 2	2.68	68.71	4.33
4-H and FFA Member-Very Active	82	39.90 <sup>a</sup>	2.50	66.14	2.54	24.17	4.22	62.4 8	2.68	73.19	3.08

Means within a column with different superscripts are different (P<.05)

<sup>1</sup> Initial Day Test Score= ITS

<sup>4</sup> Final Test Score= FTS

<sup>2</sup> Last Day Test Score= LDTS

<sup>5</sup> Final Average= FA

<sup>3</sup> Test Improvement= TI

33.1 and 32.8, respectively. Despite the differences on the ITS, the students did not perform significantly different on the last day test, the final test or the final average (P>0.05).

The effect of student's gender on assessment scores is shown in Table 3 and 4. Males rated their knowledge of course topics higher when compared to females at the beginning (36.4 vs. 31.0) (P<0.05) and the ending (71.8 vs. 66.4) (P< 0.05) of the course. However, the average

improvement on the subjective assessments was not significantly ( $P>0.05$ ) different between males and females. Males scored significantly ( $P<0.05$ ) higher than females on the ITS and LDTS. However, male and female students improved at the same rate. Despite the differences on Table 3. Least squares means ( $\pm$  Standard Error) for Average Beginning Assessment, Average Ending Assessment, and Average Improvement for students categorized by gender and enrolled in Animal Science 140 at Western Kentucky University

Gender	N	ABA <sup>1</sup>		AEA <sup>2</sup>		AI <sup>3</sup>	
		LSM	$\pm$ SE	LSM	$\pm$ SE	LSM	$\pm$ SE
Male	337	36.44 <sup>a</sup>	4.61	71.77 <sup>a</sup>	3.77	36.94	5.78
Female	293	31.03 <sup>b</sup>	4.86	66.41 <sup>b</sup>	3.91	36.36	6.01

Means within a column with different superscripts are different ( $P<0.05$ )

<sup>1</sup>Average Beginning Assessment = ABA

<sup>2</sup>Average Ending Assessment = AEA

<sup>3</sup> Average Improvement= AI

the ITS and LDTS, scores on the FTS and FA were not significantly different ( $P>0.05$ ) between males and females.

*Table 4.* Least squares means ( $\pm$  Standard Error) for Initial Day Test Score, Last Day Test Score, Test Improvement, Final Test Score, and Final Average for students categorized by gender and enrolled in Animal Science 140 at Western Kentucky University

Gender	N	ITS <sup>1</sup>		LDTS <sup>2</sup>		TI <sup>3</sup>		FTS <sup>4</sup>		FA <sup>5</sup>	
		LSM	$\pm$ SE	LSM	$\pm$ SE	LSM	$\pm$ SE	LSM	$\pm$ SE	LSM	$\pm$ SE
Male	337	37.28 <sup>a</sup>	2.15	63.92 <sup>a</sup>	2.09	25.61	3.76	61.88	2.29	70.92	2.65
Female	293	34.08 <sup>b</sup>	2.25	60.80 <sup>b</sup>	2.29	25.38	3.94	59.57	2.40	69.04	2.79

Means within a column with different superscripts are different ( $P<0.05$ )

<sup>1</sup> Initial Day Test Score= ITS

<sup>4</sup> Final Test Score= FTS

<sup>2</sup> Last Day Test Score= LDTS

<sup>5</sup> Final Average= FA

<sup>3</sup> Test Improvement= TI

## Conclusions

The results of this study demonstrate that involvement in youth activities and gender influenced both subjective and objective evaluation scores. 4-H and FFA provide opportunities for young people to learn about the agricultural industry. Involvement of the students in 4-H and FFA helps determine the students' perception of their knowledge of topics to be discussed in the Introduction to Animal Science course. The students ranked their knowledge differently relative to their involvement in activities as a high school student; however, the students' knowledge ranking improved at the same rate. Prior agricultural experience gained through 4-H and FFA activity may have allowed students to score higher on the initial day test score. These results coincide with the knowledge that prior experience with a subject addressed in a course may enhance the ability of students to learn

