Spring 2017

How Can A Self-Esteem Curriculum In A Mathematics Classroom Increase The Confidence And Ability Of Female Students?

Shelly Jean Chermack
Hamline University

HOW CAN A SELF-ESTEEM CURRICULUM IN A MATHEMATICS CLASSROOM INCREASE THE CONFIDENCE AND ABILITY OF FEMALE STUDENTS?

By

Shelly Jean Chermack

A capstone submitted in partial fulfillment of the requirements for the degree of Master of Arts in Education.

Hamline University

Saint Paul, Minnesota

April 2017

Primary Advisor: Laura Haldin
Secondary Advisor: Colleen Bell
Peer Reviewer: Suzie Myhre

To the “new” me for finally completing this paper that I had promised myself I would do so many times but I let life and other things get into the way. And Laura, for reminding I am not able to change the world with my master’s degree, but in the classroom and through my teaching and with my students. To my colleagues that make me a better teacher every day and make me continue to want to do better for our girls and other underserved populations. And finally, to my family, my real “family” that stood by me while I struggled trying to find the cure to this problem until I was ready to learn that we have to live with continuing to improve ourselves, and there is no perfect answer.

"We all do better when we all do better."
-Paul Wellstone

ACKNOWLEDGEMENTS

Special thanks to Saint Paul Public Schools for allowing me to do my research within my classroom.

TABLE OF CONTENTS

TABLE OF FIGURES

CHAPTER ONE

Introduction

Introduction

Gender equity is an ongoing issue in education. Even after 30 years since the passing of Title IX, women and girls still experience education unequally to men and boys. Girls deal with sexual harassment that is not addressed, older teachers feeling a lack of need to adjust their curriculum to make it gender equitable, and even older curriculum materials that are lacking in positive strong female characters and role models. As a female, a feminist, a mathematician, a scientist, and the daughter of a strong-willed mother, I've always been aware and conscious of gender inequity if and where it exists.

My desire to make a change in the way women and girls are educated in the public schools has brought me to my research question that I want to address for this capstone. How can a self-esteem curriculum in a mathematics classroom increase the confidence and ability of female students?

Pre-College Years

Growing up I had a strong sense of self worth. I was never told I could not do something or accomplish anything because of my gender. My parents always had faith in my ability to succeed in anything I tried to do. When I wanted to join band in fifth grade, my parents bought me my flute and they knew that I was going to be able to play without much help or lessons. My mom instilled values of female empowerment and feminism. My mom ruled the house; she made many decisions for the family. She never wanted to see me settle for anything or anyone because of my gender. She taught me to be outspoken; to always speak my mind and not be afraid of people that disagree with me. My father encouraged my mother, my sister, and I to be strong, independent women. This upbringing helped me through my adolescent years and as an adult.

In elementary school and through junior high, I always felt very apt at mathematics. I did very well in all my classes and my teachers felt that I was inappropriately tracked, or ability-placed. My eighth grade mathematics teacher, whom also felt this, told me that I could take a placement test to try to skip a math level and finally be in the appropriate, advanced math class. Unfortunately, I wasn't allowed time to prepare for the test and wasn't exposed to some of the skills prior to being tested on them.

At the beginning of my sophomore year, I asked my geometry teacher if I could fix this issue and he allowed me to take his class independent study. I was able to finish the year's worth of geometry in a semester and then I took higher algebra (Algebra 2) independent study as well. By my junior year of high school I was finally in the advanced math class; pre-calculus.

While registering for senior year, I had the option to take calculus or discrete mathematics. I chose the latter. When my senior year started I found that I was one of the only a few females in the class. I remember walking into class and hearing, "Hi, Shelly," from Andrew. "What's up?" from Barack. "Hey Shelly," from Jon, but none of the friends I really wanted to see were in the class. Where was Sara? Where was Kelly? Where was Alyssa? This made it too uncomfortable, so I ended up dropping math my senior year and not taking math again until college.

College (Bachelors Degree) Years

In college, after deciding to get into education, I found that what I experienced in my math classes in school wasn't out of the norm. Gender equity in education is an issue that every math, science, English, and social studies classroom must deal with (the former two having discriminations against females and the latter two with issues with males).

