

A Quasi-Experimental Evaluation of Student Academic Performances in Single Sex Secondary Classrooms

Abstract

Teacher beliefs and environmental conditions influence student performance outcomes. In this non-equivalent comparison quasi-experimental design study, students enrolled in ten secondary Principles of Agriculture courses assigned to a control or treatment group based upon their sexual identity. Teachers were asked periodically about their expectations of student performances. Over the course of the academic semester, students within the treatment group maintained higher grade point averages and better attendance. Boys from the treatment group maintained a higher percent of non-discipline referrals than boys from the control group. In addition, correlations are made between the teachers' expectations, and student performance and career aspirations. The researchers recommend that secondary schools consider single-sex classrooms for entry-level agricultural courses and for additional research to be considered to further strengthen the preliminary findings.

Keywords: Males; Females; Gender; Grade Point Average; Expectancy

Introduction

In 2001, the No Child Left Behind (NCLB) Act began to allow public schools to offer same-sex classes, which led to the 2006 amendment to the Title XI regulation that removed the ban on single-sex public education. Title IX is the section of Every Child Succeeds Act that prescribes gender equity in public education's in-school and extracurricular activities. Since NCLB, over 1,600 school districts across the United States have implemented some degree of single-sex education (Klein et al., 2014).

As more school districts across the United States implement same-sex schools and classrooms, the research that supports this learning environment remains widely disputed; especially, with a deficiency of same-sex education research in public schools. Pahlke et al. (2014) conducted a meta-analysis of 453 single-sex education studies that exposed an array of methodological issues: (a) mostly convenience samples; (b) typically conducted in private school settings with highly motivated students, exceptionally trained teachers, small class sizes, and high socioeconomic status; and (c) student participants did not represent the demographics of the community. This study mitigated the methodological issues, addressed in the 2014 study, by implementing the following research design: (a) a quasi-experimental design; (b) conducted in a public-school setting with traditionally trained teachers, larger class size, and more representative socioeconomic status; and (c) students represented the demographics of the community.

Although none of Pahlke et al. (2014) meta-analysis included studies within agricultural education classrooms, research regarding one sex is not uncommon. Although most of the recent literature that has emerged is regarding gender dynamics at the post-secondary level (Cline, et al., 2019; Murphey et al., 2016; Kleihauer et al., 2013), some studies have investigated the effects of gender on the secondary level (i.e. Chumbley et al., 2015; Kagay et al., 2015; Velez et al., 2015; Ricketts et al., 2004). Newsom-Stewart and Sutphin (1994) found that girls and boys held differing perception about agricultural education and called for further investigations that "examine cultural and gender differences" in SBAE (p. 55). Their recommendation for future research spurred studies that investigated the effects of gender on student achievement (Johnson et al., 1998), students' rationale for course selection (Sutphin & Newsom-Stewart, 1995), and the emergence of girls in leadership roles (Ricketts et al., 2004). Over 25 years after Newsom-Stewart and Sutphin's introductory study on gender dynamic, literature in SBAE still remains scarce in gender studies and gender related issues (Enns & Martin, 2015).

Ricketts et al. (2004) found that male students participated in more technical skilled projects (i.e. mechanics, tractor operations) while female students participated in more soft skilled projects (i.e. agricultural communications, marketing, public speaking). The authors called for extensive research to uncover if this phenomenon continued to occur. Rosch et al. (2015) conducted a longitudinal study to measure leadership gains (skills, confidence, and engagement) in secondary agricultural students and found female students gain significantly in leadership while male students did not.

At present, no literature regarding the effectiveness of same-sex classrooms in school-based agricultural education (SBAE) courses is in existence. As such, this study sought to address the absence of literature by examining the effectiveness of same-sex classrooms and teacher effectiveness in SBAE programs in Kentucky. This research aligned with priority four (meaningful, engaged learning in all environments) of the national research agenda for the American Association of Agricultural Educators by evaluating the learning environment of single-sex classrooms in agricultural education (Roberts et al., 2016).

Literature Review/Theoretical Framework

The Pygmalion effect posits that teachers' beliefs influence student outcomes (Rosenthal, 2010). Such teacher beliefs are often called teacher expectations or teacher expectancy. These expectations can be based on a teacher's knowledge of a student (Good, 1987), such as previous grades, behavior, or perceptions of in class performance, but are also based on one's prejudices and biases (Reyna, 2008). Rosenthal and Jacobson (1968) hypothesized that a teacher's expectations induce change in their own behavior towards specific students, which then may lead to differences in academic performance. For example, a teacher with a belief that a certain student will not perform well in mathematics because of their previous math grade (teacher expectation), may reduce the amount of effort they put into teaching the student (behavior), which may cause the student to actually perform poorly on a mathematics assessment (academic performance). In this way, the Pygmalion effect is a self-fulfilling prophecy (Merton, 1948); a teacher's poor expectation results in poor student performance and a teacher's high expectation induces greater student performance.

Over 50 years of empirical research has established the strong predictive power of teacher expectations (Jussim & Harber, 2005). Within an academic setting the Pygmalion effect can predict whether a student succeeds in their academic performance (Friedrich et al., 2015; Hinnant et al., 2009; Good & Nichols, 2001; Rosenthal, 1972; Rosenthal & Jacobson, 1968), predict how students are placed in ability tracks (Anderson, 2018), and predict the development of self-concepts (Trouiloud et al., 2002). Mostly, academic outcomes are measured through course grades or end of course tests (Jussim & Harber, 2005). Although the predictive power of the Pygmalion effect is widely accepted, the sources of teacher expectations remain broad within academic settings (Friedrich et al., 2015).

