

# 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

**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

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

## Effectiveness

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, employ-

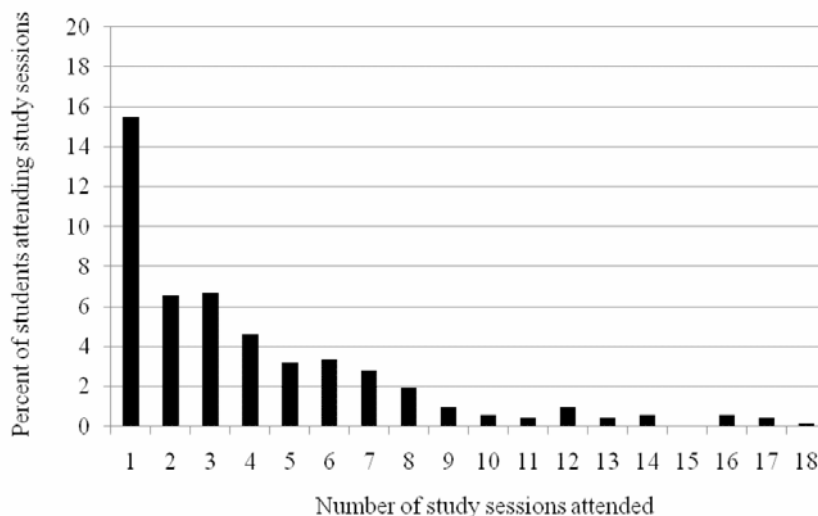
ment, and peer pressure. The average student that participated in peer-led study groups attended an average of 4.0 + 3.6 study sessions (Figure 1). Even though the mean attendance was 4.0 study sessions, students predominately attended only one. It was noted that attendance was greatest immediately prior 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.

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).

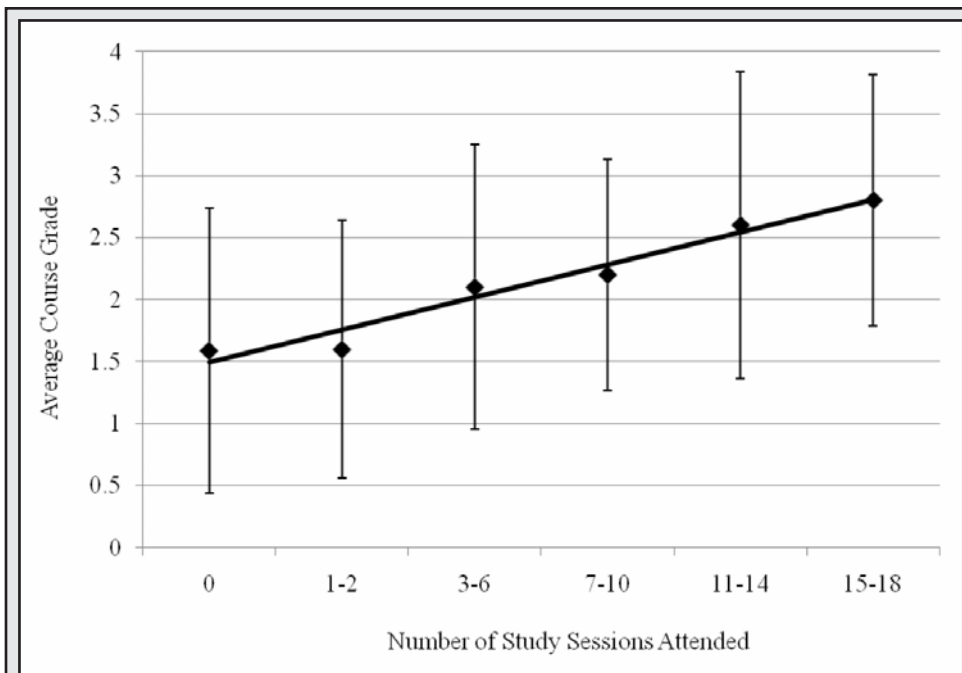


Figure 2. Effect of peer-study session attendance on course grade (A = 4.0) in undergraduate animal science classes. For each study session attended there was a 0.08 increase in course grade ( $p < 0.01$ ).