While getting my first bachelors degree and teaching license in elementary education, I had professors in both my math and science education classes that covered some issues with gender equity. I distinctly remember my science methods professor (a male) starting the first class with an activity where he told us to draw a picture of a scientist. After we were done with our drawings we showed them to the class and my professor pointed out that most people instinctively draw a picture of a man in a lab coat with messy hair and glasses. His activity not only pointed out the stereotypes of gender in science, but other stereotypes of scientists as well. Unfortunately, there was a little more discussion, but not much concentration on the issue.

Post-Graduate Years

After I received my first bachelor's degree, I decided to go back to college for my master's degree, as well as additional teaching licenses in both mathematics and science. At this stage in my life, I wasn't affected, or didn't notice if I was in the minority as a woman in these classes. I think one of the reasons that I did not notice the people in my class was because I was older than most of the other students in my classes, so I concentrated more on the class, the professor, and the lectures, than I did to making friends in the class. I also think since I was older, I finally had a good enough sense of self worth and self confidence that it didn't matter to me who was in class, I just wanted to do well for myself. It was less about competition and more about my own goals in my education and my personal learning.

My subsequent education classes for the secondary subjects didn't really focus on gender issues in education, except for my class called Equity and Social Justice, which was for my masters. In my class on equity we talked about a lot of areas in education and society in general in which equity issues exist. We unfortunately didn't discuss many ways to cope with social injustices and inequities in education. It made me curious to research any new strategies being used in education to combat gender equity.

Professional Years

I am now in my eighth year of teaching high school mathematics and fourth year of teaching high school biology. I have had the benefit of teaching in both alternative and main stream environments, as well as in suburban and urban schools. I've noticed now that I've been teaching full time that there are about an equal number of males and females

teaching mathematics classes, biology classes tend to have more female teachers, but the physical sciences still tend to have more male teachers. I've seen many girls dealing with insecurities in their math and science abilities, as well as in their personal lives. I don't remember seeing such a high level of female students feeling inadequate in terms of their ability in math and science. My colleagues and I from my years in the alternative schools have discussed the lack of self-esteem in our female students. Their low self-esteem shows in many aspects of their lives. They struggle with their confidence in school and they lack the self-esteem needed for appropriate romantic relationships. I see girls in the halls being nearly emotionally and verbally abused by their boyfriends. I also hear female students using their sexuality to hold on to boyfriends. I have seen the lack of self-esteem and need to hold on to their romantic relationships also lead to fighting among girls and suspensions. Their lack of self-esteem is making them more susceptible to abuse and even endangering their health.

Now with my experience in a main stream, urban school, I have seen female students still struggle with their confidence in mathematics and the physical sciences. Girls are still underrepresented in upper level math and physical science courses. This experience has made me think about ways in which to boost the self esteem of girls in my classroom and in general. I think that an increased level of esteem will help girls in their academics, as well as in their maturity.

This brings me to my question I developed for my capstone. How can a self-esteem curriculum in a mathematics classroom increase the confidence and ability of female students?

Preparation for My Research

My upbringing, my experience as a student and my experience as a teacher have made me aware of issues that females face in life, society, and school when dealing with gender equity. Helping boost self-esteem and self awareness in females may help girls in their confidence in academics and life. As an educator, I will always be looking for ways to improve my students' self-esteem. In the next chapter I will highlight some literature that researches theories on gender differences in educational ability, the history of female education, self esteem and its connection to learning, the pros and cons to single-sex education, and general gender equity and schools.

CHAPTER TWO

Literature Review

Introduction

In the previous chapter, I explained the origins of my passion for gender equity. Through this passion, I have been able to decide on a research question for my capstone; How can a self-esteem curriculum in a mathematics classroom increase the confidence and ability of female students?

There are different aspects of research in gender studies that have touched on the issue of gender equity, they include; the history of women's education, self esteem and its effects on learning, biological differences of the genders and theories behind their effects on learning, the pros and cons to single-sex education, and finally general research on gender equity in education and other aspects of society.

History of the Education of Women in the United States

In the United States, women and girls have struggled in receiving equitable education since the advent of public education and before. Their struggles have ranged from a total lack of education, to being educated in secret, to learning "women's" subject

matter, to unequal segregated schooling, to finally integrated schooling. Girls and women today still struggle with equity in their education. Girls and women bare the results of an apathetic society that overlooks harassment and subtle inequities in all aspects of their lives, including education.

Colonial Era

Prior to the late 1700s, girls were not offered an education in the school system. By 1767, one of the first schools in the country allowed girls to receive an education, but it was only offered an hour before and after the regular school day, when the boys were not in school (Sadker & Sadker, 1994).