Murdock-Perriera and Sedlacek (2018) posits that sources of teacher expectations may include preconceived biases and personal factors, such as empathy. Despite a broad view of what creates or considered a "teacher expectation," the effects of teacher expectancy are argued to be an agent of educational inequality (Anderson, 2018); especially, in students who belong to a stigmatized group (Jussim & Harber, 2005). For example, the academic performance of minority students can be hindered by teacher expectations. Good and Nichols (2001) contended that teachers' expectations of African American, elementary students hindered end of course test scores compared to European American students. Other scholars have suggested that teacher expectations may contribute to differences in achievement between boys and girls. Gentrup and Rjosk (2018) showed that students who were subject to strong teacher expectation biases showed high or low achievement gains, correspondingly. Specifically, Gentrup and Rjosk found that girls' mathematics gains were unfavorably affected by negative teacher expectations.

Although teacher expectancy has been well cited in educational research (Rosenthal, 2002), SBAE scholars have yet to investigate teacher expectations in the contexts of SBAE. The researcher tested the merits of the Pygmalion effects within SBAE in this study. Specifically, the researcher investigated the expectations teachers formed based on the single-sex learning environments and the relationship between teacher expectancy and various student outcomes (academic performance, attendance, behavior, career interest, agricultural career interest, and interest in agricultural education).

Purpose/Objectives

The purpose of this nonequivalent comparison group quasi-experiment was to evaluate the effectiveness of single-sex classrooms through the lens of the Pygmalion effect theory. The independent variable in this study was the manipulation of learning environments within *Principles to Agriculture* courses by mediating the composition of classrooms to either single-sex classrooms (treatment) or coeducational classrooms (control). Analyses between X+ and X- were conducted along with analyses between the four levels of independent variable: X₊₁ (boys in treatment group), X₊₂ (girls in treatment group), X₋₁ (boys in control group), and X₋₂ (girls in the control group). The dependent variables included teacher expectations and student performance outcomes. The following research objectives and hypotheses guided the scope of the study:

RO1: Describe the student performance outcomes of X₊₁, X₊₂, X₋₁, and X₋₂ in terms of academic performance, attendance, behavioral instances, and FFA membership.

RO2: Examine the relationship between teachers' expectations for attendance, teachers' expectations for academic performance, teachers' expectations for behavior, teachers' expectations for students' interest in an agricultural career, teachers' expectations for students' interest in agricultural education, attendance, academic performance, behavior, and students' interest in an agricultural career, and students' interest in agricultural education.

Methodology

The untreated control group design with dependent pretest and posttest samples (Shadish et al., 2002), frequently called the nonequivalent comparison group design, was utilized in this study. This quasi-experimental design is recommended in educational field research for ethical, practical, and legal reasons (Steiner et al., 2009). Such reasons include 1) safeguarding the rights of minors, 2) the difficulty to enact randomized sampling in school systems, and 3) following legal boundaries for school records made the use of a quasi-experimental design justified. The use of a pretest is advantageous to facilitate causal inference from the quasi-experiment (Shadish et al., 2002). The pretest that measures the same outcome variable as the posttest also aids in statistical analysis. The pretest also provides how the treatment groups and control groups initially differ which is critical for indicating the possible operation of internal threats to validity (Bell et al., 1995).

Random assignment in higher order units (classrooms) were employed, which is appropriate for educational field research (Shadish et al., 2002). A unit describes whomever is assigned to experimental conditions. High order units (also known as aggregate units), such as classrooms, are collections of individual units, such as students. Simple random assignment was employed at the classroom level (higher order unit) rather than randomly assigning students to the treatment (individual unit). In this study, six classrooms at three school sites were randomly assigned treatment conditions and two classrooms at two school sites were randomly assigned to control conditions. Then students were placed in the class by their identified biological sex, given to the schools' guidance counselors. Both students and their parents were given the option to opt-out of same-sex classrooms within the first week of school. A third class was offered among the three treatment schools for students/parents that did not want to participate or for students who identified as non-binary or gender non-conforming. At the time of this study, no student/parent opted from participation and zero students from the three schools identified as non-binary or gender non-conforming.

The researcher was unable to randomly assign students due to practical restrictions set by schools (e.g. last-minute scheduling, unable to communicate with the middle school, control over students' schedule request).

The intervention for this quasi-experiment was separating the *Principles of Agriculture* courses in homogenous, same-sex classrooms. The intervention was randomly assigned to three of the four selected schools to form the treatment group (Group A) following a selection protocol for participating schools. Group A had two subgroups that included Group A-boys and Group A-girls. Group A-boys ($X+1$) consisted of treatment classrooms where students were all boys and taught by a male teacher. Group A-girls ($X+2$) consisted of treatment classrooms where students were all girls and taught by a female teacher. The remaining school consisted of two heterogeneous, co-educational classes that formed the control group (Group B; $X-$). One control group class was taught by a female teacher while the other was taught by a male teacher. The intervention lasted one semester of the Fall 2019 school year, a total of 15-weeks. No other intervention was provided. All instructors taught the Principles of Agriculture course to state standards. The only manipulated difference between the treatment group and control group was the composition of sex in the classroom. Both groups were administered both a pretest and posttest.

