Enhancing Self Efficacy in the Hispanic High School Biology Student: Getting Students to Believe in Their Ability to Master Science Curriculum

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Abstract

Many high school Hispanic students display passivity and a lack of confidence with regards to their abilities to master science curriculum, setting them up for failure with both current course grades and future success in a healthcare field. The purpose of this study is to determine more effective techniques a high school biology teacher could use to eliminate passivity and establish self confidence in Hispanic student's abilities to master science curriculum. Literature overwhelmingly suggests that incorporating Hispanic culture into the science curriculum and having more cooperative learning activities in class will help to improve the confidence of Hispanic students. Experimental data gathered during this study has indicated that students become most confident in an area when they are learning in a learning environment where they are working with peers and getting a lot of teacher support.

Chapter 1 Introduction

I teach biology at a small charter high school in Northern California. Our population of 400 students is 90% Hispanic, 75% free or reduced lunch, and 95% ELL. The majority of our students will be the first in their family to graduate from high school and go on to attend a four year university.

Many students have ambitious dreams of going on to become various professionals in science and healthcare fields including: nurses, pediatricians, surgeons, obstetricians, engineers, and scientists. Over the past two years, I have observed the majority of Hispanic students are immediately convinced that science is too challenging for them to grasp. Rather than having faith in their ability to struggle and eventually arrive at a solution, students immediately give up at their first difficult encounter. "I don't get it," is a commonplace phrase in my classes. When I ask the students what part of the problem or question they don't understand, their usual response is, "Any of it." Students exhibiting these behaviors sit there helpless in their seats with their hands raised, eagerly waiting for their knowledgeable teacher to spoon-feed them the answer. This mentality and behavior is setting them up for failure, both through negatively impacting present course grades and destroying potential future success in their respective chosen careers.

Student’s passivity and lack of self confidence towards science is quite the enigma. Does it result from environmental factors passed down from previous generations? The majority of our Hispanic students are attaining higher levels of education than other family members. This lack of education in their families could instill an intimidation factor towards science. Is this lack of confidence indirectly conveyed to students beginning in elementary school? The focus in elementary school is mastering California State Content Standards in language arts and mathematics. Language arts is more emphasized for ELL, while science is thrown by the

wayside. ELL are nurtured and "babied" more so than other students because they are learning both the English language and science content. Do Hispanic students come to expect this babying throughout their educational careers? What strategies can teachers use to push through this heap of passivity and lack of confidence in Hispanic student's science education? I am striving to answer all these questions through my research.

Statement of Problem

Many Hispanic students display passivity and a lack of confidence in their abilities to master science curriculum. This is setting them up for failure with both current course grades and future success in a healthcare or scientific field. With increasing numbers of Hispanic immigrants entering the United States each year and the Baby-boomer population entering retirement, having a bilingual healthcare and scientific workforce is more important than ever.

Purpose Statement

The purpose of this study is to identify effective techniques a high school biology teacher could use to eliminate passivity and establish self confidence in Hispanic students' abilities to master science curriculum. Hispanic students studying biology will significantly improve academically from determining these techniques. Student's increased self efficacy will pave the way for future generations of students to pursue careers in various healthcare and scientific fields with confidence.

Research Question

What are effective techniques a high school biology teacher can use to eliminate passivity and establish self confidence in their Hispanic student's abilities to master science curriculum? Where does this lack of self efficacy originate?

Theoretical Rationale

Bandura's Social Cognitive Learning Theory (Bandura, 1977) also known as Self Efficacy Theory, is the key theory behind my research question. This theory states people will be more likely to achieve at their perceived level of attainment rather than their actual level of attainment. Students who believe they are capable of achieving at a higher level will be more motivated to succeed than those who do not. According to Artino (2006), "Much of the research suggests that students' perceptions of competence may more accurately predict their motivation and future academic choices than actual competence" (p. 236). Research indicates many Hispanic students may not believe they are capable of mastering science, causing them to not want to try. The human condition is to protect oneself from failure, and if a student believes failure is inevitable, then why bother?

Assumptions

The majority of my students come from homes where their parents never graduated from high school. This makes it unlikely they have relatives who have gone into their desired healthcare fields. Spanish is the primary language spoken in many of my student's homes. Since their parents never graduated from high school and have difficulty understanding English, they are not able to help their children with their biology homework. Growing up as an ELL student,

elementary and middle school teachers over nurtured these students, positively reinforcing the passivity observed in high school. Having come from such an impoverished background, these students do not feel confident in their abilities to master science curriculum.

Background and Need

Mbamalu (2001) discusses a two year study that was completed to determine the essential reasons behind minority student's performance in science courses. Through this study, four reasons behind minority student's poor performance in science courses were found. These were as follows:

1. A general lack of background knowledge in science
2. Verbal skill deficiencies
3. Difficulty making connections between various scientific concepts
4. Inability to relate scientific concepts to real-life experiences.

A remedy for addressing each reason was found through the Transitional Strategy model. This model emphasizes enabling students to make broader connections between scientific concepts and the real world. Its aim is to increase student self efficacy in science. Solutions to each of the reasons stated above were found:

1. Develop each subject linearly as a transition from simple to complex with the same topic rather than teaching by chapters
2. Design language of instruction to reflect student's linguistic development
3. Allow for slowness in developmental process because construction of knowledge occurs at different rates for each student
4. Recognize intelligence as a whole thinking process rather than a set of skills.

Mbamalu (2001) found low confidence in minority student's scientific abilities is attributed to consistently poor performance in science in both elementary and middle school and teachers holding subconscious stereotypical beliefs that minority students are incapable of mastering science.

Chapter 2 Review of the Literature

Introduction

The literature addresses issues related to the connections between self efficacy, behavior, and socioeconomic status. Overwhelming, research has shown that inquiry based, hands-on cooperative learning activities that include Hispanic cultural references are the most effective science instructional method for Hispanic students.

Historical Context

Alfred Bandura (1977) conducted a landmark study to determine the relationship between self efficacy and behavioral changes. This study led to the establishment of Self-Efficacy Theory or Social-Cognitive Theory. Bandura hypothesized that, "Expectations of personal efficacy are derived from four principle sources of information: performance accomplishments, vicarious experience, verbal persuasion, and physiological states" (Bandura, 1977, p. 205). "Individuals with significant phobias were divided into three groups. Each group received a different treatment, either participant modeling, modeling alone, or no treatment" (Bandura, 1977, p. 205). Results showed a direct correlation between behavioral changes and self efficacy. "Subjects in the participant modeling group attained the highest self efficacy scores, while those in the no treatment group had the lowest scores" (Bandura, 1977, p. 206). This study demonstrates how important it is for students to participate in hands-on activities. Students who directly participate in the learning process are more likely to believe they can master the concepts.

Schunk (1987) conducted research on the relationship between Self Efficacy Theory and cognitive achievement in students. He expanded on Bandura's Self-Efficacy Theory. Schunk

(1987) observed that students with higher self efficacy for a particular subject had higher levels of resilience than those with lower self efficacy. When students encountered a challenging problem, those with higher self efficacy levels had a greater tendency to persevere and continue trying to solve the problem, whereas those with lower self efficacy gave up quickly. This indicates how low many Hispanic student's levels of self efficacy are in relation to science when they enter high school biology. Due to the baggage from earlier years of failure, these students are immediately convinced that they are incapable of comprehending science at a high level and give up at the first sign of difficulty. Their resilience for science is extremely low.

Boardman and Robert (2000) studied the relationship between neighborhood socioeconomic status and self efficacy. Data collected confirmed their hypothesis that individuals residing in neighborhoods of a lower socioeconomic status have whole lower self efficacy than individuals residing in higher socioeconomic status neighborhoods.

Boardman et. al. (2000) also found that individual self efficacy was more related to the socioeconomic status of the neighborhood than the individual. This is due to the resources coming in and out of neighborhoods, as well as the social networks in those neighborhoods reinforcing the low self efficacy mentality. This indicates that the neighborhood a student comes from can play a very important role in how that student feels about their capabilities with science.

Review of Previous Research

Hispanic Students

Abi-Nader (1990) studied what characterizes a successful college prep program for Hispanic students. He found successful college prep programs for Hispanic students motivated

students to: “Create a vision of the future, redefine their image of self, and create a supportive community” (Abi-Nader, 1990, p. 41). For creating a vision of the future, many Hispanic students have the desire to go to college, but lack the social capital to get there. Having presentations where alumni from a college prep high school who have gone on to college come back and speak to current high school students, has been found to be very beneficial. It gives the current high school students the belief that they can also succeed in college. Teachers discussing examples of previous students who have gone on to succeed in college and educating students in various study skills for succeeding in college, such as note-taking, reading, and writing also helps to instill a vision for the future in Hispanic students (Abi-Nader, 1990).

For redefining their image of self, many Hispanic students feel like they are incapable of succeeding in college because of mainstream cultural stereotypes applied to Hispanics. Teachers having high expectations for their students has been found to be beneficial**.** Abi-Nadar (1990) describes an example of an effective teacher as, “He emphasizes daily attendance, meeting deadlines, completing assignments, being independent, and pursuing opportunities for community service and leadership” (p. 52). Teachers having a more personal relationship with their students also help the students to truly believe their teachers care about them and want them to succeed.

Creating a supportive community begins with creating a feeling of family in both the classroom setting and throughout the school. This has proven to be very helpful, since family is such a huge part of Hispanic culture. “Traits that characterize family structure, such as: acceptance, mutual support, and self preservation or regeneration have been found to be very helpful” (Abi-Nader, 1990, p. 54).

Crosnoe (2005) completed a study to research the key contributions to Hispanic student success and downfall. He found two dimensions of schooling are important contributions to Hispanic student success. The first dimension is the "academic side of schooling, tapped here by graded achievement" (Crosnoe, 2005, p. 563). The second dimension is "the social-psychological side of schooling, tapped here by various indicators of school participation (school attainment, educational engagement, and extracurricular participation)" (Crosnoe, 2005, p. 563). Crosnoe discovered the second dimension is equally as important as the first dimension. How much a student likes school and how strongly connected they feel to their school are going to determine their success academically in school, and ultimately their future educational/career paths.

Crosnoe (2005) found the achievement levels of Hispanic students were highest at small, private schools with some Hispanic teachers and at schools with a high percentage of Hispanic students. Crosnoe discovered that schools that had high, attainable expectations for their students produced high achieving Hispanic students. Having unrealistic expectations actually had a detrimental effect on Hispanic student performance (Crosnoe, 2005). Crosnoe also found the Hispanic students who displayed the lowest levels of achievement and school orientation were third generation, U.S. born students who were more assimilated into mainstream U.S. culture (Crosnoe, 2005). "Hispanic students who performed the highest academically and had the highest school orientation were Hispanic students who were first generation, not born in the U.S. and less assimilated into mainstream U.S. culture" (Crosnoe, 2005, p. 582).

Science Instruction for ELL

Johnson and Kean (1992) studied methods science teachers could use to improve instruction and student achievement in classrooms with predominately minority students. Two, 17 day workshops were completed between the summers of 1989 and 1990. Follow up activities to assess the workshop's effectiveness in preparing science teachers to more effectively educate minority students were also conducted.