The Nineteenth Century

It wasn't until the early 1800s when girls were openly allowed to receive a public education, including at the high school level. This education was still limited. Girls were either taught at totally different schools then the boys (in larger cities), or they would enter the school on the opposite side as the boys and be kept separate from the boys at all times (in smaller, poorer towns) (Sadker & Sadker, 1994).

The first colleges available to women were seminaries, which educated women as early as the 1820s. Some seminaries offered a very rigorous education which included many of the basic course offerings also available to men, while other seminaries were very weak in their offerings to women, only offering courses related to womanly crafts (Sadker & Sadker, 1994).

In 1833, Oberlin College was the first institution to teach both men and women (Sadker & Sadker, 1994). While being an integrated college, the college was still

segregated within its walls. Women were required to tend to the male students. Female students were kept in separate courses and not allowed to speak in public assemblies thrown by the college (Sadker & Sadker, 1994).

Tufts College began to admit women in 1892 and student enrollment dropped. "The college president identified the admission of women as the cause" (Sadker & Sadker, 1994). Jackson College opened in 1900 so that the women from Tufts could be removed and sent there. Once Tufts resegregated, so did Brown and Pembroke (Sadker & Sadker, 1994).

In 1893 Radcliffe College was founded after a woman, "who had contributed funds to Harvard in 1641" (Sadker & Sadker, 1994). The Radcliffe women would use the books from the Harvard library to study, but they were not allowed to check them out or enter the library. They had to wait until the library closed and there were "messengers [that] slipped in to obtain books" (Sadker & Sadker, 1994). The women had to get the books back to the library before it opened the next day. Previous to this, professors from Harvard would teach the men and then walk off campus and reteach their courses to women, "for an extra fee of course" (Sadker & Sadker, 1994).

It wasn't until 1865 that the first all women's college, Vassar, opened its doors (Sadker & Sadker, 1994). Vassar College provided a more rigorous curriculum then most women coming to the college had expected. Unfortunately, due to the inadequacies of secondary schooling for girls in the 17th century, two-thirds of the women that arrived were forced into prerequisite courses to in the preparatory department to cover the high-school

level classes they should have already received exposure to in their secondary schooling (Sadker & Sadker, 1994).

Wellesley and Bryn Mawr followed. Wellesley included allowing the women to join the faculty after receiving their degrees. Bryn Mawr appointed the first female president to a university. Bryn Mawr also broke barriers by not making the women tend to basic household chores and by treating them as equal scholars to the men. The women were expected to wear caps and gowns to class like the men and they did not have to be chaperoned (Sadker & Sadker, 1994).

The Twentieth Century: Pre-Title IX

The Commission on the Reorganization of Secondary Education adjusted the responsibility of high school education in 1918. They made the primary goal of high school education to prepare students with a vocational education (Sadker & Sadker, 1994). This proved to be another area of segregation for high school girls. Girls were offered domestic science as vocational training, while boys were taking manual training or industrial arts. Even girls that were college bound were required to take home economics courses.

Girls were also allowed to skip mathematics and science courses in high school and fill their credit with electives instead. Girls were being vocationally tracked into careers as teachers, secretaries, nurses, or mothers, even as late as the 1970s (Sadker & Sadker, 1994).

There was blatant sexism in the schools as well. When the Sadker's asked women at workshops to tell them what it was like in the '40s, '50s, and '60s, they would get responses such as; "There was a big assembly, and two awards were presented for

Outstanding Citizenship, one to a girl and one to a boy. The boy received a gift of $50, the girl received $25" (Sadker & Sadker, 1994). It was also seen in counseling; "you scored highest in the school on spatial relations, but you can forget that [told by a guidance counselor to a female student]. There's nothing a girl can do with it...And for heaven's sake, don't tell the boys. They'll be so embarrassed to have been beaten by a girl" (Sadker & Sadker, 1994).

Again the inequities did not stop at high school graduation. "All I can remember is that he [an architecture faculty member at Iowa State University] said he would have to admit me but that I would never graduate. He said that girls didn't graduate in architecture from Iowa State" (Sadker & Sadker, 1994). "'Why are you taking accounting? You'll never get to be an accountant. You should go to secretarial school.' He [an accounting professor] told me even though I had the best grades in the whole class" (Sadker & Sadker, 1994). At the Ph.D. level, women were being told that they were a waste of time for the department because they just would get their degree and then get married and stop working, while the men in the department would use the degree for actual work (Sadker & Sadker, 1994).

