

Appraisal of Critical Thinking Skills in Animal Science Undergraduates who Participated on a Nationally Competitive Collegiate Judging Team

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Abstract

Evaluation courses have remained an integral part of collegiate animal science programs throughout the country and are a precursor for a national judging team. An evaluation course focuses on teaching students general accepted criteria for evaluating a particular animal, industry standards and rules to compare multiple animals, and emphasizes students being able to defend their judgments both written and orally. These skills are necessary for building well-rounded graduates. Participation on a judging team has been associated with developing problem solving and decision making, employer preferred life skills (Boyd et al., 1992; Rusk et al., 2002). Eight students in the Department of Animal and Veterinary Sciences at Clemson University took a standardized critical thinking exam. Four of the students had never taken an evaluation course or competed on a judging team (N) and the remaining four had taken an evaluation course and competed on a national judging team (J). All students were similar in regards to age, gender, classification and GPA. Because of the low sample size, and lack of a pretest, the tentative conclusion that we can draw from this exercise is that students who have participated in national horse judging contests subsequently demonstrate a higher level of critical thinking ability.

Introduction

It is imperative that college of agriculture graduates seeking employment possess a balanced combination of base knowledge and independent thought combined

with critical thinking ability. Recent advances and restructuring of the workplace has increased emphasis on teamwork. Not only are employees expected to think creatively, solve problems, and make decisions, they are expected to perform as part of a team (Gokhale, 1995). Gokhale (1995) describes critical thinking attributes as analysis, synthesis, and evaluation of concepts. Previous research shows that senior students in a college of agriculture scored lowest on a critical thinking ability construct in comparison to basic cognitive ability and applications ability constructs (Torres and Cano, 1995). Many students are graduating with less than adequate cognitive skills that are vital to solve problems and make decisions (Torres and Cano, 1995). The college experience must prepare graduates for the experiences that lie ahead, which includes thinking critically, individually, and as a member of a team.

Participation on a horse judging team exposes a student to analytical and critical thinking, judgment, and written and oral communication skills. Students first learn general judging criteria for a particular breed. Students are taught conformation and performance standards, practice evaluating multiple animals against the breed standard, then rank the animals in order of best fit to the ideal. Students utilize known criteria to critically and independently evaluate classes, and develop written and oral justification (reasons) for judgments. Students learn to develop reasons for their assessment and give the justification to a professional in an oral presentation format. In relation to higher orders of cognition described by Bloom et al. (1956),

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Appraisal of Critical

participation on a judging team involves a significant amount of critical thinking: application of criteria for evaluating animals, analysis of individual classes, synthesis of criteria, and evaluation of multiple disciplines. Logically, it makes sense that an activity utilizing higher order thinking would produce a student better equipped to handle thinking critically. Researchers (Gokhale, 1995) studied individual and group exercise outcomes and concluded that students who participated in collaborative learning as a team performed significantly ($P=0.001$) higher on a critical thinking test. Further, students participating in collaborative learning indicated that participation as a group stimulated thinking and facilitated understanding.

Using the Watson Glaser Critical Thinking Appraisal exam (WGCTA), researchers in Missouri (Shann et al., 2006) examined critical thinking ability of undergraduate students ($n=63$) enrolled in a live animal and meat evaluation course. Students were given either form A or form B on the first class day (pretest) and again on the last class day (posttest); students that received form A initially received form B for the posttest, and vice versa. Course work included 16 weeks of instruction in animal anatomy; live animal evaluation and pricing; carcass grading; carcass pricing; and ranking philosophies for beef, pork, and lamb. Researchers observed an improvement in students average WGCTA score from the first to the last class day (39.9 and 55.5, respectively).

Little research has looked specifically at the relationship of judging teams and their ability to foster critical thinking processes. The objective of this study, therefore, was to quantify the critical thinking ability of students who have previously competed on an equine evaluation team and compare them to similar students who have not previously been a part of an animal evaluation team.

Materials and Methods

This study attempted to quantify the level of critical thinking ability in students who had previously participated on a national-level competitive judging team, and determine if there was a difference when

compared to students who had not previously had evaluation training. The null hypothesis stated that students who had previously participated on an evaluation team scored the same on a critical thinking ability test as students who had no prior animal evaluation training. The alternative hypotheses stated that students who had prior evaluation experience scored differently on a critical thinking ability test than students who had no prior evaluation experience.