The assessment of threats to internal validity, also known as ambiguous temporal precedence (Shadish et. al, 2002), is a critical methodological approach for a quasi-experimental design (Creswell & Creswell, 2018; Cook & Steiner, 2010; Martin & Bridgmon, 2012). Internal validity is assessing whether the dependent variables (outcomes) are indeed causal to the manipulated independent variable (treatment) (Martin & Bridgmon, 2012). Actions were taken in to minimize potential threats to internal validity (see Table 1).

Table 1

Threats to Internal Validity and Actions Taken

Type of Threat to Internal Validity	In Response, Actions Taken
History	Both the treatment and control group were subjected to the same time frame and external events.
Maturation	All student participants were similar in age, mostly 9th grade students enrolled in Principles of Agriculture course.
Regression to the mean	Student participants were from public school and had similar ability levels.
Selection	Treatment groups were randomly assigned at higher order units.
Mortality (study attrition)	Schools provided letters of support from administration to prevent attrition during the study.
Diffusion of treatment	Control group was located at a different site and participants did not have contact with each other.
Compensatory/ resentful demoralization	Both the control and treatment group received the same benefits for participating in the study. No compensation was offered to participants.
Compensatory rivalry	Steps were taken to ensure that teachers in both the control group and treatment do not amend their teaching out of competition to other groups.
Testing	The administration of pretest and posttest had a 15-week interval to prevent participant familiarity with instruments.
Instrumentation	The same instrument was used for pretest and posttests.

Note. Adapted from Creswell and Creswell (2018).

Inclusion criterion was implemented to recruit a sample that shared the following characteristics:

1. The school was located in Kentucky;
2. The secondary agriscience department had a minimum of two teachers;

3. The school had a minimum of one male instructor and one female instructor certified to teach secondary agriculture;
4. Both teachers were willing to teach a Principles to Agriculture course to the standards set by the Kentucky Department of Education;
5. The school provided a minimum of three sections of *Principles to Agriculture*.

Forty-three schools met the inclusion criterion and were contacted through an initial recruitment e-mail. Two follow-up e-mails and personal phone conversations occurred within a month of the initial correspondence from a faculty member who had a positive established reputation among the state's teachers. Various reasons for not participating consisted of a) not enough enrollment for two classes; b) lack of administrative support; c) lack of teacher interest; d) uncertainty of job placement the following year; and e) school scheduling restrictions. At the end of the recruitment, 10 schools expressed interest to participate in the study. Two of the 10 schools declined to participate in the study because of their uncertainty of enrollment and course offerings. In December, eight schools confirmed interest and ability to participate in the study. Each school was asked to supply a letter of support from their administration in order to participate in the study. In January, six schools received written letters of support from their administration. Teachers ($n = 10$) from six schools attended a meeting to discuss the study procedures. Four schools were randomly assigned by the treatment group and two schools to the control group. Over the summer one school in the control group had a change of teachers and failed to meet the criterion. As a result, five schools (ten classrooms) participated in the study. Of these, three schools (eight classrooms) served as treatment and two schools (two classrooms) served as a control. Each school was located in a rural community, primarily Caucasian, and farming communities (Glass, 2020).

A total of 191 freshman students enrolled in their first year of high school (14-16 years of age) participated in this study. Of this sample, 102 (53.4%) were female students and 89 (46.6%) were male students. A total of 144 (76 female students, 68 male students) students were placed into single-sex classrooms as the treatment group, with the remaining 47 students (26 female students, 21 male students) remained in coeducational classrooms as the control group. Participation in the study was granted by collection of parental permission and student assent within the first two weeks of school. Student participants in the treatment group (same-sex classrooms) had the option to opt-out into a traditional coeducation classroom. Parents also had the option to opt-out their child to a coeducation classroom. No students or parents requested to opt-out of same-sex classrooms.

The school districts reported that of the student participants, 21 (11.3%) had an identified Individualized Education Plan (IEP) or 504 plan and 10 (5.4%) students were considered gifted. Most of the student participants qualified for free and/or reduced lunch ($f = 95$; 56.4%) and considered poor. The majority of student participants were paid FFA members ($f = 111$; 66.1%). Students' ethnicity was not collected. Students reported the marital status of their biological parents. Respondents indicated that most of their biological parents were not married ($f = 89$; 54.6%). Most of the students ($f = 84$; 51.5%) were unsure about their father's level of education, while many students reported their mother's level of education to be a bachelor's degree ($f = 89$; 16.0). The study followed all protocols, confidentiality, and safety measures approved by the university's Institutional Review Board (IRB).

Measures

Dependent variables reported by the instructor, or the school district were labeled as "student performance outcomes" in this study. Academic performance, FFA membership, attendance, and behavioral referrals were dependent variables that were reported by the school district or instructor. Each measure is discussed in more detail below.

Academic performance was assessed through end of *Principles to Agriculture* semester grade and overall cumulative high school Grade Point Average (GPA). The end of semester grade for the *Principles*

of Agriculture course was reported by the instructors at the end of the semester in January 2020. The semester grade was reported in letter grade format (A-F). Each letter grade was coded for analysis (4.0 A, 3.0 B, 2.0 C, 1.0 D, and 0.0 F). GPA was reported by the school district at the end of the semester in January 2020. The GPA was report on a scale between 0.00 – 4.00. The GPA reflects only classes that were taken in the first semester as a freshman student. If the student took classes for high school credit in middle school, those classes were not included in the reported GPA. The GPA only reflected the current semester courses and not cumulative.