Title IX to the Reagan Era

Title IX was passed by the federal government in 1972 (Sadker & Sadker, 1994). Title IX was written to ensure equal educational experiences to both males and females. Under the law, schools were not allowed to use gender bias in, "school athletics, career counseling, medical services, financial aid, admissions practices, and the treatment of students" (Sadker & Sadker, 1994).

In 1974, congress passed the first law to create funding for gender related issues in education. The Women's Educational Equity Act (WEEA), created funding through federal monies to help in the research, training, and production of materials to eliminate sex bias in schools (Sadker & Sadker 1994). The money from WEEA enabled many projects to be established, including projects geared toward improving teaching strategies to funding schools to comply with Title IX.

In 1976, Amendments were added to the Vocational Education Act of 1963 which required that each state have a sex equity coordinator to handle "seven key functions, such as to create awareness of programs to reduce sex bias and stereotyping in vocational education, gather and analyze data on men and women in state vocational education programs, and assist local education agencies and others in improving vocational education opportunities for women" (Klein et al. 2010).

Unfortunately, even with the introduction of the 1976 amendments to the Vocational Education Act of 1963, many schools, school districts, principals, superintendents, school boards, etc. were not compelled to comply with Title IX. Schools continued segregation of class options, vocational programs, and money spent toward athletics by gender. Students were disciplined differently and scholarships were awarded unequally according to gender as well. Many complaints were made, but no school lost federal funds because of sex discrimination between 1972 and1991 (Sadker & Sadker, 1994).

In 1977 the Career Incentive Education Act allowed for funding of career education activities that were designed to eliminate sex discrimination (Klein et al. 2010).

The Civil Rights Act was amended in 1978 to include coverage of educational services. This act also created even more programs to work on the alleviation of educational bias. In 1980, the National Institute of Education was also providing funding to increase gender equity in the schools and education (Sadker & Sadker 1994).

Even with the passage of these federal bills in response to the outcry by some of gender inequity of schools and the threat of losses of federal funding due to noncompliance, not one school lost any of its federal funding due to its lack of compliance to Title IX. Many schools did not take the law seriously and continued their gender inequitable ways feeling no need to adjust to please the new law (Sadker & Sadker 1994).

Reagan-Bush Administration Era to Present

With the election of President Ronald Reagan in 1980, there was a drastic change in the view of the need to continue gender equity programs at the federal level. With the new administration, there came a change in core values in the federal government to a more conservative view of right and wrong and society. Many conservative politicians in the federal government felt that a strong family and family values started with the suppression of girls and women in career aspirations.

These politicians then came to control and head the different departments in education and oversee the funding that was supposed to be as a result of WEEA, Title IX, the restructured Civil Rights Act, and the National Institute of Education. Most of the founders of the movement that had been heading these areas of government were being forced out and replaced by non-supporters of the cause (Sadker & Sadker 1994).

The next step for the eradication of the funds to combat gender inequity in the schools was to eliminate the federal funding that the previous acts and laws had created. By 1992, the budget for WEEA had been cut from $10 billion to a half million dollars (Sadker & Sadker 1994). And then by 2003, the WEEA Equity Resource Center and the Gender Equity Expert Panel was discontinued all together (Klein et al. 2010).

There were other areas of government that were picking up the slack where the Reagan-Bush era was gutting the gender equity in education budget. The National Science Foundation (NSF) has been supporting different equity programs since 1981. The NSF has funded programs which included the, "Program on Gender in Science and Engineering, [which had] distributed over $9 million each year since 1999 for work at all levels of education" (Klein et al. 2010). Also, the Perkins Vocational Education Act between 1984 and 1998 provided funding and support for gender equity for students and adults in education (Klein et al. 2010). In addition, the U.S. Department of Labor manages grants part of Women in Apprenticeship and Nontraditional Occupations Grant Program (Klein et al. 2010).

The history of women's education is very complicated. What started as far from equitable has seen gains that have brought the education of women towards equal footing with men. While seeing a strong dedication to the advancement of furthering women and girls in education in the '60s and '70s, the U.S. has backed off on its commitment toward women and equitable practices in education.