The experimental design is:

X O¹

O²

“O¹” represents the students participating in the animal evaluation experience, “X” is the treatment which occurred on a volunteer basis (judging team experience), and “O²” is the student group who did not receive the treatment.

Population

Eight students in the Animal and Veterinary Sciences department at Clemson University participated in the project. Students (J) who competed on a national level at horse judging contests ($n=4$) and students (N) who had not competed on a judging team, or taken an evaluation course ($n=4$) were evaluated. Of the parameters listed in Figure 1, group N was identical to group J with regard to classification, age, GPA and gender. Demographic information for eight students is listed in Table 1. Group N students were identified from a pool of 83 students enrolled in one of three courses being used for an additional study in the Animal and Veterinary Sciences department at Clemson University. All testing and observation was approved by the Institutional Review Board (IRB) at Clemson University.

Instrumentation

Students filled out a questionnaire (Figure 1) designed to determine demographic information. This questionnaire was utilized to determine specific demographic information of the judging students and identified their peers whose demographic information was similar to them such that a comparison group could be made. The questionnaire identified characteristics of each student with respect to age, gender, classification, GPA, and previous judging experience. Each of these characteristics was self-reported by the student and therefore may not be completely accurate.

The Waston-Glaser Critical Thinking Appraisal (WGCTA) test, form A and B, from Harcourt Assessment provided means to objectively assess

Table 1. Self-reported Demographic Information for (J) Judging Team Members and (N) Control Group of Students

Student	Classification	Age Range	GPA	Gender
J 1	Junior	18-20	> 3.49	Male
J 2	Junior	21-24	2.5-2.99	Female
J 3	Junior	18-20	2.5-2.99	Female
J 4	Junior	21-24	> 3.49	Female
N 1	Junior	18-20	> 3.49	Male
N 2	Junior	21-24	2.5-2.99	Female
N 3	Junior	18-20	2.5-2.99	Female
N 4	Junior	21-24	> 3.49	Female

Figure 1. Questionnaire for students taking the WGCTA exam.

Testing No.:					
<i>Please take your time to answer every question truthfully and to the best of your ability.</i>					
1. Please indicate your classification (according to known hours completed) by circling the appropriate response:					
Freshman	Sophomore	Junior	Senior		
2. Please indicate your age by circling the appropriate range:					
18-20	21-24	>24			
3. Please indicate your GPA by circling the appropriate range:					
< 1.5	1.5 – 2.09	2.1 – 2.49	2.5 – 2.99	3.0 – 3.49	> 3.49
4. Please indicate your gender by circling the correct response:					
Male	Female				
5. Have you ever been involved in a judging program before (i.e.: 4-H, FFA, or evaluation class in college)?					
Yes	No				

a student's critical thinking ability. The WGCTA provides an estimate of an individual's standing on a composite of attitude, knowledge, and skills by means of evaluating the student's ability to think critically in five categories; 1) Inference, 2) Recognition of Assumptions, 3) Deduction, 4) Interpretation, and 5) Evaluation of Arguments. Each category is weighted equally and the test is on an 80 point scale. The Inference section requires the test taker to discriminate among degrees of truth or falsity of inferences drawn from given data. Recognition of Assumptions requires the ability to recognize unstated assumptions or presuppositions in given statements or assertions. Deduction entails determining whether certain conclusions necessarily follow from information in given statements or premises. Interpretation consists of weighing evidence and deciding whether generalizations or conclusions based on the given data are warranted. Finally, Evaluation of Arguments distinguishes between arguments that are strong and relevant or weak and irrelevant. The components include problems, statements, arguments, and interpretations of data. All components are aimed at mimicking real-world situations one might encounter at work, school, or in newspaper and magazine articles. Validity and reliability have been established for the WGCTA by the respective authors with a reliability coefficient of 0.74 (Watson and Glaser, 1980). Watson and Glaser (1980) deem the exam credible to evaluate an individual student's critical think ability and compare the score to national averages. Another study that utilized the WGCTA for high school students (n=384) measured the WGCTA as yielding a reliability coefficient of 0.78 (Cano, 1993). Researchers in Texas found that the WGCTA exam remained reliable and consistent when given to undergraduate and graduate students (n=58) at Southwestern State University (Gadzella et al., 2005).