The school district reported student attendance by full days missed throughout the 15-week fall semester. Days missed did not include partial days missed where students may have been late or left early. The reasoning behind the absence was not reported (e.g. doctors visit, school business, unexcused absence, suspension).

The school district reported behavioral incidents that occurred throughout the 15-week fall semester. Behavioral incidents defined by the Kentucky Department of Education (2020) are written discipline referrals. Reported behavioral incidents were school-wide rather than just in the *Principles of Agriculture* course – a course designed for entering first-year high school students.

The researcher developed a questionnaire that assists in describing teachers' expectancy. The instrument contained six items related to dependent variables (academic performance, behavioral incidents, FFA membership, attendance, interest in an agricultural career, and interest in agricultural education). Each item was set to a five-point Likert-scale from 1 (strongly disagree) – 5 (strongly agree) whereas 3 served as neutral. Teachers completed the survey at three points in time: a) prior to the start of the class; b) at the start of the class; and c) at the end of the semester. A panel of experts reviewed the questionnaire for face and content validity (Ary et al., 2019). All three members were chosen based on their experience with teaching and educational research. To establish face and content validity, the panel experts received documents containing the research purpose, objectives, and copies of the questionnaires. The members were asked to examine clarity, verbiage, and visual appearance as recommended by Creswell and Creswell (2018) Modifications were made following the expert panel's reviews to meet face and content validity. The instrument was deemed acceptable.

The teacher participants completed the expectancy questions at three various points – two times prior to the start of the semester and once at the end of the semester. The first student data collection time point (pretest) occurred during the first two weeks. The second data collection point (posttest) occurred 14-15 weeks after the pretest in the last week of the semester. The pretest included the same measures as the posttest.

Data collected from each student was inputted into IBM Statistical Package for Social Sciences® (SPSS) version 26 for data analysis. The data were organized and cleaned prior to analysis. As recommended by Field (2018), descriptive analyses (e.g., means, standard deviations, skew, kurtosis, histograms) of the data and examined items for normality (Shapiro-Wilk test and Levene's test) was conducted prior to fitting to any statistical model. A *strict* confidence level ($\alpha \leq 0.05$) was established for statistical test required in investigating the research objectives.

Findings

Research objective one sought to describe students' performance outcomes between the four subgroups of this quasi-experiment (X_{+1} , X_{+2} , X_{-1} , and X_{-2}) in terms of academic performance, attendance, behavioral instances, and FFA membership. Students' academic performance was measured by the end of

semester grade and end of semester GPA (see Table 2). Girls in the treatment group (X_{+2}) reported the highest semester grade in the *Principles of Agriculture* course ($m = 3.53, SD = 0.79$), followed by boys in the treatment group ($X_{+1}; m = 2.88, SD = 1.11$), girls in the control group ($X_{-2}; m = 2.86, SD = 1.32$), and boys in the control group ($X_{-1}; m = 1.90, SD = 1.55$). Semester GPA was reported on a 4.00 scale. Girls in the treatment group (X_{+2}) reported the highest semester GPA in the *Principles of Agriculture* course ($m = 3.14, SD = 0.71$), followed by girls in the control group ($X_{-2}; m = 3.13, SD = 0.78$), boys in the treatment group ($X_{+1}; m = 2.96, SD = 0.68$), and boys in the control group ($X_{-1}; m = 2.20, SD = 1.05$).

Table 2

Students' Academic Performance of Treatment and Control Groups (n = 191)

Variable	Treatment (n = 144)						Control (n = 47)					
	Boys (n = 68)			Girls (n = 76)			Boys (n = 21)			Girls (n = 26)		
	M	SD	Range	M	SD	Range	M	SD	Range	M	SD	Range
LG	2.88	1.11	4.00	3.53	.79	4.00	1.90	1.55	4.00	2.86	1.32	4.00
GPA	2.96	.68	3.00	3.14	.71	2.80	2.20	1.05	3.70	3.13	.78	2.70

Note. LG = *Principles to Agriculture* Letter Grade; GPA = High School Grade Point Average. LGs were reported as letter grades from A to F. Each letter grade was coded using a numerical value (A = 4.00, B = 3.00, C = 2.00, D = 1.00, and F = 0.00). GPAs were reported on a 4.00 scale.

Student attendance was measured by the reported full days missed with one semester of each student (see Table 3). Girls in the treatment group (X_{+2}) reported the highest percentage of students with perfect attendance or no days missed ($n = 23$), followed by boys in the treatment group ($X_{+1}; n = 6$), girls in the control group ($X_{-2}; n = 2$), and boys in the control group ($X_{-1}; n = 0$). Girls in the treatment group (X_{+2}) had the highest percentage of students who missed five days or less ($n = 64; 78.3%$), boys in the treatment group ($X_{+1}; n = 39; 67.3%$), followed by boys in the control group ($X_{-1}; 65.0%; n = 13$) and girls in the control group ($X_{-2}; .62.0%; n = 13$).