Self-Esteem and Effects on Educational Ability

How much does self-esteem affect students' ability in school and learning? Does a gap in self-esteem levels affect girls' ability in mathematics, or do lower abilities in mathematics affect girls' self-esteem levels? Does a lack in self-confidence affect girls' ability in mathematics, or vice versa? How does self-confidence relate to self-esteem levels in high school girls?

Self-Esteem Slide

Even as pre-teens, girls already start feeling a difference in daily concerns then boys. Girls deal with stereotypes that place more importance on looks. This concern can place more attention to relationships then careers. Girls are exposed to the stereotypes of men as the career holders and women as the caretakers (Lindstrom & Tracy, 2003). Sadker and Sadker found a slide in self-esteem in girls from elementary years to high school (2004). Thomasenia Adams reaffirms this in "Pulling the Plug on Gender-Related Differences in Mathematics," as well as Patrick McCormick in, "Are Girls Taught to Fail?"

The decrease in self-esteem that girls start to feel in middle school into high school affects how they perceive how they look as well. In one study done by Sadker and Sadker, they found that girls of White/Non-Hispanic and Hispanic groups dropped in number from elementary to middle school and then to high school for the amount of girls that could say they liked the way they looked. Only African American girls actually improved in this category (Sadker & Sadker 2009).

Female Representation in the Real World

Where did this pressure to look a certain way come from? What effect is it having on these girls' education and learning? Girls are seeing the negative stereotypes of needing to look a certain way in and out of school. It comes from parents, television, movies, advertisements, magazines, celebrities, and other aspects of society. "During the 1980s, women presented in the media as beauty images, such as Playboy centerfolds and Miss America contestants, were 15 percent or more below the weight expected for their age and height" (Sadker & Sadker 1994). Fashion models, "have become ever thinner and now weigh a shocking 23 percent less than the average woman" (Sadker & Sadker 1994). Historically girls are not getting any relief at school either. Even as early as third grade there is no change in the body shape of boys in texts from this age between 1900 and 1980, but girls lost weight and got thinner in the pictures (Sadker & Sadker 1994). The result being that more and more and younger and younger girls are dieting to look "right."

It's estimated that one-half to three quarters of adolescent girls are on a diet and nearly three quarters of adult women are on a diet (Sadker & Sadker 1994). This dieting creates stress on teenagers, making it more difficult for them to learn. To make matters worse for middle school girls, since they are going through puberty, they will be accumulating body fat as part of reproduction. To the middle school girl, this is disaster and eating disorders among middle schools are rampant. The negative body image just compounds the issue of low self-esteem.

Desire to Fit In

If a girl is smart, once she is in middle school, most feel they can not show it. Girls believe that it's important to be popular and to be popular they believe you need to be attractive, not smart. If you are smart you don't get dates (McCormick 1995). Girls did not want to be seen as smart. They wanted to be labeled normal. When girls are in gifted classes in the middle school, they attribute it to studying hard, not to intelligence, while they feel that the boys are just the, "real brains" (Sadker & Zittleman 2009).

Negative gender stereotypes have been found to affect how students interact with each other, participate, choose courses in school, and make decisions toward their careers. Girls begin to censor themselves in class. They find that it's more important to be seen as quiet and beautiful then as smart (Sadker & Sadker 2004). Girls start feeling that they will be less attractive to boys if they are smart. In addition, male students can also lower the girl students' level of self-esteem and confidence. Boys can make dismissive and patronizing remarks that are easily dismissed and not corrected by teachers (Abu El-Haj, 2003).

Eventually, teachers can contribute to girls' lack of self-confidence in mathematics. Teachers tend to give the answers to girls more often and explain the problem to boys (Sadker & Sadker, 2004). If a girl is seen as unpopular in school, her contributions to school and accomplishments are ignored more than popular students, which are praised and more often publicly recognized.

After years of exposure to negative stereotypes in society, media, and school, girls can start to lose their level of confidence and in turn, limit their occupational choices and career potential (Lindstrom & Tracy, 2003). Even the smartest, most promising girls stop

taking classes in advanced math and science (especially physical science) and feel that a career that will involve too much application of those subjects will not be for them.

Avoiding Upper Level Math and Physical Science

Girls of all abilities are choosing not to take mathematics and science, at the required levels, as well as at advanced levels (El-Haj 2003). Some statistics show that, males enroll in these courses at one-third more of a rate than female students (Fredua-Kwarteng 2005). In advanced mathematics courses, there is about a 60% chance that males will enroll in the class while only about a 25% chance that female students will enroll (Fredua-Kwarteng 2005) and when you look at the students that are taking the advanced placement Calculus exams, 48% of those taking the AB exam (part one) are girls, but only about 39% of those students taking the more difficult BC exam (part two) are female (Klein et al. 2010).