The three major themes of these workshops were: Multicultural Understanding, Problem Solving, and Cooperative Learning (Johnson & Kean, 1992, p. 278-279). The Multicultural Understanding theme of these workshops consisted of the following principles: "All students are capable of learning science, reducing the amount of "teacher talk," becoming aware of both the teacher's learning styles and the student's learning styles, integrating more multicultural awareness throughout the curriculum, including more social issues in the curriculum, and utilizing community resources more frequently in science education" (Johnson & Kean, 1992, p. 278-279).

During the two workshops, teachers created units throughout the school year that utilized each theme. The group as a whole critiqued the units. After participation in these workshops, teachers noted throughout the school year that discipline issues decreased and positive interactions among teachers and students increased. There was an increase in the number of cooperative inquiry based learning activities that took place during class time. Curriculum became less about memorization and more conceptual in nature. Teachers began collecting surveys periodically from their students assessing the effectiveness of various instructional strategies. Consistent student feedback is key in helping teachers improve their instruction.

Lee and Fradd (1998) studied effective techniques science teachers can use to help students of all language backgrounds learn science. They discovered there are various components of science learning students must acquire in their pursuit of scientific knowledge.

These components are divided into two broad categories: Scientific Knowledge and Scientific Habits of Mind. Within Scientific Knowledge are three smaller subgroups: knowing science, doing science, and talking science. Within Scientific Habits of Mind are two smaller subgroups: scientific values and attitudes; and scientific worldview (Lee & Fradd, 1998). In order for effective science learning to occur for ELL, the connection needs to be made between "the nature and practice of science with the language and cultural experiences of NELB students" (Lee & Fradd, 1998, p. 15). Lee and Fradd discuss the important of recognizing that students who share the same cultural background do not necessarily share the same experiences. ELL are having to develop literacy skills and proficiency in English while learning science at the same time.

Knowing science involves incorporating student background knowledge with new knowledge to formulate a complete learning process. Doing science involves developing scientific inquiry skills. This may be difficult for Hispanic students because their cultural background greatly respects authority. These students are more accustomed to directly following a teacher's directions rather than formulating questions on their own (Lee & Fradd, 1998).

Talking science involves developing literacy in science. This can be especially difficult for students coming into school with little or no previous formal schooling, and/or students from more oral language backgrounds. Instruction involving more oral discourse techniques and pictoral representations has been found to be beneficial to students from these backgrounds (Lee & Fradd, 1998).

Acquiring scientific attitudes and values can be very difficult for students from non-Western cultural backgrounds, where cooperation and harmony, rather than questioning authority and working independently, are emphasized. Scientific attitudes and values have been widely developed from the Western world (Lee & Fradd, 1998).

Incorporating both the mainstream US culture and the cultural perspectives of minority student's views towards science can help bridge the gap between the two cultures (Lee & Fradd, 1998). Acquiring scientific worldviews involves learning to explain how the natural world functions. This can be especially difficult for students from different backgrounds, since their culture may have alternate explanations for the natural world. These explanations may take on a more personal, social, and supernatural context (Lee & Fradd, 1998). "Cultivation of the scientific worldview, while recognizing and respecting alternative worldviews, requires a great deal of consideration and sensitivity for both teachers and students" (Lee & Fradd, 1998, p. 18).

The National Science Teachers Association (NSTA) discusses in their position statement (2011), *Science for English Language Learners*, how every student deserves to have access to a high quality science education. Components of this high quality science education include beginning with more structured inquiry based activities and then gradually moving into more open-ended inquiry activities, connecting student's experiences to the curriculum, building on student's prior knowledge, integrating literacy skills into the curriculum, and should be understanding and respectful of cultural and linguistic differences among students from various ethnic backgrounds (NSTA, 2011).

Hispanic Student Attainment of Advanced Science Degrees

Young (2005) conducted research on the leak in the scientific educational pipeline at the secondary level. This is preventing African and Hispanic American students from completing bachelor degrees in scientific fields. “Disparity among racial and ethnic groups in secondary education systemic factors, such as teacher quality, course taking, school funding, and expenditures on instructional resources, are considered key contributors to the leak in the science education pipeline” (Young, 2005, p. 206).

African American and Hispanic American students are more likely to have less exposure to more rigorous science instruction at the high school level and are suffering in college as a result. Minority students with access to higher level classes are not enrolling in them in high numbers. Young found that “African American and Hispanic American students were less likely to have taken more than five semesters of science” (Young, 2005, p. 208).

The number one factor for students not enrolling in more advanced science classes is because current instructional methods in high school science fail to connect the content to the student’s lives. This causes students to get bored of science and not desire to continue studying science academically. Also, many minority students attend urban schools with very high rates of teacher turnover. Many students in these settings are ELL’s and lower achieving students. Teachers in these settings need to be trained and equipped with the proper resources to ensure that minority students are receiving a scientific education tailored to their needs (Young, 2005).

Special Collections

Reyes, Scribner & Scribner (1999) discuss many valid reasons why particular Hispanic schools are so successful. They propose a learning community organized around four different dimensions: collaborative governance and leadership, community and family involvement, culturally-responsive pedagogy, and advocacy oriented assessment and quality control.

Relating to the first dimension, Collaborative Governance and Leadership, high performing Hispanic schools were found to have leadership at all levels. A strong sense of collaboration and community was found in these schools. A strong belief existed that all children are capable of learning and that it is up to the teachers and administration to work together to ensure high student achievement. These schools have a strong mission shared by all community members and progressive teaching methods are encouraged. These schools place a strong sense of responsibility on themselves to make sure that every student receives the resources and support they need to achieve at their highest potential.

Relating to the second dimension, Community and Family Involvement, the importance of parental involvement in the school is stressed. Creating a warm environment where parents feel welcome into the school is crucial for establishing this contact. The school needs to reach out and initiate contact with parents. Successful Hispanic schools also recognize and appreciate the importance of preserving Hispanic cultural values.

Relating to the third dimension, Culturally-Responsive Pedagogy, a common belief exists among teachers at high performing Hispanic schools that all students can succeed. A great value is placed on the child's first language and cultural background. Three learning strategies were found to be most effective for educating Hispanic students. These were as follows, "1). An emphasis was placed on meaning and understanding, 2). Mathematical skills were embedded in

context, and 3). Connections were made between subject areas and between school and life outside of school" (Reyes et. al., 1999, p. 5).

Relating to the fourth dimension, Advocacy Oriented Assessment, it was "found that best assessment practices take into consideration the entire learning environment, the effectiveness of instruction, and the availability of resources and strategies needed to remedy student's learning difficulties" (Reyes et. al., 1999, p. 16). Alternative forms of assessment, in addition to the state mandated standardized testing, were used in high performing Hispanic schools. These included: "portfolio assessment, curriculum-based assessment, whole language instruction, informal reading inventories, and informal procedures for assessing weaknesses and competencies in writing and spelling" (Reyes et. al., 1999, p. 16).

Administrative Records

The Science Framework for California Public Schools discusses several strategies that are recommended for effective science instruction to English Language Learners. Above all, the predominant focus is that instruction is designed so all students have access to the science curriculum and are able to experience academic success.

An importance is placed on developing scientific literacy for English Language Learners. "It includes direct instruction and experiences for students in English phonology, morphology, syntax, and semantics, and it must support students as they move towards proficiency in the academic language of science" (California Department of Education [CDE], 2004, p. 289). Many words have meanings different in science than in outside fields. This creates a lot of confusion for ELL, so teachers from all content areas need to work on building vocabulary. Scientific vocabulary needs to be frontloaded at the beginning of each lesson so students can begin to

become acquainted with the new terminology. Students also need to develop an understanding of the meanings of Greek and Latin prefixes, roots, and suffixes, since these are frequently used in vocabulary terminology throughout the scientific curriculum (CDE, 2004).

Statistical Information

California Department of Education (2004) conducted a census on student ethnicity during the 2008-2009 fiscal year. It was found that 49% of all students enrolled in California schools are Hispanic. 24.2% of students enrolled in California schools are English Language Learners. In 2007-2008, grades nine through twelve enrollment for Hispanic students in California was 913,059. The percentage of Hispanic students that dropped out from 2006-2010 was 54,998 or 23.8% of all dropouts in California.

The number of English Language Learners in California reached a peak of 1,599,542 students in 2003 and has decreased to 1,475,988 students in 2010. Out of these 1,475,988 students, 712,961 or 48.3% are classified as being enrolled in structured English immersion curriculum. The breakdown for the various services being provided to English Language Learner students in California during 2010 and the number of students receiving these services are as follows:

Service:	**Number of Students:**	**Percentage of Students:**
EL's Receiving ELD[1] Services	120,637	8.2%
EL's Receiving ELD and SDAIE[2] Services	869,200	58.9%
EL's Receiving ELD and SDAIE with L1[3] Support	297,198	20.1%
EL's Receiving ELD and Academic Subjects Through L1	73,654	4.9%
EL's Receiving Other EL Instructional Services	94,762	6.4%
EL's Receiving No EL Instructional Services	20,537	1.4%

[1]ELD = English Language Development

[2]SDAIE = Specially Designed Academic Instruction in English

[3]L1 = Primary Language

The number of teachers providing various EL services in California during 2010 is variable as well. The breakdown for this data is as follows:

Service:	**Number of Teachers Providing Service:**	**Percentage of Teachers Providing Service:**
Teachers Providing L1 Instruction to EL's.	4,967	2.4%
Teachers Providing SDAIE and ELD Services	137,259	67.2%
Teachers Providing SDAIE Services Only	46,798	22.9%
Teachers Providing ELD Services Only	15,306	7.5%
Total Teachers Providing ELD, SDAIE, or L1 Instruction to EL's	204,280	

CELDT (California English Language Development Test) scores are also an important piece of data. The annual CELDT for California Sophomore high school students whose primary language is Spanish, conducted during the 2009-2010 school year provided the following data:

CELDT Level:	**Number of Students Who Scored at that Level:**	**Percentage of Students Who Scored at that Level:**
Beginning	4,296	7.0%
Early Intermediate	8,445	13.0%
Intermediate	24,142	38.0%
Early Advanced	22,571	36.0%
Advanced	3,912	6.0%

CST (California Standards Test) data from the 2009-2010 school year for California Hispanic students taking the Biology CST. 15% scored Far Below Basic, 16% scored Below Basic, 38% scored Basic, 21% scored Proficient, and 10% scored Advanced. The CST 2009-2010 results for Hispanic Economically Disadvantaged students taking the Biology CST were as follows: 16% Far Below Basic, 17% Below Basic, 39% Basic, 19% Proficient, and 8% Advanced (p. 142).

Interview with an Expert

This study adheres to the ethical standards for participation of human subjects in research, as discussed in the Publication Manual of the American Psychological Association (American Psychological Association, 2009). Additionally the research proposal was reviewed and approved by the Dominican University Institutional Review Board for the Protection of Human Subjects (IRBPHS).

Discussion of Interview

An interview was conducted (anonymous, personal communication, January 7, 2011). She was previously the biology teacher at our school for four years until she moved up to the Assistant Principal position and I took over as the school's biology teacher in 2009. She is definitely an expert in working as a biology educator for Hispanic students. I got the opportunity to ask her

four different questions, each question pertaining to improving self efficacy and eliminating passivity in Hispanic biology students.