Table 3

Students' Attendance and Behavioral Referrals (n = 168)

Characteristic	Treatment (n = 127)		Control (n = 41)	
	Boys (n = 58)	Girls (n = 69)	Boys (n = 20)	Girls (n = 21)
	f(%)	f(%)	f(%)	f(%)
Days missed				
0	6(10.3)	22(31.9)	0(0.0)	2(9.5)
1 to 5	33(57.0)	32(46.4)	13(65.0)	11(52.5)
6 to 10	13(22.4)	9(13.0)	4(20.0)	8(38.0)
11 to 15	6(10.3)	1(1.5)	2(10.0)	0(0.0)
16 to 20	0(0.0)	4(5.7)	0(0.0)	0(0.0)
21 to 25	0(0.0)	0(0.0)	0(0.0)	0(0.0)
26 to 30	0(0.0)	1(1.5)	1(5.0)	0(0.0)
Behavioral referrals				
0	38(65.5)	58(84.1)	14(70.0)	19(90.5)
1 to 5	16(27.6)	11(15.8)	3(15.0)	2(9.5)
6 to 10	3(5.1)	0(0.0)	3(15.0)	0(0.0)
10 or more	1(1.7)	0(0.0)	0(0.0)	0(0.0)

Students' behavioral incidents were measured by the number of discipline referrals of each student within one semester. The minimum number of discipline referrals reported was zero and the maximum number of referrals reported by one student was thirteen. Of the student participants, 90.5% of the girls in the control group (X_{-2}) reported the highest percentage of students with no behavioral incidents ($n = 19$), followed by girls in the treatment group (X_{+2} ; $n = 58$), boys in the control group (X_{-1} ; $n = 14$), and boys in the treatment group (X_{+1} ; $n = 38$).

Research objective two sought to determine a relationship between teachers' expectations and students' interest in agricultural education, attendance, academic performance, behavior, and students' interest in an agricultural career. Table 4 displays the results from the Pearson correlation.

Table 4

Pearson's Correlation Matrix for Treatment Teachers' Expectations and Student Performance Outcomes

Variable	1	2	3	4	5	6	7	8	9
1. TEAP	-								
2. TEREf	-.163*	-							
3. TEATT	-.034	.595**	-						
4. TECC1	.278**	-.585**	-.102	-					
5. TEACP	.796**	-.106	.197**	.149*	-				
6. ASG	.403**	-.198**	-.285**	.080	.300**	-			
7. SGPA	.223**	-.130	-.164*	-.004	.178*	.677**	-		
8. ACP8	.130	.012	.046	.064	.078	.100	.110	-	
9. CC1	.097	.119	-.052	-.026	-.001	.125	.172*	.366**	-

Note. TEAP = Teachers' Expectations for Academic Performance; TEREf = Teachers' Expectations for Discipline Referrals; TEATT = Teachers' expectations for Attendance; TECC1 = Teachers' Expectations' for Student Interest in the Agricultural, Food, and Natural Resources Career Pathway; TEACP3 = Teachers' Expectations for Students Interest in Agricultural Education Pathway; ASG = Agriculture Semester Grade; SGPA = Semester Grade Point Average; ACP8 = Student Interest in the Agricultural Education Pathway; CC1 = Student Interest in the Agriculture, Food, and Natural Resources Pathways. * $p < .05$. ** $p < .01$.

Teacher expectations for academic performance had a statistically significant ($p < .05$) relationship with teacher expectations for referrals ($r = -.163$), with teacher expectations for students' interest in an agricultural career ($r = .278$), with teacher expectations for students' interest in agricultural education ($r = .796$), and with students' semester grades ($r = .403$). Teacher expectations for academic performance had a statistically significant ($p < .01$) relationship with students' semester GPA. Students' semester GPA had a low magnitude, positive correlation ($r = .223$) with teacher expectations for academic performance. There was no significant relationship between teacher expectations for academic performance and teacher expectations for attendance, students' interest in agricultural education, or students' interest in an agricultural career.

Teacher expectations for behavior had a statistically significant ($p < .01$) relationship with teacher expectations for attendance ($r = .495$), with students' interest in an agricultural career ($r = -.585$), and with students' semester grade ($r = -.198$).

Teacher expectations for attendance had a statistically significant relationship with teacher expectations for students' interest in agricultural education ($r = .197$), student's semester grades. ($r = -.285$), and with student's semester GPA ($r = -.164$). with teacher expectations for attendance.

Teacher expectations for students' interest in agricultural education had a statistically significant relationship with students' semester grades ($r = .300$) and with students' semester GPA ($r = .178$) with teacher expectations for students' interest in an agricultural career. Students' semester GPA had a statistically significant ($p < .05$) relationship with students' interest in an agricultural career ($r = .172$).

Spearman's Rho correlations revealed a significant relationship between students' behavior and teacher expectations for academic performance. Student behavior had a statistically significant relationship with students' interest in an agricultural career ($r_s = .152$). Students' semester grades had a negative correlation with students' attendance ($r_s = -.328$). Students' attendance had a significant relationship with students' interest in an agricultural career ($r_s = -.203$).

Conclusions, Implications, and Recommendations

The treatment group had higher semester grades for their *Principles to Agriculture* course. Also, the girls (X_{+2}) and boys (X_{+1}) in the treatment group had a higher high school GPA when compared to their same sex colleagues in the control group (X_{-1} ; X_{-2}). The results imply that across the different school sites, the students in the treatment group had higher academic performance than students in the control group. These findings support the conclusions of Gurian et al., (2009) that single-sex classrooms increase students' academic performance.