information presented (Osman and Hannafin, 1994). Despite the fact that the involvement did affect their opinion of how much they knew, the participation in 4-H and/or FFA did not translate into higher scores on the objective tests at the end of the semester. The results of the present study do not agree with those previously reported where students involved in the youth organizations had higher grade point averages when compared to those students not involved in the organizations (Ball et al., 2001). The explanation for this difference in results could be due to the fact that students from the present study who had prior agricultural experience thought they possessed more knowledge on subjects presented throughout the course, and hence, they did not study as much or as regularly as students without prior experience or involvement in the youth organizations. This outcome could be desirable when considering that instructors want students to be able to succeed in the course regardless of their level of previous experience prior to enrollment in the course.

Gender plays a role in subjective and objective assessment performance with scores on multiple choice exam differing. The present findings closely follow those previously reported by Bridges and Casavant (2002) who showed that males outperformed females on multiple-choice exams. In the present study, males not only scored higher on the objective tests but also subjectively self-assessed their knowledge higher. It appears that males thought they had more understanding of the course subject matter than females. A plausible explanation for these results could be that males may have had more previous experience with agriculture and related topics than the females. Despite the gender assessment score differences, women and men had similar rates of improvement on the subjective self-assessment administered at the beginning and at the end of the semester. The study demonstrated similar learning rates among males and females. The results of the present study are in agreement with those previously reported (Bridges and Casavant, 2002) indicating that males and females have similar rates of course knowledge improvement. Student gender was not a significant source of variation for FTS or the FA received in the course. Male and female FA score differences may have resulted from differences in performance on other testing instruments (either quizzes or hourly exams) administered throughout the semester. The quizzes and hour exams are fill-in-the blank, short answer or essay type exams on which the females must have excelled the males in performance. Bridges and Casavant (2002) found that females had superior performance on these type exams. Furthermore, males may not study as regularly due to their perceived course subject matter knowledge; whereas, females spend more time studying the course topics.

### **Implications and Recommendations**

The implications and recommendations reflect the findings and important conclusions that resulted from the study. The recommendations are intended to provide some basis for important considerations among high school and college educators as they attempt to provide learning opportunities for students with varying educational and agricultural experiences:

- Involvement of students in 4-H and FFA activities appears to create a strong degree of self-confidence in their academic ability relative to animal science.
- Active involvement in the youth organizations did not relate to an improvement in the rate of increase in perceived knowledge during the semester. However, those students who classified themselves as very active members of both organizations rated their knowledge highest of all involvement groups at the end of the semester.
- Based upon the initial objective test scores, active involvement in the youth organizations gave those students a knowledge advantage.
- The extra self-confidence and knowledge advantage of those students active in the youth organizations did not translate into better performance on the objective measures of knowledge given at the end of the semester.
- Students with little or no background in agriculture or involvement in the agricultural youth organizations can perform just as well as students with a favorable background if the course is designed to teach students as if none has any prior knowledge or experience. In order to allow inexperienced students to gain both knowledge and confidence, it may be necessary to utilize the animal units at the university farms to offer inexperienced students the opportunity to interact with farm animals in a production setting.
- Educators at the high school level should place much greater emphasis on the idea of “lifelong learning” as a means of encouraging students to develop a more open-minded inquisitive attitude. Having a high degree of self-confidence can be very positive, but this should not substitute for excellent study habits and a zeal for learning new information.
- Males had more confidence in their ability at both the beginning and the end of the semester and actually outperformed females on the initial test and last day test score.
- Females appear to have better study habits and work harder on course assignments to allow them to have overall performance similar to male students.
- Professors should provide confidence building animal experiences for students who are deficient in animal experience or those who simply wish to be involved in more animal activities at the university farms.
- Faculty of introductory classes in agriculture should utilize outcomes based educational models to maintain relevancy in course content and assessment.

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