The first question asked was as follows: "During your experiences teaching Biology, what have you observed in Hispanic student's confidence levels?" She mentioned that Hispanic student confidence levels in biology were really low at the beginning of the school year, but continuously increased throughout the school year. This could be attributed to student's really low background knowledge on the subject. Due to the high percentage of ELL's in our school district, the focus in the primary grades is on language arts and mathematics. Any background knowledge the students are coming into class with can be credited to the Discovery Channel. Due to the high poverty levels of many Hispanic families, these students do not leave the area very often. Therefore, cable television becomes an educational tool for them.

The second question asked was as follows, "What recommendations would you have for improving Hispanic student confidence levels in biology?" She emphasized the importance of incorporating hands-on activities into the curriculum. She also discussed how it is important to connect the content to anything students are familiar with, such as television and pop culture. Differentiation in the curriculum is key. She stressed that, "If they always feel like they are not successful, they won't feel confident. When you don't feel successful day after day, you zone out." Differentiation in the curriculum gives every student a chance to excel through incorporating everyone's strengths.

The third question asked was as follows, "What recommendations would you have for eliminating passivity in some Hispanic students towards learning biology?" She stressed how essential it is to hold students accountable for their biological education. During group work situations, it is very important to hold everyone accountable. She also suggested a strategy for

calling on students in class using popsicle sticks. This will keep the students on their toes since they never know when they are going to be called on.

The fourth question asked was as follows, "How can primary and secondary teachers work together to improve student confidence in science beginning at a young age and continuing through student's educational experiences? She emphasized the positive effects of collaboration between primary and secondary teachers. Collaboration between grade levels helps the secondary teachers get a sense of the background knowledge students are coming in with and it also gives the primary teachers an idea of what they need to prepare their students for.

Summary

One of the most important methods used to increase Hispanic student confidence is through using various hands-on methods throughout a lesson. It has been discovered that the more confident a student feels in their ability to master subject matter, the more resilience they will have and the more successful they will become. Students who come from areas of lower socioeconomic backgrounds have been found to have less self efficacy. However, individual self efficacy was more related to the socioeconomic status of the neighborhood than it was of the individual. Students achieving academic success were also found to be more oriented to school itself.

Chapter 3 Method

Description of Method

A quantitative research design was used to survey Hispanic high school biology students. A sample of four different biology classes was divided into two groups. The placement of classes in particular groups was determined based on the day the classes met. Three trials were conducted.

Each trial consisted of one lesson taught during March 2011. Each lesson included a laboratory activity as its major focus. Both groups worked in cooperative groups during the course of each lab/activity. Data has repeatedly confirmed from the literature the high effectiveness of students working in groups. Background information was provided to the students before the lab took place. This background information connected to the content the students had taken notes on during the previous lesson. The same laboratory exercise was completed in every class, but instructional methods varied between the two groups.

One group was instructed in a teacher directed method. This involved the teacher explaining the background information about the lab to the students and demonstrating how to perform the lab. As the students worked in groups, the teacher frequently checked in with students. If there was any sort of confusion, the teacher immediately intervened and clearly explained what needed to be done next. There was a significant amount of “hand holding” and “babying” taking place.

The other group was instructed in a student directed method. In this method, students took on a more proactive role in their learning, working in groups cooperatively amongst themselves to obtain a better grasp on the material. The teacher merely gave the lab handout to

the students, showed the students where the lab materials were and said, “Get to work.” The teacher occasionally checked in on student groups and asked them guiding questions to focus their thinking, rather than telling them the answer.

At the end of the lesson, a brief survey was given to all students. This survey consisted of the students writing down their gender and answering three questions. The questions asked were as follows:

1. Following this lesson, I feel confident in my ability to understand the content presented in this lesson
2. I feel confident in my ability to correctly perform the procedure for this activity/lab
3. I feel confident in my ability to correctly answer questions related to this content on a future quiz/test.

The survey forced the students to write down either Strongly Agree, Agree, Neither, Disagree, or Strongly Disagree for each question. The study was repeated two more times with new content and a new laboratory exercise. In trial #2, the groups reversed roles. The group who initially experienced teacher directed instruction now experienced student directed instruction and vice versa. For the third trial, the student switched back to their trial 1 groups.

Surveys were collected and analyzed quantitatively based on the responses students provided for each question. Results were complied based on improved confidence with a specific instructional method. Gender was also factored into the equation.

Sample and Site

The study was conducted at the charter high school I work at in Northern California. The sample consisted of four classes of students taking a basic biology class. The majority of the students in

these classes were Sophomores, with a few Freshmen and Juniors as well. Out of this total student population, 90% of the students are Hispanic, approximately 75% are on the free/reduced lunch program, and 95% are English Language Learners. The total population of 122 students consists of 66 females and 56 males.

Access and Permissions

I notified the principal at our school through both verbally and in writing my intentions with carrying out this study. I assured her that this study would not detract from the content being learned in my classroom and received her approval to carry out the study. Each student that participated in the study is a student in one of my regularly scheduled biology classes. Each student participated in the typical work of the subject matter. The instructional methods were the only difference. Students were aware after the first trial that they were my experimental subjects and that they would be taking two more surveys of the same nature. They were not informed as to the purpose of the experiment, or when the trials would occur, so as to not skew results.

Data Gathering Strategies

A brief survey was given to all students at the end of the lesson. This survey consisted of the students writing down their gender and answering three questions related to their perceived confidence levels in the subject matter. For each question, the students wrote down either: Strongly Agree, Agree, Neither, Disagree, or Strongly Disagree. Surveys were anonymous with respect to the individual student, but not anonymous with respect to their group or gender.

Data Analysis Strategies

Data analysis was conducted quantitatively. The percentages of students in each group who chose “Strongly Agree,” etc for each question was calculated. The data was also analyzed for each question with respect to gender. These percentages were tabulated and graphed. After the conclusion of the study, the mean for the responses for each question was calculated.

Chapter 4 Findings

Description of Site, Individuals, Data

The site for the study was a charter college prep high school in Northern California. Its student population is approximately 400 students. The subjects participating in this study were 122 students within four different periods of biology.

Since I am the only biology teacher at my school, this gave me the unique opportunity to work with every student enrolled in biology during the 2010-2011 school year. The majority of these students were sophomores, with a small percentage of juniors and freshmen.

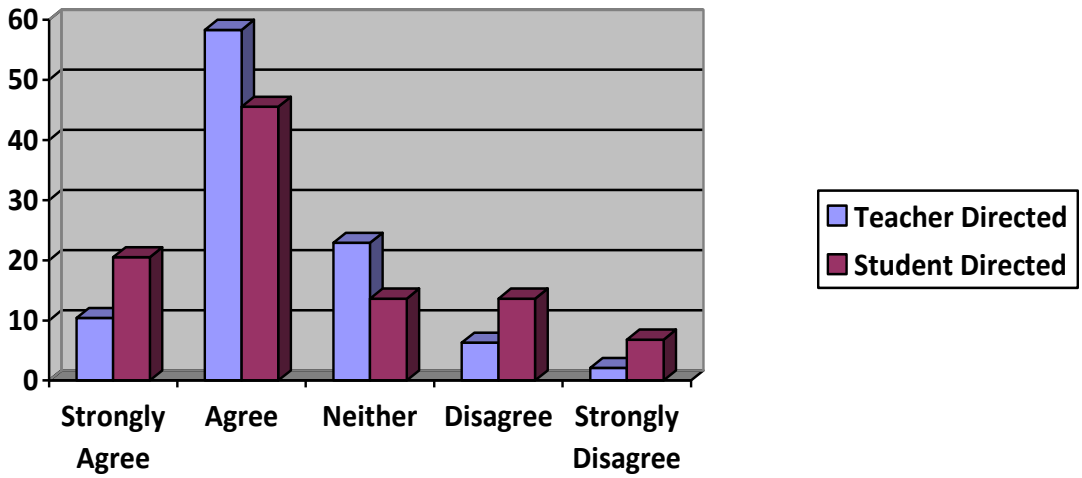
Experiments were completed during March 2011. For each trial, my four biology classes were divided into two different groups. The first group received teacher directed instruction, which meant there was a lot of hand holding and instruction from the teacher's end. The second group received student directed instruction, which involved very little teacher intervention. The first trial involved the Allelic Frequencies and Sickle Cell Anemia Lab. The second trial involved the Beak Adaptations Lab and the third trial involved the Symbiosis Relationships Activity. Quantitative data was collected and analyzed based on student's perceived confidence levels and gender. Results were tabulated for each trial and averaged for each question to get the overall results. Data was graphed for each question on each trial based on all students and gender.

Trial #1 Findings Allelic Frequencies and Sickle Cell Anemia Lab

Question #1: Confidence in Understanding of Content (All)

Instructional Method:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	10.4	58.3	22.9	6.3	2.1	100
Student Directed:	20.5	45.5	13.6	13.6	6.8	100

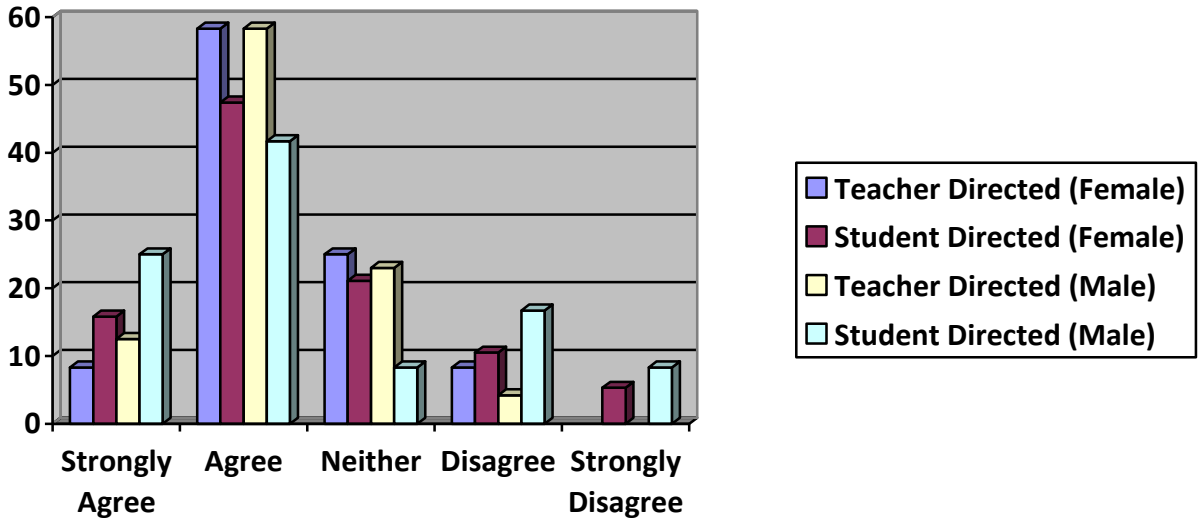
Note: Student responses for each category are listed in percentage.