Collection

Four students who had previously participated on a nationally competitive horse judging team were identified by the judging team coach in the department of Animal and Veterinary Sciences. A concurrent study (n=83) was utilizing the WGCTA and the demographic questionnaire (Figure 1) in spring 2007. Of the 83 students tested in the alternate study, four were identified that matched the demographic characteristics of the judging students exactly, except for judging or evaluation experience (Figure 1). The four students (N) reported they had never received any animal evaluation training. Test scores from the N students involved in the additional study served as the control group with which to compare the J scores. Judging (J) students took the WGCTA on the two consecutive days that the non-judging (N) students took the WGCTA for the additional study.

Data analysis

All data were coded and analyzed using Microsoft Excel for Windows. Data were analyzed for mean and standard deviation of each category of the WGCTA and final score for both groups (J and N). Raw scores were then standardized and compared using a z-score. By standardizing scores, we can effectively distribute values around a mean of zero. The z-score allows us to compare the relative standings of values from distributions with different means. Each z-score corresponds to a point in a normal distribution and describes the deviation from the mean, or from another specific point. Final score means were compared to published national norms for college students (Watson and Glaser, 1980).

Results and Discussion

Many standardize tests regularly publish results from their broad base of test-takers with the intent of comparing scores. It is helpful to compare individual student scores and larger group scores to national averages to understand where the concerned party ranks. Group J scored higher when compared to national averages, scoring in the 60th percentile (mean=56.25) while group N scored in the 45th percentile (mean=53.5). Mean score for both groups was 54.9 ± 6.85 . Z-scores for J and N were 0.197 and -0.204, respectively. This indicates that average scores for each group differed 40% of a standard deviation compared to the mean for both groups. The mean score for group J was higher than or equal to 57.8% of the individual student scores in both groups

Appraisal of Critical

Table 2. Mean WGCTA Scores for (J) Judging Team Members and (N) Control, including Standard Deviation and Z-score

	J	N
Inference	8.25	8.5
Recognition of Assumptions	12.5	8.75
Deduction	10.25	10.5
Interpretation	12.5	13.75
Evaluation of Arguments	12.75	12
Total score	56.25	53.5
Standard Deviation	6.55	7.85
Z-score	0.197	-0.204

and the mean for group N was higher than or equal to 41.9% of the individual student scores in both groups. Group J scored numerically higher than group N on the Recognition of Assumptions and Evaluations of Arguments portions of the WGCTA exam (12.5 vs. 8.75 and 12.75 vs. 12, respectively). All results are reported in Table 2.

Judging competitively at the collegiate level may increase critical thinking ability above peers who have not competed on a judging team. Tangible benefits of participation on a judging team are not well documented. Popular opinion is that students gain valuable skills in higher order thinking by being an active participant on an animal evaluation team, and research shows that participation in extra-curricular activities is beneficial to enhancing critical thinking ability (Gellin, 2003; Shann et al., 2006). However, more technically based science education is becoming commonplace, taking the place of hands-on experiences. While both are beneficial to the student, a clear interpretation of benefits derived from each is warranted. When asked what benefits were derived from their experience on a judging team, respondents indicated that their experience was most essential to the development of decision making and problem solving skills (Rusk et al., 2002). This study is limited by the small sample size. There were only a few students who had competed collegiately on a judging team available to take the exam. Regardless of the small sample size, these students are thought to be similar to other students who would choose to compete on a judging team. Likewise, students making up the control group (N) are believed to accurately represent animal science students. Judging teams typically involve a small number of students at any particular university and can be quite expensive to support; however, the benefits out-weigh the disadvantages.

Summary

Students participating on a competitive judging team demonstrate numerically higher critical thinking scores and score higher relative to national norms compared to their peers who have not previously had any animal evaluation training. Offering opportunities

to students, including involvement on a competitive judging team, should be utilized and supported as an important aspect of higher education. Contributing to a student's knowledge by providing facts in a classroom is not enough; a student must be able to demonstrate understanding of concepts in hands-on projects, including intercollegiate competition (Kauffman et al., 1971). In order to produce students with critical thinking abilities, it is imperative to make opportunities available that will challenge them, thus creating an individual capable of independent thought and critical thinking; valuable skills for the workplace (Boyd et al., 1992). The WGCTA is an effective means to quantify critical thinking ability of students.

Conclusions and inferences drawn from this study may only apply to the limited data collected here. The study takes place utilizing eight students in a department of Animal and Veterinary Science at Clemson University.

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