The academic performance of boys and girls is a chief concern for educational researchers (Cheema & Gulluzzo, 2013; Legewie & DiPrete, 2012; Morris, 2008). After all, girls are disproportionately more likely than boys to make higher grades in high school, attend college, and aspire for higher status occupations in the workforce (Carter 2005; Lopez, 2003). Some scholars have even classified boys as at risk and academically disadvantaged (Cook, 2006; Gunzelmann & Connell, 2006; Mittleman, 2022; Van Duzer, 2006). The findings from indicate that girls indeed had higher academic performance compared to their male counterparts, regardless of treatment. However, the boys in the treatment group (X_{+1}) outperformed the boys in the control group (X_{-1}). Programs, strategies, and interventions are needed for secondary teachers to improve the academic performance of high school boys. Gurian et al. (2009) argues that single-sex classrooms can allow teachers to give specialized attention to boys which is recorded to improve academic performance; thus, teachers may consider this movement for early entry courses into secondary agriculture.

The scholars posit that girls have greater motivation to do well in school. Some scholars believe that interventions that increase boys' academic motivation is the best way to reduce the underperformance in academics. A study by Schipps et al. (2015) utilized a goal-setting intervention to successfully increase the academic performance of secondary boys. They argue that a written goal program in secondary classrooms allows students to increase internal awareness of their goals which as a result increases self-regulation. Students who have superior self-regulation are more likely to do well in school, graduate, and further their education through post-secondary learning (McClelland, 2018). Therefore, the academic performance of secondary boys may be enhanced with increased self-regulation. The implementation of goal setting programs in secondary classrooms is recommended and indeed needed to be empirically tested.

Interestingly, the treatment group also had the highest percentile of students with perfect attendance compared to the control group. Low school attendance is powerful predictor of high school dropout (Rumberger, 2011). Kearney and Graczyk (2013) posits that reducing anxiety and disruptive behavior in classrooms are ways to increase attendance among secondary students. If this claim is true, then the

increased attendance of students in the treatment group may be due to reduced social anxieties (Hart, 2016) and improved classroom management (Dijkstra & Berger, 2018) in same-sex classrooms. Further research that examines the effects of single-sex classrooms on secondary student attendance and the outcomes that bolster attendance is needed.

The control group had the most students with no discipline referrals compared to the treatment group. A study by Dijkstra and Berger (2018) found that single-sex classrooms reduced physical aggression of students, especially in boys. The reasoning of the discipline referrals was not collected in this investigation, whether the treatment or control group had discipline referrals related to physical aggression is unknown. Therefore, the researcher cannot support the claims of Dijkstra and Berger and further investigation is needed. Overall, boys in this study had a higher percentage of discipline referrals than girls which back the findings of Downey & Vogt Yuan (2005).

Teacher expectations had seven statistically significant correlations with student outcomes. Teacher expectations for referrals had a low magnitude, negative correlation with teacher expectations for academic performance. In other words, teachers who expected more discipline referrals had lower expectations for a student's academic performance. While teacher expectations for academic performance had a substantial magnitude, positive correlation with students' semester grade and high school GPA. Interestingly, teachers who believed that their students would perform well academically also believed they would have interest in the agriculture, food, and natural resources career pathways as well as the agricultural education pathway.

The findings helped to further support research conducted by Glock (2016) in which she discovered teachers' expectations influence academic performance. Performance expectations also coincided with research from Osborne et al. (2016) who reported that teachers with high expectations gained an increase in student performance and teachers with low expectations had a decrease in student performance.

Often, teachers are unaware of their expectations or how they influence their students. For example, a study by Kern and McCowan (2016) found that teachers were unaware to their tendency to call on White student disproportionately to minority students, even though minority students raised their hand proportionally to White students. These teachers would be unable to adapt their response rate without first being exposed to the bias. For teachers to make changes to their implicit behavior, they must first be made aware of their own expectations, biases, and prejudices towards students (Vincent, et al., 2014; King & Schellen, 2014; Whipp, 2013). Teachers may make necessary changes to their interactions with student once they become aware of their expectations and how their beliefs can influence student outcomes.

Therefore, the creation of an assessment for secondary teachers to become aware of their self-fulfilling expectations is warranted. Also, evaluations by administrators to examine teachers' implicit behavior are recommended. Such observations may also be conducted by peer or mentor teachers. Without creating ways for teachers to understand their own biases and prejudices, teachers may unknowingly hinder students (Accavitti et al., 2016; Vincent et al., 2014; Kumar & Hamer, 2013; Thompson, 2014; Stenhouse & Jarrett, 2012). On the post-secondary level, preservice teachers also need to learn about the hefty influence of their teachers' expectations by student identities, and in the essence of this study, their sexual identification. By doing so, the agricultural education profession can pave a path to closing a present achievement gap among male and female students.

Discussion

Mittleman (2022) recently examined the academic achievement of 200,000 youth and found that males were, in fact, struggling more than any other group. However, when inserting intersectionality within his data analysis, Mittleman found that males who identified as gay were the second highest achieving

students and that females who identify as lesbian were noticing similar academic struggles as straight males. Furthermore, straight, racial minority males were the lowest academically achieving students. The findings of Mittleman raise the question for additional research and a discussion that needs to occur among scholars in agricultural education which relates to the overall system of agricultural education and does (or can) that system assist in closing academic achievement gaps. In the current study, we noticed that the separation of one variable (the biological sex of the student), improved the academic achievement of male students. As scholars continue to navigate through academic achievements and teacher pedagogies, teacher educators must explore new methodologies that prepare teachers for delivering instruction that can assist a multicultural classroom of various intersectionalities. If not, a continued gap will occur among students who have little in common with the individual delivering the information.