Question #1: Confidence in Understanding of Content (Gender)

Instructional Method:	Gender:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	Female	8.3	58.3	25.0	8.3	0	100
Student Directed:		15.8	47.4	21.1	10.5	5.3	100
Teacher Directed:	Male	12.5	58.3	23.0	4.2	0	100
Student Directed:		25	41.7	8.3	16.7	8.3	100

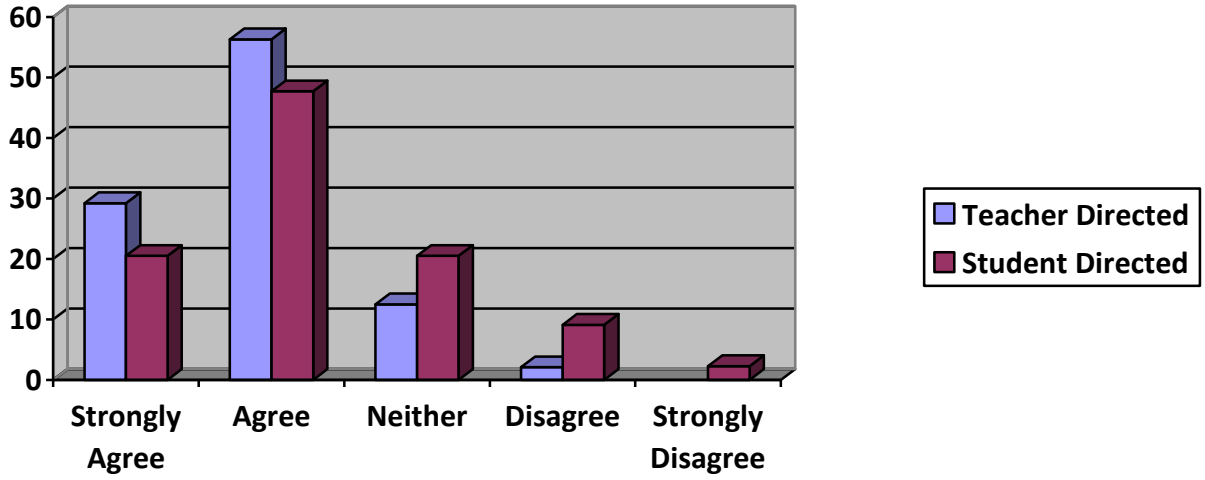
Note: Student responses for each category are listed in percentage.



Question #2: Confidence in Ability to Correctly Perform Activity/Lab (All)

Instructional Method:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	29.2	56.3	12.5	2.1	0	100
Student Directed:	20.5	47.7	20.5	9.1	2.3	100

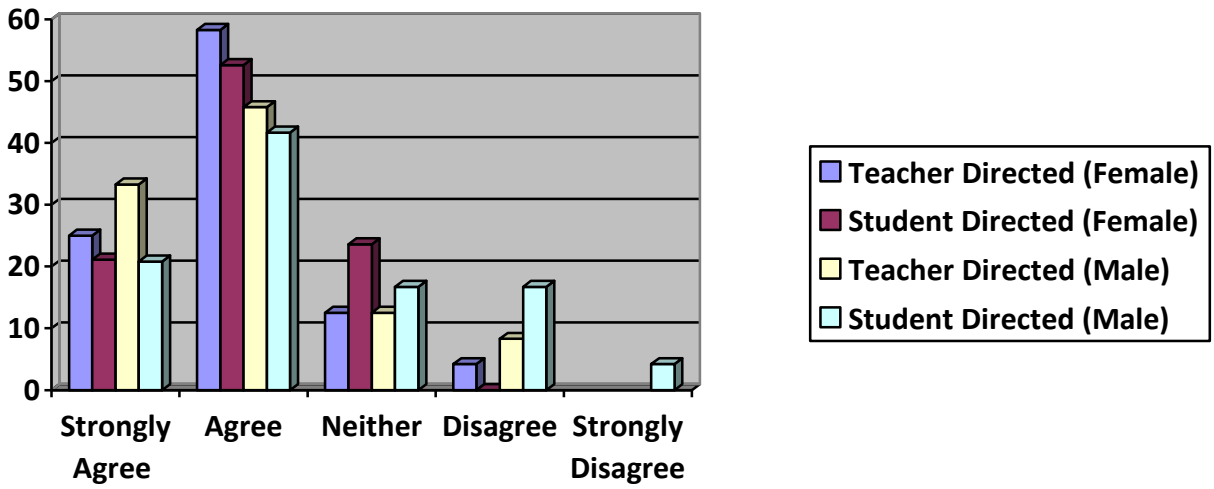
Note: Student responses for each category are listed in percentage.



Question #2: Confidence in Ability to Correctly Perform Activity/Lab (Gender)

Instructional Method:	Gender:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	Female	25.0	58.3	12.5	4.2	0	100
Student Directed:		21.1	52.6	23.6	0	0	100
Teacher Directed:	Male	33.3	45.8	12.5	8.3	0	100
Student Directed:		20.8	41.7	16.7	16.7	4.2	100

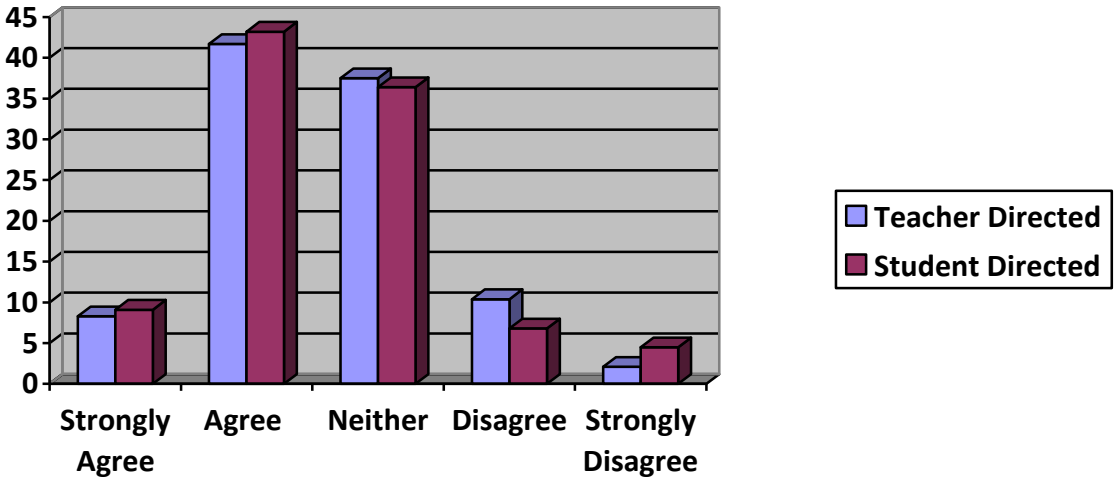
Note: Student responses for each category are listed in percentage.



Question #3: Confidence in Ability to Correctly Answer Test Questions Related to Content (All)

Instructional Method:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	8.3	41.7	37.5	10.4	2.1	100
Student Directed:	9.1	43.2	36.4	6.8	4.5	100

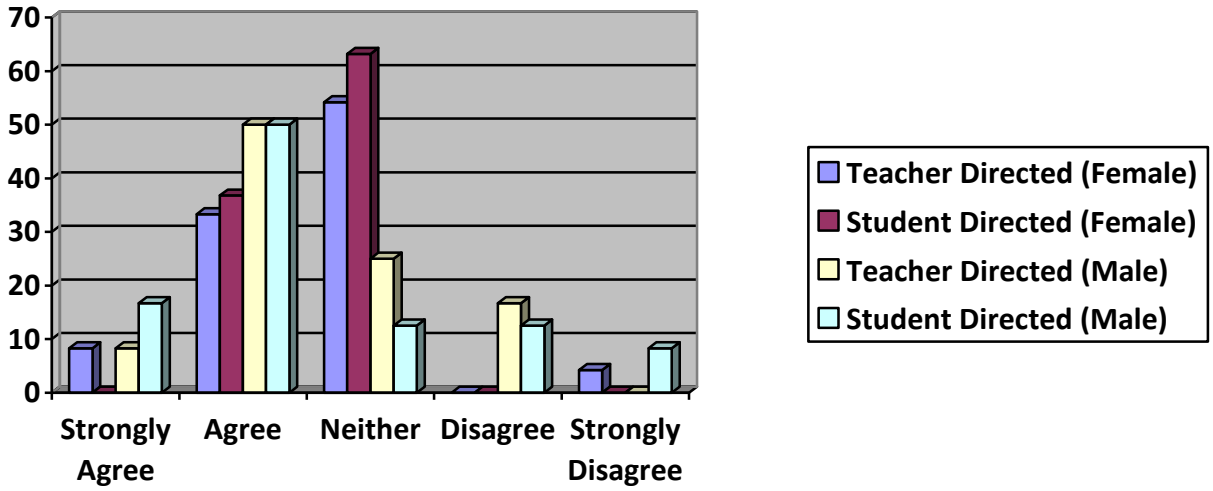
Note: Student responses for each category are listed in percentage.



Question #3: Confidence in Ability to Correctly Answer Test Questions Related to Content (Gender)

Instructional Method:	Gender:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	Female	8.3	33.3	54.2	0	4.2	100
Student Directed:		0	36.8	63.2	0	0	100
Teacher Directed:	Male	8.3	50.0	25.0	16.7	0	100
Student Directed:		16.7	50.0	12.5	12.5	8.3	100

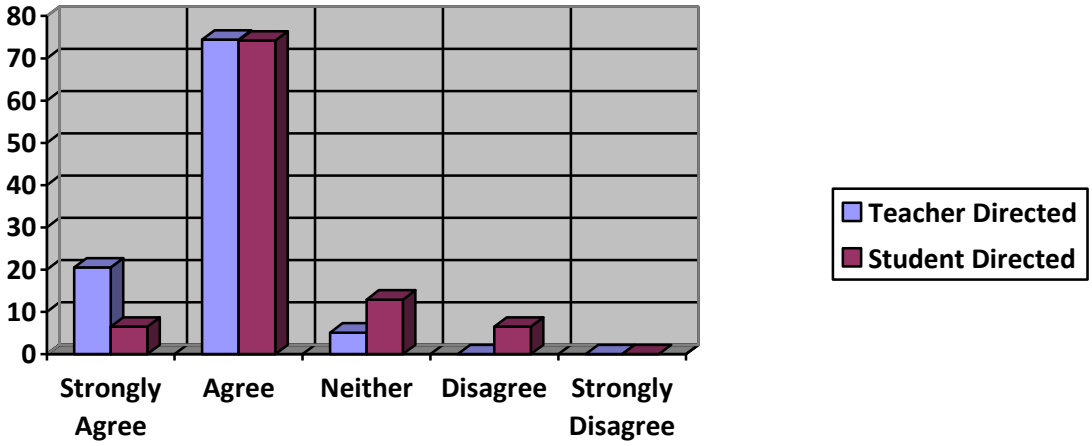
Note: Student responses for each category are listed in percentage.