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



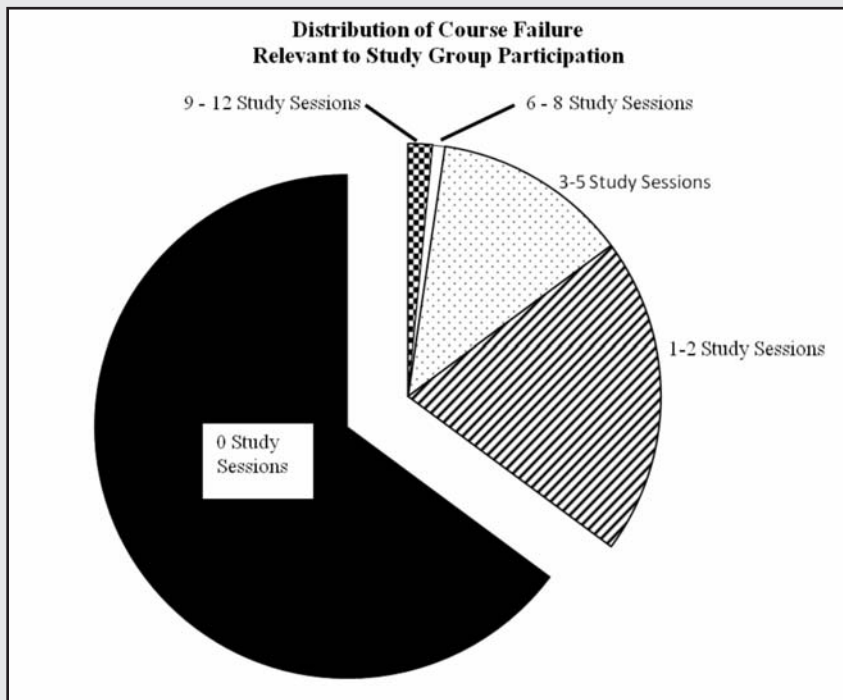


Figure 3. The additive benefits of participating in peer-led study sessions on successful course completion. Students attending more than 12 study sessions never failed the course.

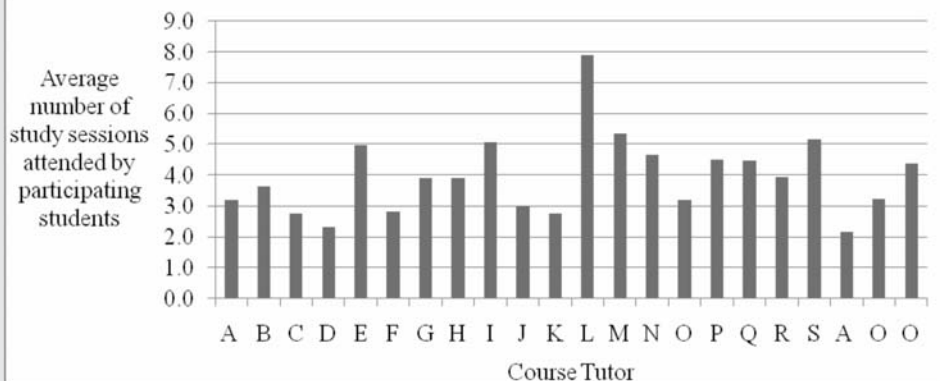
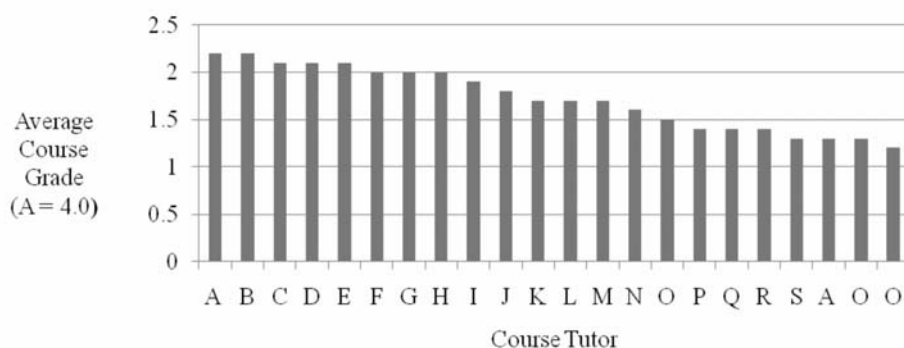


Figure 4. Tutor effect on course grade and participation. A positive correlation was found between tutor and course grade ( $r = 0.10, p < 0.01$ ). Note: some tutors (A, O) led multiple study groups.

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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