References

- Ary, D., Jacobs, L. C., Sorenson Irvine, C. K., & Walker, D. A. (2019). *Introduction to research in education (10th ed.)*. Cengage.
- Baker, M. A., & Robinson, J. S. (2019). The interaction of learning style on measures of successful intelligence in secondary agricultural education students exposed to experiential and direct instruction. *Journal of Agricultural Education, 60*(3), 14-31.
<https://doi.org/10.5032/jae.2019.03014>
- Carter, P. L. (2005). *Keepin' it real: School success beyond Black and White*. Oxford University Press.
- Cheema, J. R., & Galluzzo, G. (2013). Analyzing the gender gap in math achievement: Evidence from a large-scale US sample. *Research in Education, 90*(1), 98-112.
<https://doi.org/10.7227%2FRIE.90.1.7>
- Chumbley, S. B., Haynes, J. C., & Stofer, K. A. (2015). A measure of students' motivation to learn science through agricultural STEM emphasis. *Journal of Agricultural Education, 56*(4), 107 - 122. <https://doi.org/0.5032/jae.2015.04107>
- Cline, L. L., Rosson, H., & Weeks, P. P. (2019). Women faculty in postsecondary agricultural and extension education: A fifteen-year update. *Journal of Agricultural Education, 60*(2).
<https://doi.org/10.5032/jae.2019.02001>
- Cook, G. (2006). Boys at risk: The gender achievement gap. *The American School Board Journal, 193*(4), 4-6.
- Cook, T. D., & Steiner, P. M. (2010). Case matching and the reduction of selection bias in quasi-experiments: The relative importance of pretest measures of outcome, of unreliable measurement, and of mode of data analysis. *Psychological methods, 15*(1), 56-68.
<https://doi.org/10.1037/a0018536>
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches*. SAGE Publications, Inc.
- Dijkstra, J. K., & Berger, C. (2018). Friendship selection and influence processes for physical aggression and prosociality: Differences between single-sex and mixed-sex contexts. *Sex Roles, 78*(10), 625-636. <https://doi.org/10.1007/s11199-017-0818-z>
- Downey, D. B., & Vogt Yuan, A. S. (2005). Sex differences in school performance during high school: Puzzling patterns and possible explanations. *Sociological Quarterly, 49*(1), 299-321.

- Enns, K. J., & Martin, M. J. (2015). Gendering Agricultural Education: A Study of Historical Pictures of Women in the Agricultural Education Magazine. *Journal of Agricultural Education*, 56(3), 69-89. <https://doi.org/10.5032/jae.2015.03069>
- Friedrich, A., Flunger, B., Nagengast, B., Jonkmann, K., & Trautwein, U. (2015). Pygmalion effects in the classroom: Teacher expectancy effects on students' math achievement. *Contemporary Educational Psychology*, 41(1), 1-12. <http://dx.doi.org/10.1016/j.cedpsych.2014.10.006>
- Gentrup, S., & Rjosk, C. (2018). Pygmalion and the gender gap: do teacher expectations contribute to differences in achievement between boys and girls at the beginning of schooling? *Educational Research and Evaluation*, 24(3-5), 295-323. <https://doi.org/10.1080/13803611.2018.1550840>
- Glass, J. D. (2020). *Kentucky schools report card*. Kentucky Department of Education.
- Glock, S., & Karbach, J. (2015). Preservice teachers' implicit attitudes toward racial minority students: Evidence from three implicit measures. *Studies in Educational Evaluation*, 45, 55-61. <https://doi.org/10.1016/j.stueduc.2015.03.006>
- Good, T. L., & Nichols, S. L. (2001). Expectancy effects in the classroom: A special focus on improving the reading performance of minority students in first-grade classrooms. *Educational Psychologist*, 36(2), 113-126. https://doi.org/10.1207/S15326985EP3602_6
- Good, T. L. (1987). Two decades of research on teacher expectations: Findings and future directions. *Journal of Teacher Education*, 38(4), 32-47.
- Gunzelmann, B., & Connell, D. (2006). How are boys doing? *Educational Horizons*, 84, 94-101.
- Gurian, M., Stevens, K., & Daniels, P. (2009). Single-sex classrooms are succeeding. *Educational Horizons*, 87(4), 234-245.
- Hart, L. C. (2016). When "separate" may be better: Exploring single-sex learning as a remedy for social anxieties in female middle school students. *Middle School Journal*, 47(2), 32-40. <https://doi.org/10.1080/00940771.2016.1124660>
- Hinnant, J., O'Brien, M., & Ghazarian, S. (2009). The longitudinal relations of teacher expectations to achievement in the early school years. *Journal of Educational Psychology*, 101(3), 662-670. <https://doi.org/10.1037/a0014306>
- Hyde, J. S. (2005). The gender similarities hypothesis. *American Psychologist*, 60, 581-592.
- Johnson, D. M., Wardlow, G. W., & Franklin, T. D. (1984). Method of reinforcement and student gender: Effects on achievement in agriscience education. *Journal of Agricultural Education*, 39(4), 18-27. <https://doi.org/jae.1998.04018>
- Jussim, L., & Harber, K. D. (2005). Teacher expectations and self-fulfilling prophecies: Knowns and unknowns, resolved and unresolved controversies. *Personality and Social Psychology Review*, 9(2), 131-155. https://doi.org/10.1207/s15327957pspr0902_3
- Kagay, R. B., Marx, A. A., & Simonsen, J. C. (2015). Student self-perceptions of leadership in two Missouri FFA chapters: A collective case study. *Journal of Agricultural Education*,