Trial #2 Findings Beak Adaptations Lab

Question #1: Confidence in Understanding of Content (All)

Instructional Method:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	20.5	74.4	5.1	0	0	100
Student Directed:	6.5	74.2	12.9	6.5	0	100

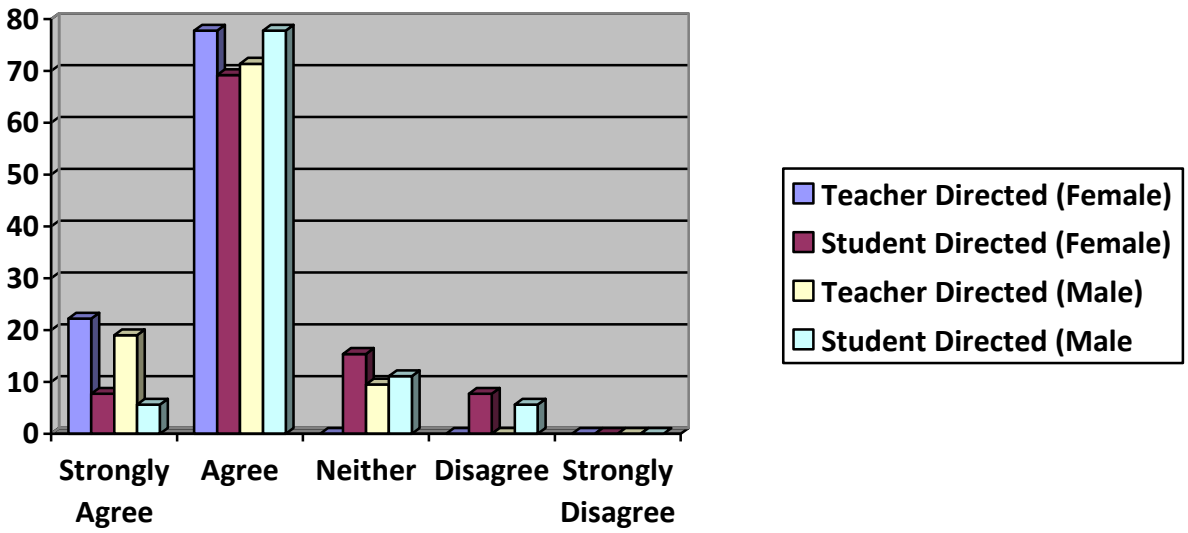


Note: Student responses for each category are listed in percentage.

Question #1: Confidence in Understanding of Content (Gender)

Instructional Method:	Gender:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	Female	22.2	77.8	0	0	0	100
Student Directed:		7.7	69.2	15.4	7.7	0	100
Teacher Directed:	Male	19.0	71.4	9.5	0	0	100
Student Directed:		5.6	77.8	11.1	5.6	0	100

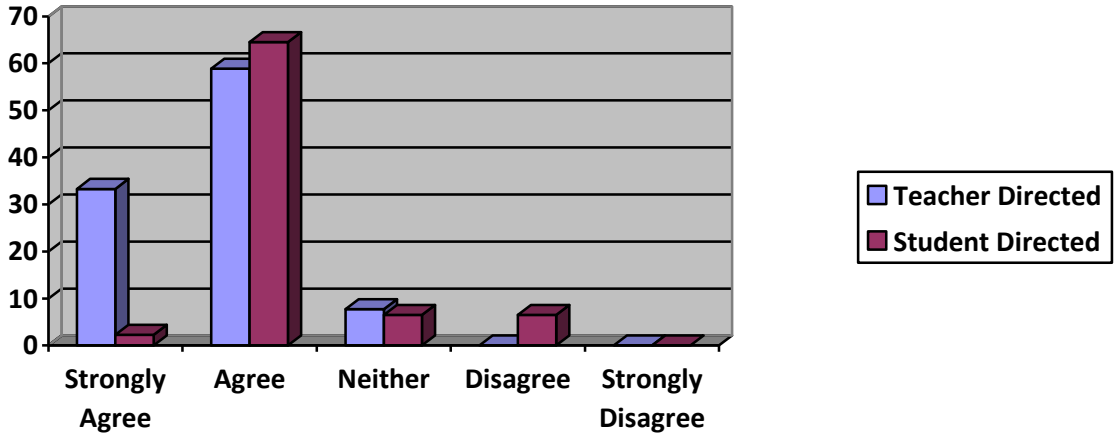
Note: Student responses for each category are listed in percentage.



Question #2: Confidence in Ability to Correctly Perform Activity/Lab (All)

Instructional Method:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	33.3	58.9	7.7	0	0	100
Student Directed:	2.3	64.5	6.5	6.5	0	100

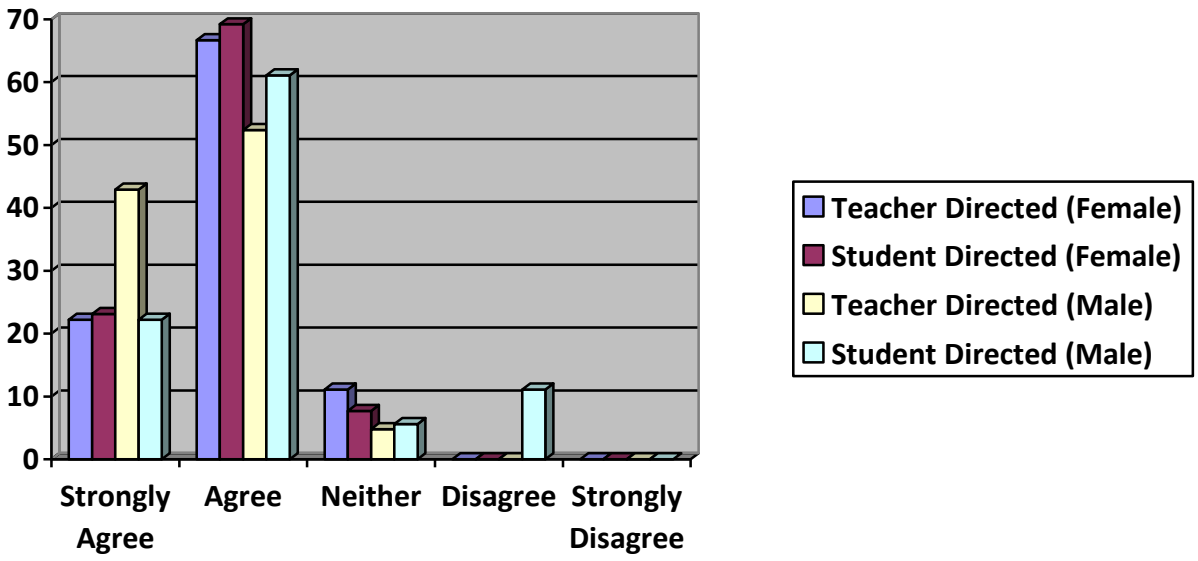
Note: Student responses for each category are listed in percentage.



Question #2: Confidence in Ability to Correctly Perform Activity/Lab (Gender)

Instructional Method:	Gender:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	Female	22.2	66.7	11.1	0	0	100
Student Directed:		23.1	69.2	7.7	0	0	100
Teacher Directed:	Male	42.9	52.4	4.8	0	0	100
Student Directed:		22.2	61.1	5.6	11.1	0	100

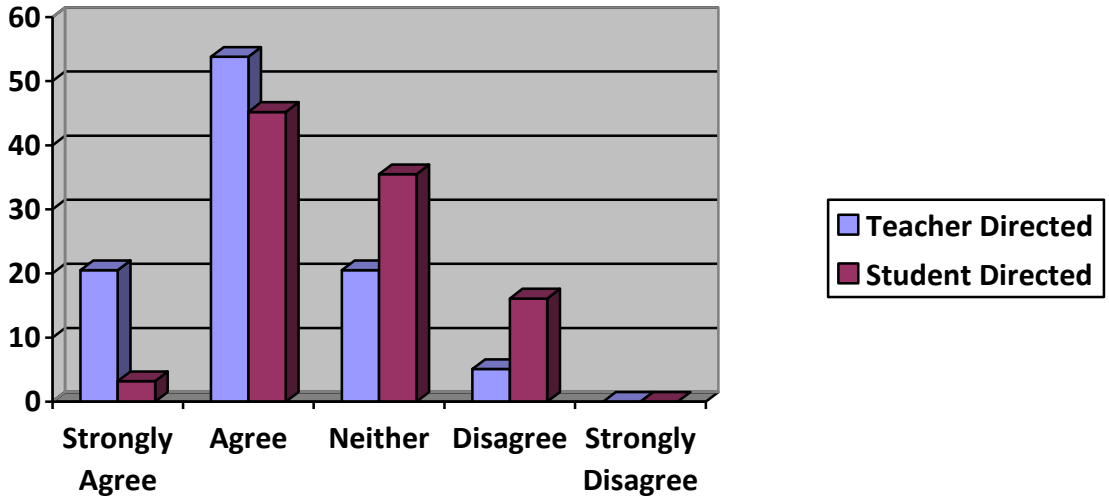
Note: Student responses for each category are listed in percentage.



Question #3: Confidence in Ability to Correctly Answer Test Questions Related to Content (All)

Instructional Method:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	20.5	53.8	20.5	5.1	0	100
Student Directed:	3.2	45.2	35.5	16.1	0	100

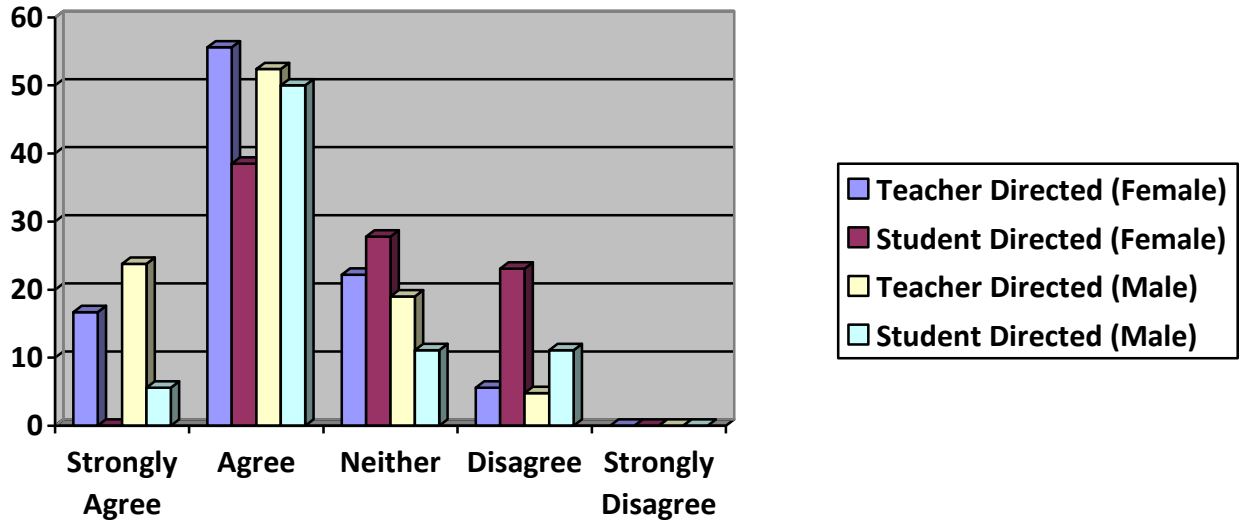
Note: Student responses for each category are listed in percentage.