This scenario isn't just seen in the mathematics classrooms. According to a study done by Burkham et al.(1997), high school girls are starting to narrow the gender gap in science, but they are still taking fewer advanced math and science courses than boys. When a student is advanced, males pursue advanced math and science courses and degrees more than females (Burkham et al. 1997). And even when looking at all levels for achievement, girls show less of a likelihood to pursue advanced science or science courses compared to boys (van Langen et al. 2006). This does not seem to be an issue that is just in the United States either. According to Roeder and Gruhn (2000), in a certain foreign country, advanced students are expected to choose one subject as their advanced subject. 13.1 percent of females will chose math as their math for their advanced subject, while 24.5

percent of male students chose math (Roeder & Gruhn 2000). "Upper-level male students chose chemistry twice as often, and sports, computer science three times as often. The greatest discrepancy is in the field of physics; the percentage of male students that chose this subject was almost eight times as great as the percentage of female students" (Roeder & Gruhn 2000).

The numbers continue when the research is limited to strictly science as well, but with one slight exception. In Advanced Placement (AP) Physics courses, girls represent between one-fourth to one-third of the class, and in computer science courses they are even less (Berube & Glanz 2008). In a study from British Columbia, males enrolled in a 12th grade physics class at a rate of 3.25 to every 1 female (Gaskell et al. 1998). The one exception in science is in the natural sciences/biology in which, female students take regular biology courses at a slightly higher rate than males (Klein et al. 2010).

Lastly, in computer science, it was found that only 8.7% of the enrollment of a 12th grade, mathematics-based, electronics class was female, compared to 91.3% of the enrollment consisting of males. In a 12th grade computer science class, 85.96% of the students enrolled were male compared to the 14.1% that were female and 21% of females enrolled in a 12th grade information technology course compared to 92% of male students (Fredua-Kwarteng 2005).

Sadly the divide does not end there, but it only continues to grow while moving into college and beyond. By already limiting what classes students chose to take in high school, science courses in college are then too hard for those students to take. And then without

those college classes, females are limited their possible careers due to not having taken science courses (Sadker & Sadker 1994). As of 2010,

> the undergraduate population in the biological sciences [was] over 50% female; chemistry [had] grown from less than 10% female bachelor's-level graduates in the 1960s to 50% in 2005; physics and engineering [lagged] at 25% and 22%, respectively; and the percentages of women in computer science [had] actually declined from 28.6% in 1994 to 27.6% in 2001. However, the lagging fields [were]…two or three times more…popular with women (in total numbers) than they were 30 years [before]. Meanwhile, anthropology, primatology, and veterinary medicine [were] attracting, and most likely [would] continue to attract, female majorities. (Klein et al. 2010)

After all of this, if we compound the issue by looking at women and girls that are minorities or from low-income families, the numbers are even worse. Only half as many low-income students and minority students take critical math courses to prepare them for science and engineering in college (Campbell 1992).

There are many things making girls and women choose to pursue subjects outside of upper-level mathematics and physical sciences. So what is causing this deterrence from these subjects? Girls are encouraged to take biology if they show an interest in science because biology is shown to be the "softer" science, while chemistry and physics are harder and rough (Burkam 1997). Female students tend to take higher-level math and science courses in high school when they are pursuing a career in science (Lindstrom 2003). The issue is with female students that are academically capable to take higher-level math and

science courses, but are still opting out at a young age and therefore limiting their career choices. The girls preferred things that were "people oriented" and allowed them to show feelings and that they care. The girls were turned off by subjects that were theory based, more logical and analytical and things that were solution oriented (Malone 1997). Even when recommended to take the upper-level classes by their counselors and teachers, these students still declined the opportunity.

Parental Influence

Parents can have some influence on girls' decision of whether or not to take advanced courses as well. An employment of the mother of an advanced female can influence her into studying chemistry or computer science (Heller 1996). Also, the "parental level of education influences the choice of science and mathematics subjects both directly and indirectly for girls" (van Langen 2006).