- Kearney, C., & Graczyk, A. (2014). A Response to Intervention Model to Promote School Attendance and Decrease School Absenteeism. *Child & Youth Care Forum*, 43(1), 1-25. <https://doi-org.ezproxy.uky.edu/10.1007/s10566-013-9222-1>
- Kleihauer, S., Stephens, C., Hart, W. E., & Stripling, C. T. (2013). How six women deans of agriculture have attained their leadership role: a qualitative study. *Journal of Agricultural Education*, 54(3), 15-27. <https://doi.org/10.5032/jae.2013.03015>
- Klein, S., Lee, J., McKinsey, P., & Archer, C. (2014). *Identifying US K-12 public schools with deliberate sex segregation*. Feminist Majority Foundation.
- Legewie, J., & DiPrete, T. A. (2012). School context and the gender gap in educational achievement. *American Sociological Review*, 77(3), 463-485. <https://doi.org/10.1177/0003122412440802>
- Lopez, N. (2003). *Hopeful girls, troubled boys: Race and gender disparity in urban education*. Routledge.
- Martin, W. E., & Bridgmon, K. D. (2012). *Quantitative and statistical research methods: From hypothesis to results* (Vol. 42). John Wiley & Sons.
- McClelland, M. (2018). Self-regulation. In Halfon, N., Forrest, C. B., Lerner, R. M., & Fuastman, E. M. (Eds.). *Handbook of life course health development* (pp. 275-298). Springer International Publishing.
- Mittleman, J. (2022). Intersecting the Academic Gender Gap: The Education of Lesbian, Gay, and Bisexual America. *American Sociological Review*, 87(2), 303-335. <https://doi.org/10.1177/00031224221075776>
- Morris, E. M. (2008). "Rednecks," "ruttlers," and 'rithmetic: Social class, masculinity, and schooling in a rural context. *Gender and Society*, 22(6), 728-751.
- Murdock-Perriera, L. A., & Sedlacek, Q. C. (2018). Questioning Pygmalion in the twenty-first century: The formation, transmission, and attributional influence of teacher expectancies. *Social Psychology of Education*, 21(3), 691-707. <https://doi.org/10.1007/s11218-018-9439-9>
- Newsome-Stewart, M. & Sutphin D. H. (1994). How tenth grade students perceive agriculture and environmental science: Comparison by gender and ethnicity. *Journal of Agricultural Education*, 35(3), 50-56. <https://doi.org/10.5032/jae.1994.03050>
- Pahlke, E., Hyde, J. S., & Allison, C. M. (2014). The effects of single-sex compared with coeducational schooling on students' performance and attitudes: A meta-analysis. *Psychological Bulletin*, 140(4), 1042. <https://doi.org/10.1037/a0035740>
- Ricketts, J. C., Osborne, E. W., & Rudd, R. D. (2004). Female leadership in rural Florida FFA chapters. *Journal of Agricultural Education*, 45(1), 42-53.
- Roberts, T. G., Harder, A., & Brashears, M. T. (Eds). (2016). *American association for agricultural education national research agenda: 2016-2020*. Department of Agricultural Education and Communication.

- Rosch, D., Simonsen, J. C. & Velez, J. J. (2015). Examining year-long leadership gains in FFA members by prior FFA involvement, class year and gender. *Journal of Agricultural Education*, 56(3), 227-241. <https://doi.org/10.5032/jae.2015.03227>
- Rosenthal, R., & Jacobson, L. (1968). Pygmalion in the classroom. *The Urban Review*, 3(1), 16-20.
- Rosenthal, R. (1972). Pygmalion revisited, revisited: On a loud and careless call for caution. *Interchange*, 3(1), 86-91.
- Rosenthal, R. (2002). The pygmalion effect and its mediating mechanisms. In J. Aronson (Ed.), *Improving academic achievement* (pp. 25-35). Academic Press.
- Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Houghton Mifflin.
- Steiner, P. M., Wroblewski, A., & Cook, T. D. (2009). Randomized experiments and quasi-experimental designs in educational research. In Ryan, K. E. & Cousins, J. B. (Eds.), *The SAGW international handbook of educational evaluation* (pp. 75-96). SAGE Publications, Inc.
- Sutphin, H. D., Newsom-Stewart, M. (1995). Student's rationale for selection of agriculturally related courses in high school by gender and ethnicity. *Journal of Agricultural Education*, 36(2), 54-61. <https://doi.org/10.5032/jae.1995.02054>
- Van Duzer, E. (2006). Gender bias in prediction of boys' academic failure. *Action in Teacher Education*, 28, 94-98.
- Velez, J. J., Lambert, M. D., & Elliott K. M. (2015). Perceptions of critical thinking, task value, autonomy, and science lab self-efficacy: A longitudinal examination of students' CASE experience. *Journal of Agricultural Education*, 56(2), 204-216. <https://doi.org/10.5032/jae.2015.02204>
- Vincent, S. K., Kirby, A. T., Deeds, J. P., & Faulkner, P. E. (2014). The evaluation of multicultural teaching concerns among pre-service teachers in the South. *Journal of Agricultural Education*, 55(1), 152-166. <https://doi:10.5032/jae.2014.01152>