Question #3: Confidence in Ability to Correctly Answer Test Questions Related to Content (Gender)

Instructional Method:	Gender:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	Female	16.7	55.6	22.2	5.6	0	100
Student Directed:		0	38.5	27.8	23.1	0	100
Teacher Directed:	Male	23.8	52.4	19.0	4.8	0	100
Student Directed:		5.6	50.0	33.3	11.1	0	100

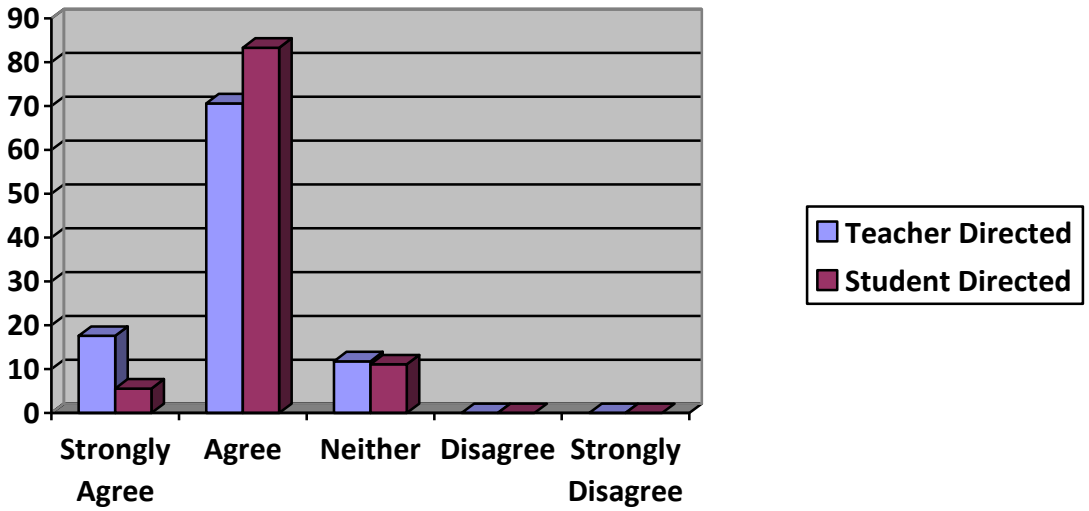
Note: Student responses for each category are listed in percentage.



Trial #3 Findings: Symbiosis Relationships Activity

Question #1: Confidence in Understanding of Content (All)

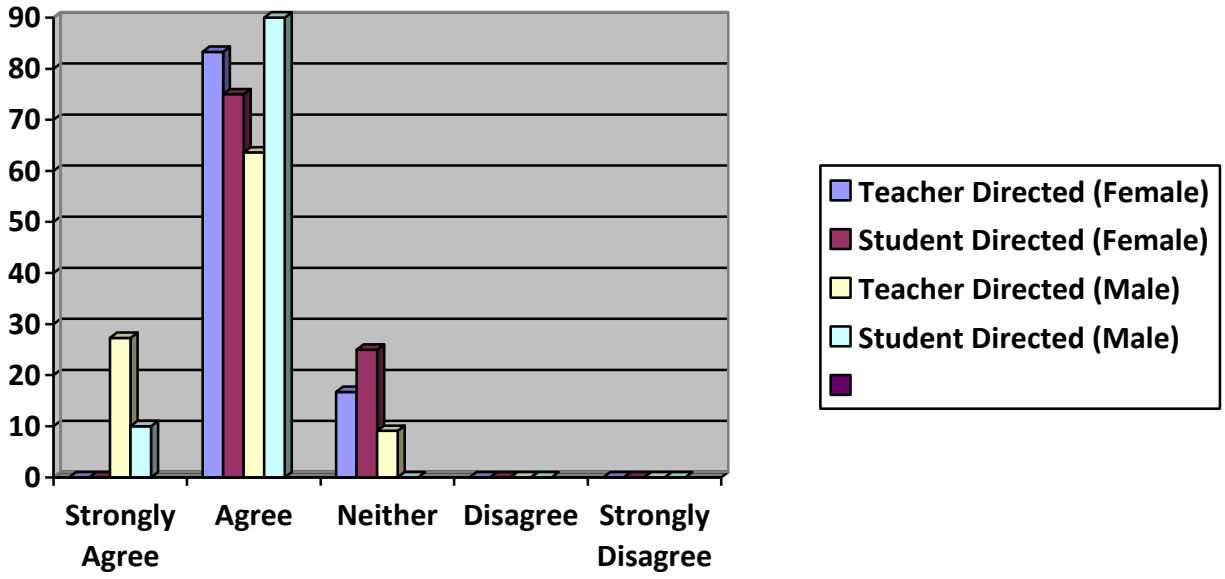
Instructional Method:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	17.6	70.6	11.8	0	0	100
Student Directed:	5.6	83.3	11.1	0	0	100



Note: Student responses for each category are listed in percentage.

Question #1: Confidence in Understanding of Content (Gender)

Instructional Method:	Gender:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	Female	0	83.3	16.7	0	0	100
Student Directed:		0	75.0	25.0	0	0	100
Teacher Directed:	Male	27.3	63.6	9.1	0	0	100
Student Directed:		10.0	90.0	0	0	0	100

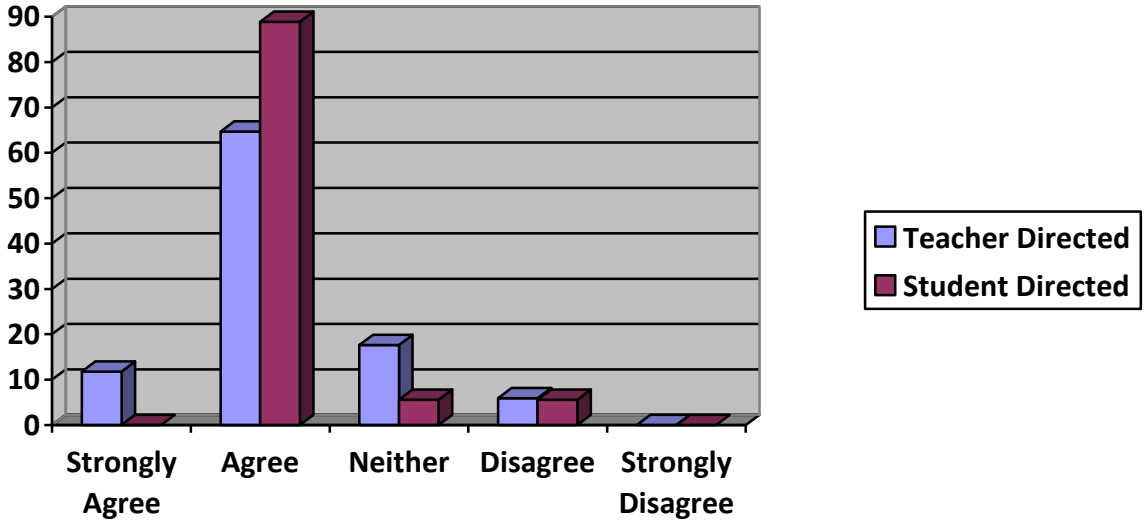


Note: Student responses for each category are listed in percentage.

Question #2: Confidence in Ability to Correctly Perform Activity/Lab (All)

Instructional Method:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	11.8	64.7	17.6	5.9	0	100
Student Directed:	0	88.9	5.6	5.6	0	100

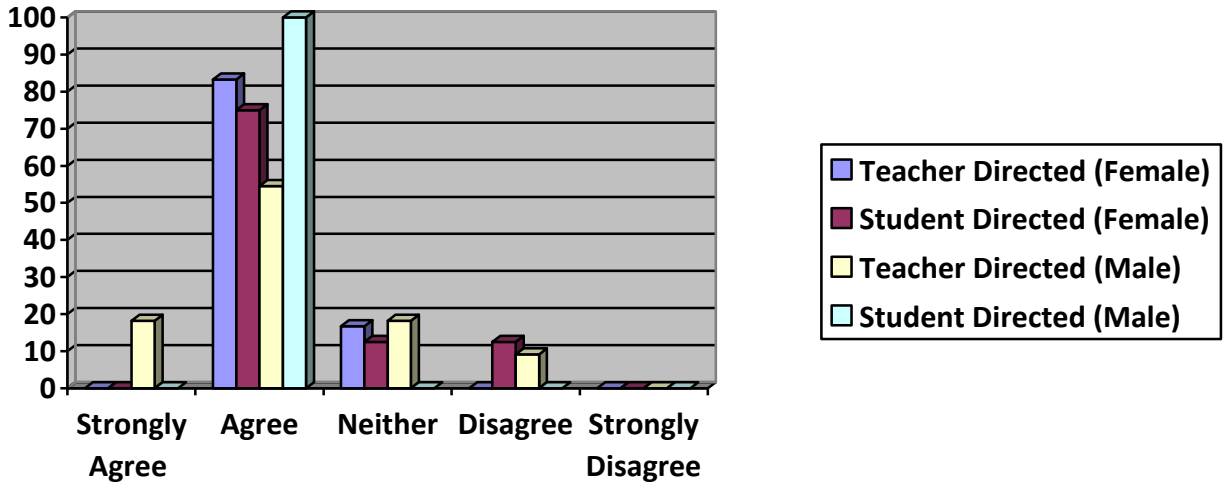
Note: Student responses for each category are listed in percentage.



Question #2: Confidence in Ability to Correctly Perform Activity/Lab (Gender)

Instructional Method:	Gender:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	Female	0	83.3	16.7	0	0	100
Student Directed:		0	75.0	12.5	12.5	0	100
Teacher Directed:	Male	18.2	54.5	18.2	9.1	0	100
Student Directed:		0	100	0	0	0	100

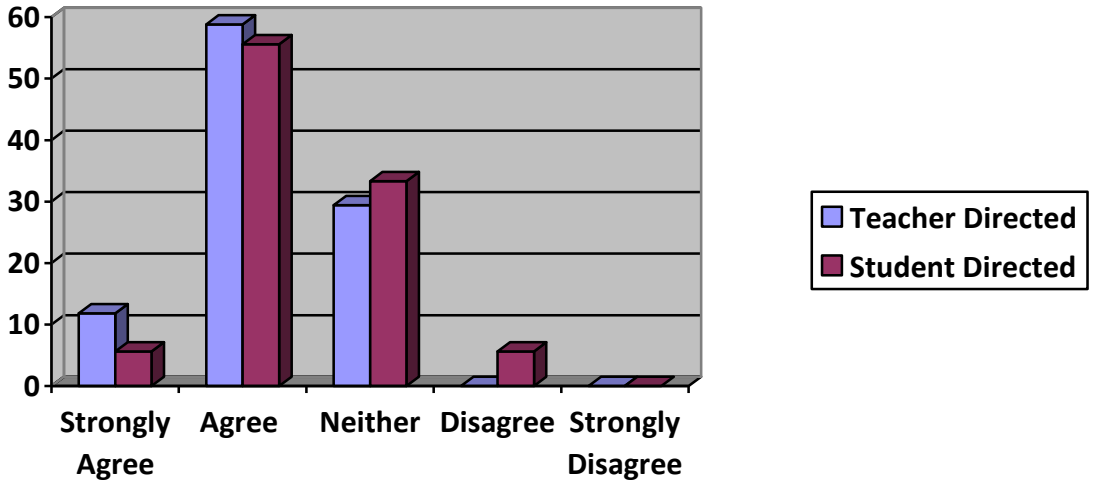
Note: Student responses for each category are listed in percentage.



Question #3: Confidence in Ability to Correctly Answer Test Questions Related to Content (All)

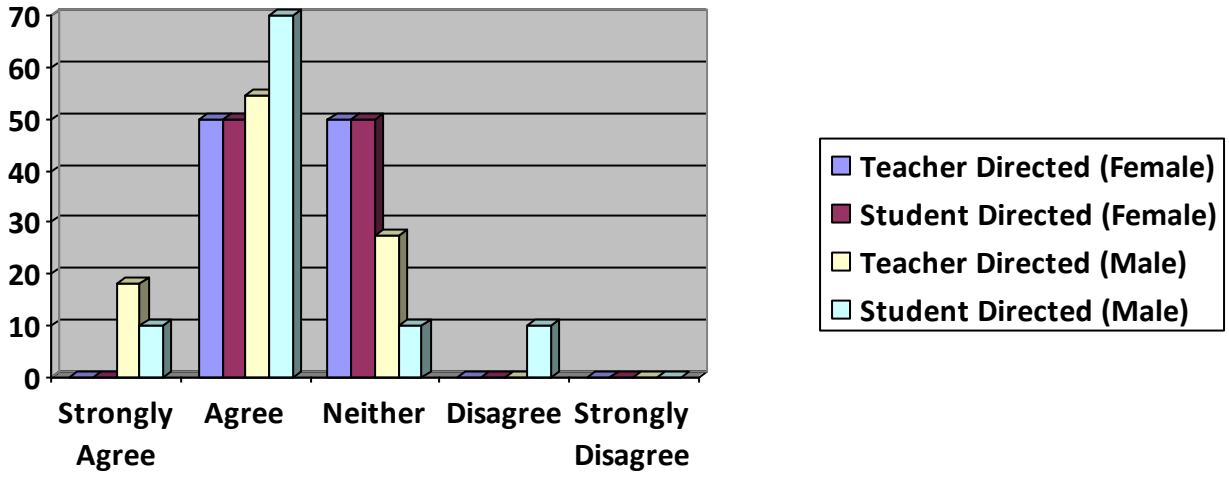
Instructional Method:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	11.8	58.8	29.4	0	0	100
Student Directed:	5.6	55.6	33.3	5.6	0	100

Note: Student responses for each category are listed in percentage.



Question #3: Confidence in Ability to Correctly Answer Test Questions Related to Content (Gender)

Instructional Method:	Gender:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	Female	0	50.0	50.0	0	0	100
Student Directed:		0	50.0	50.0	0	0	100
Teacher Directed:	Male	18.2	54.5	27.3	0	0	100
Student Directed:		10.0	70.0	10.0	10.0	0	100

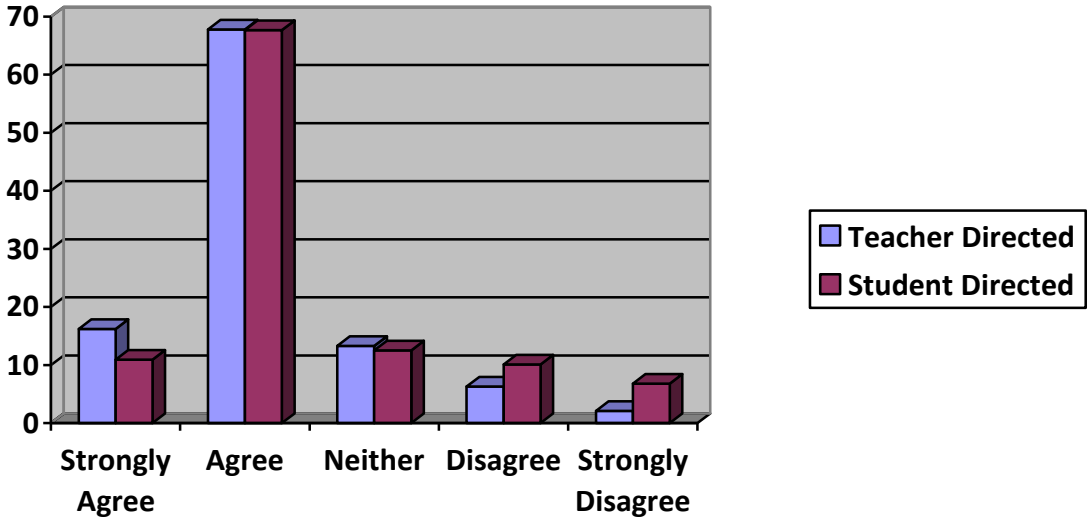


Note: Student responses for each category are listed in percentage.

Overall Findings

Question #1: Confidence in Understanding of Content (All)

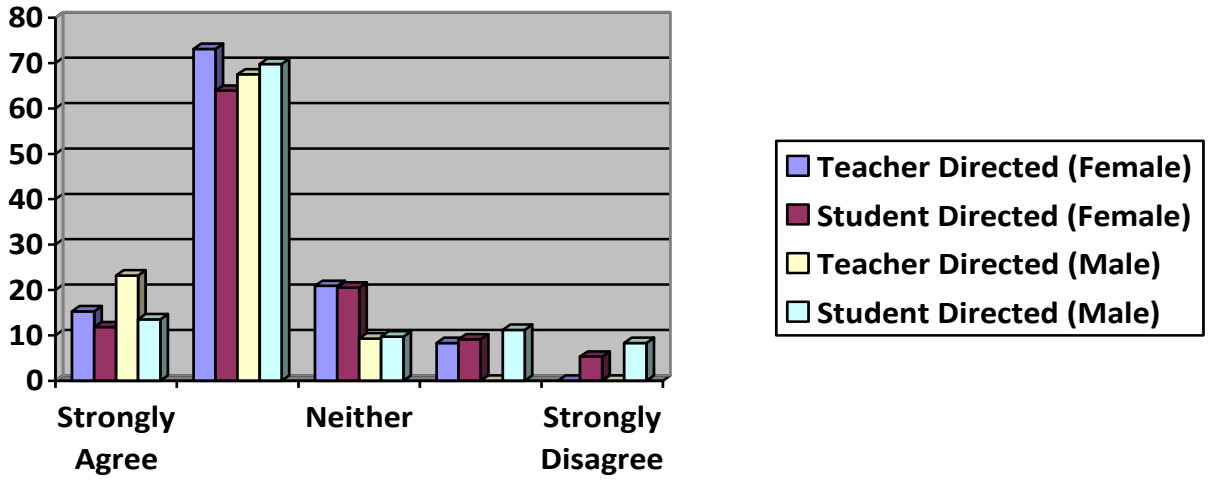
Instructional Method:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	16.2	67.8	13.3	6.3	2.1	100
Student Directed:	10.9	67.7	12.5	10.1	6.8	100



Note: Student responses for each category are listed in percentage.

Question #1: Confidence in Understanding of Content (Gender)

Instructional Method:	Gender:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	Female	15.3	73.1	20.9	8.3	0	100
Student Directed:		11.8	63.9	20.5	9.1	5.3	100
Teacher Directed:	Male	23.2	67.5	9.3	0	0	100
Student Directed:		13.5	69.8	9.7	11.2	8.3	100

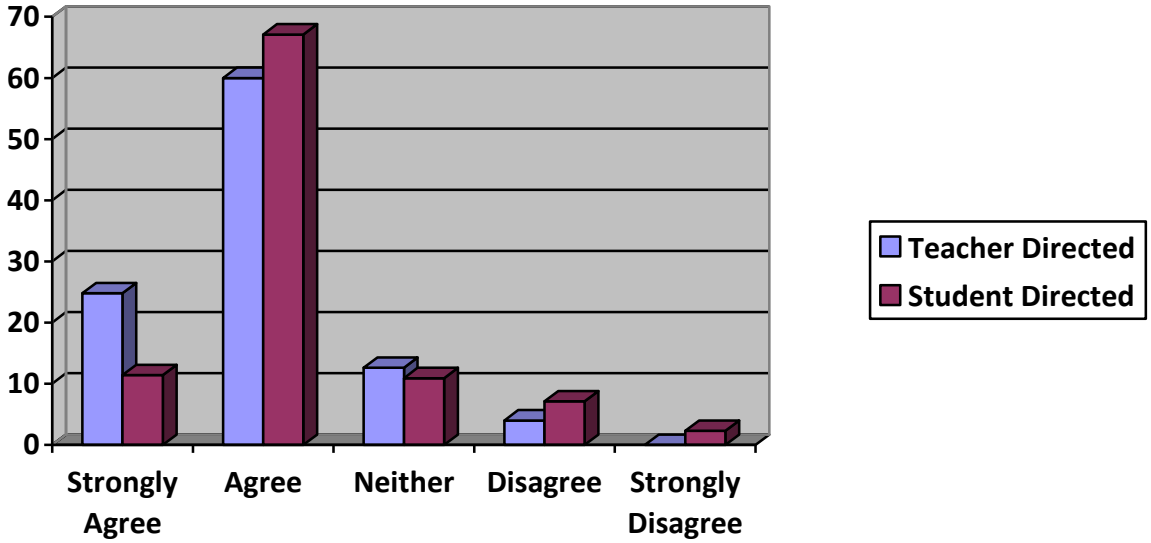


Note: Student responses for each category are listed in percentage.

Question #2: Confidence in Ability to Correctly Perform Activity/Lab (All)

Instructional Method:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	24.8	60.0	12.6	4.0	0	100
Student Directed:	11.4	67.1	10.9	7.1	2.3	100

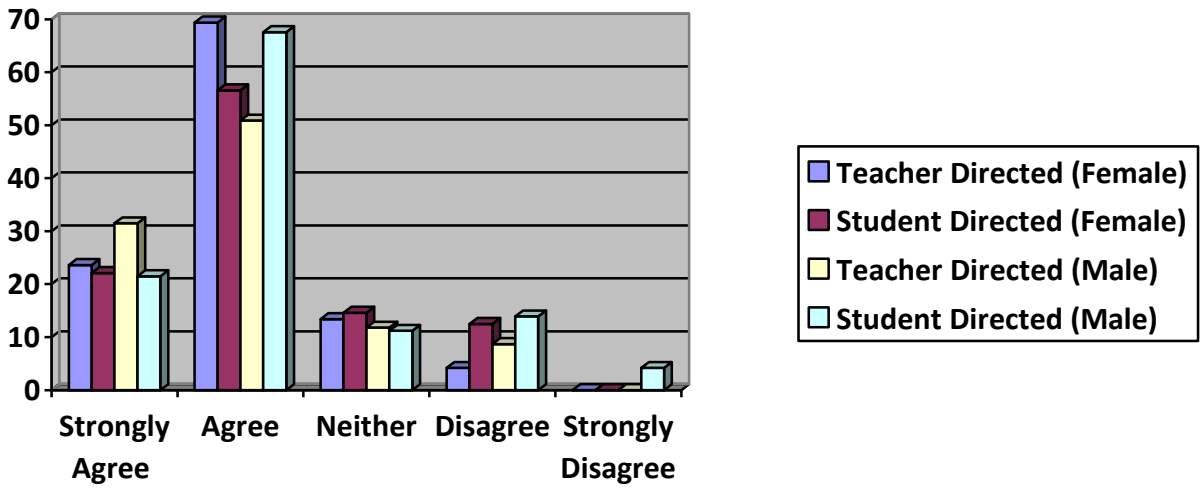
Note: Student responses for each category are listed in percentage.



Question #2: Confidence in Ability to Correctly Perform Activity/Lab (Gender)

Instructional Method:	Gender:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	Female	23.6	69.4	13.4	4.2	0	100
Student Directed:		22.1	56.6	14.6	12.5	0	100
Teacher Directed:	Male	31.5	50.9	11.8	8.7	0	100
Student Directed:		21.5	67.6	11.2	13.9	4.2	100

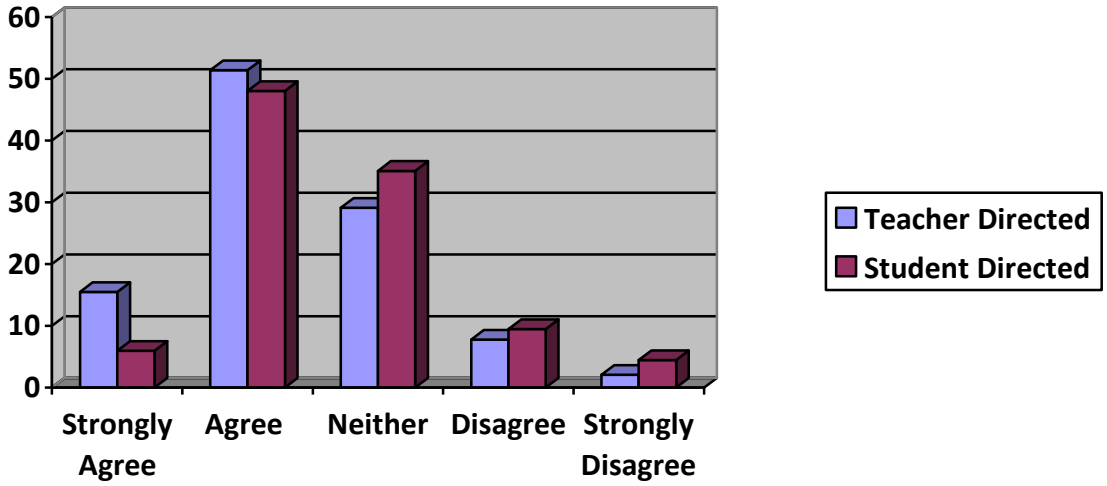
Note: Student responses for each category are listed in percentage.



Question #3: Confidence in Ability to Correctly Answer Test Questions Related to Content (All)

Instructional Method:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	15.5	51.4	29.1	7.8	2.1	100
Student Directed:	6.0	48.0	35.1	9.5	4.5	100

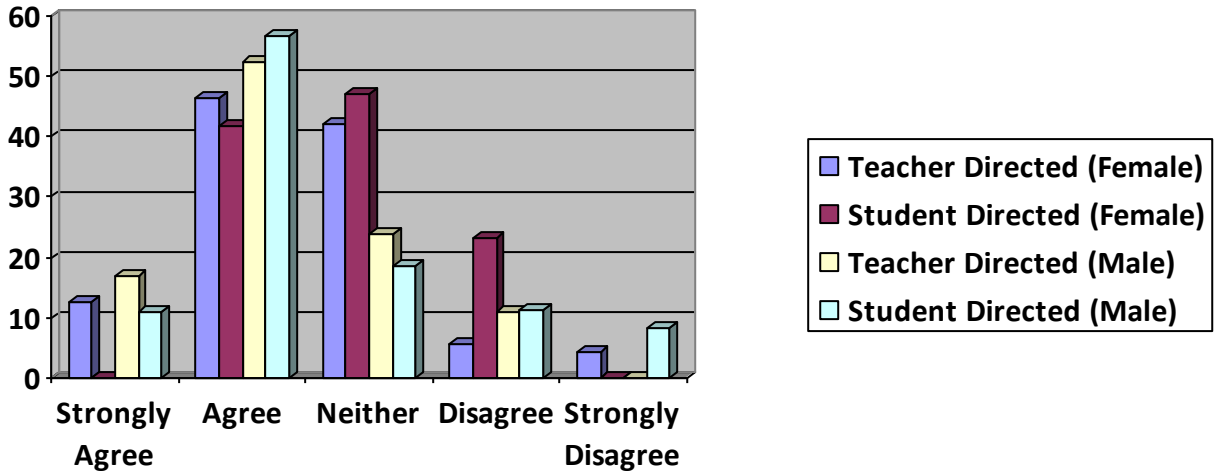
Note: Student responses for each category are listed in percentage.



Question #3: Confidence in Ability to Correctly Answer Test Questions Related to Content (Gender)

Instructional Method:	Gender:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	Female	12.5	46.3	42.1	5.6	4.2	100
Student Directed:		0	41.8	47.0	23.1	0	100
Teacher Directed:	Male	16.8	52.3	23.8	10.8	0	100
Student Directed:		10.8	56.7	18.6	11.2	8.3	100

Note: Student responses for each category are listed in percentage.

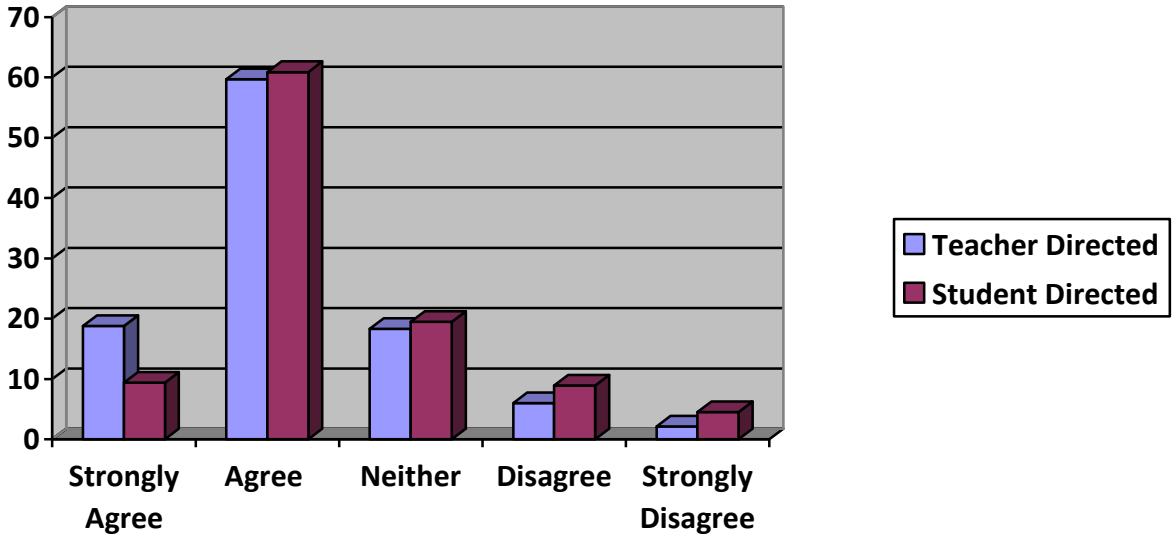


Overall Averages

All

Instructional Method:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	18.8	59.7	18.3	6.0	2.1	100
Student Directed:	9.4	60.9	19.5	8.9	4.5	100

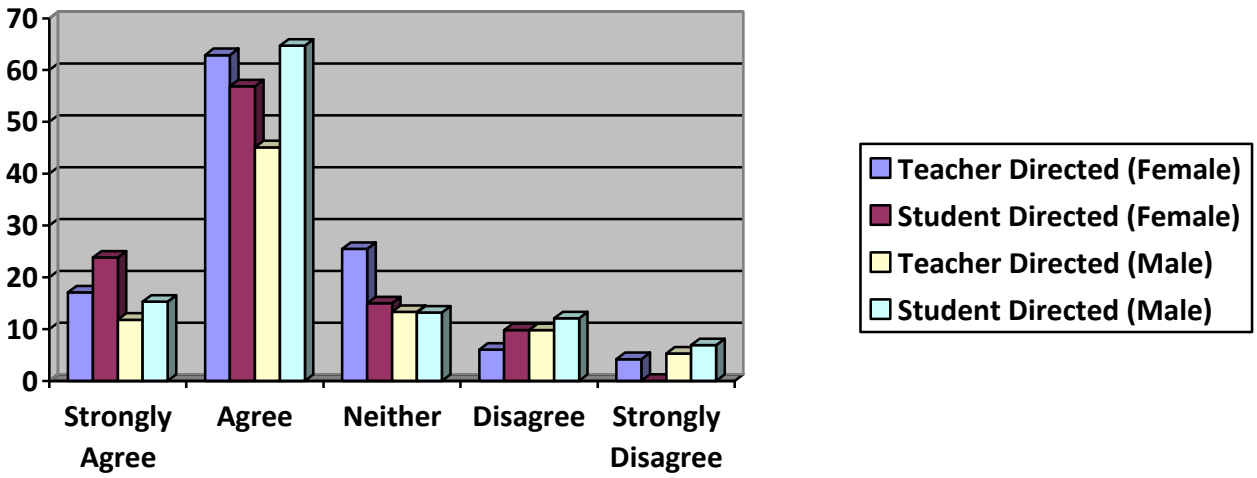
Note: Student responses for each category are listed in percentage.



Overall Average Gender

Instructional Method:	Gender:	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree	Total
Teacher Directed:	Female	17.1	62.9	25.5	6.0	4.2	100
Student Directed:		23.8	56.9	15.0	9.8	0	100
Teacher Directed:	Male	11.8	45.1	13.3	9.8	5.3	100
Student Directed:		15.3	64.7	13.2	12.1	6.9	100

Note: Student responses for each category are listed in percentage.



Analysis of Themes

The data overwhelmingly indicates that the teacher directed method of instruction is the most effective method for establishing confidence in Hispanic biology students. This is not surprising considering these student's educational background. Throughout their schooling, these students have been “babied,” so this is what they have come to expect. A teacher who provides clear directions and intervenes when appropriate, is going to be the most effective for these students. With respect to gender, there is not a clear indication as to what appears to be the most effective form of instruction. Both teacher directed and student directed methods appear to elicit similar responses in females and males.

Chapter 5 Discussion /Analysis

Summary of Major Findings

The major findings are that Hispanic high school students self efficacy in biology increases when they are participating in teacher directed instruction during cooperative learning activities. It is crucial that they are both having the opportunity to work in groups and getting a significant amount of support from their teacher.

The teacher needs to clearly explain the background information and demonstrate how to complete the lab so the students correctly understand how to complete the experiment. Research has indicated that Hispanic student's academic achievement occurs more highly in smaller schools that have a large percentage of Hispanic students and where there are high expectations for the students. I feel very fortunate because these attributes can be found at the school I work at. Our school is a progressive charter school that is constantly pushing the boundaries to improve Hispanic student instruction in all content areas. I feel fortunate to be working at a school that has the ideal characteristics for Hispanic student success.

Comparison of Findings to Existing Literature

My findings from my own experimentation directly aligned with existing literature research. Doing science involves developing scientific inquiry skills. This may be difficult for Hispanic students, since they come from a cultural background where authority is greatly respected. These students are not used to questioning things and are accustomed to doing what the teacher tells them to do rather than formulating questions on their own (Lee & Fradd, 1998).

Limitations/Gaps in the Research

While the literature discusses connecting scientific curriculum to student's cultural background, it rarely suggests how to connect the Hispanic cultural background to science. They also do not really discuss how to build relationships between parents and teachers to help in student learning.

Implications for Future Research

Self Efficacy for Hispanic high school biology students needs to be examined in large schools versus small schools, schools in urban areas versus more rural areas, and schools with Hispanic science teachers versus schools without Hispanic science teachers. These studies have not been completed and would provide valuable information.

Overall Significance of the Research

The literature discusses several techniques for improving Hispanic student instruction in science. Student-centered, cooperative learning activities are mentioned several times in the literature. Relating the content to the student's lives is also crucial in maintaining their interest.

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