Peer Pressure

Even friends can have an influence on whether or not a student will decide to take a course in school, "Girls with a predominately female friendship group are 1.7 times as likely to reach [a high] level of advanced math as are those with a gender-equal or predominately male group" (Riegle-Crumb et al. 2006). In addition, "the grades of same-sex friends have a statistically significant positive effect on the probability of a girl progressing into advanced course work" (Riegle-Crumb et al. 2006). This isn't just limited to mathematics either. Even with "Physics, there is a substantial jump in the probability of taking this course when girls' friends are mostly female *and* earn mostly As in science. The probability almost doubles" (Riegle-Crumb et al. 2006). This effect may be because,

"female friends can offer emotional support for the pursuit of subjects that are not only academically difficult, but stereotyped as masculine, a factor that may be particularly troubling to adolescent girls who are formulating the beginning of an adult feminine identity" (Riegle-Crumb et al. 2006).

Staff Influence

Lastly, and probably most unfortunately, some female students are deterred from taking upper level math and science courses from school counselors, administration, and teachers themselves. "Sometimes it is counselors who harm when they mean to help. Feeling sorry for girls who find their math and science courses difficult, they literally excuse them, a dismissal less likely to be offered to male students" (Sadker & Sadker 1994). Teachers and advisors can encourage girls to avoid upper level courses when their confidence is sliding (McCormick 1995).

> High-achieving girls in [a] math group believed that their teachers were more important in helping them decide to take advanced math courses than did high achieving male students. In [a] science group, high-achieving girls responded that their parents were more important in helping them to decide to take advanced science courses than the male students. (Reis & Park 2001)

In a study asking students that took AP courses, "more than 50 per cent indicated that they selected specific AP weighted courses (AP chemistry, history, and biology) based on their affinity for a teacher, their respect for particular teachers' abilities to teach, and a teacher's willingness to support them as students" (Reis & Park 2001)

Why are Girls not Taking the Classes?

So why are girls choosing, or not choosing to take upper level math and science courses? Is it how they perceive the classes, or is it how they are actually taught in previous classes that has turned them off to future math and science endeavors? As early as elementary school, girls will start to receive a different learning experience in the classroom than boys. It starts when teachers assign boys the jobs that are hands-on during the science class and girls the jobs of recorder (Klein et al. 2010). Klein et al. have found studies showing, "that teachers [react] differently to the behaviors of male and female students" (Klein et al. 2010). The findings showed that teachers would respond to male students more often to, "reprimand or critique" their performance and that the finding stayed consistent over time (Klein et al. 2010). Reis & Park found that, "teachers in science lecture classes questioned boys on the subject matter 80% more often than girls" (Reis & Park 2001).

Looking back, some of the research said that students relied on who was teaching the classes to decide if they were going to take a class or not. A study written about in the April 2010 Educational Digest states that, "both male and female teachers tend to direct more comments to boys" ("Girls Disengage from High School Science" 2010). Klein et al. found, "numerous classroom studies that documented how male students still received the majority of the teachers' time and attention, how males called out more than females, and how males received more precise feedback and criticism from instructors" (Klein et al. 2010). In another study, "almost half of the boys, 48 percent, but only 39 percent of the girls said they speak up in class. The gender gap was wider on the question of arguing with

teachers. Almost twice as many boys as girls, 28 percent versus 15 percent, said they always argued with teachers when they thought they were right" (Sadker et al. 2009). The silencing of female students may be a response to the teachers themselves. LaFrance found that,

> teachers can effectively foreshorten women's verbal input by the subtle application of nonverbal responses. These include the absence of accomplishment responses such as looking at the student *all* the while she is talking and the presence of multiple, successive head nods that can bring a speaker to an unanticipated halt…female students get the message that their verbal contribution is just not heard. (LaFrance, n.d.)

When looking at classrooms around the world, this disparity between male and female education within even the same classrooms isn't just seen in the United States. In, "parts of sub-Saharan Africa…both male and female teachers display negative attitudes toward girls in their verbal comments and their behavior" (Klein et al., 2010). And this imbalance between the education of females and males is also seen at the post-secondary level as well. "In mixed-sex college classrooms, even the brightest women students often remain silent." (LaFrance, n.d.)

Girls are Silenced through Harassment

So then the question may be; what makes these girls/women so quiet? Is it before or after they get into the classroom? A study done through Wellesley College's Center for Research on Women found that out of, "4,000 girls in grades 2 through 12,…39% experienced sexual harassment every day at school. Eighty-nine percent of the girls

reported experiencing sexual comments and gestures" (Klein et al., 2010). In another study, "4 out of 5 students (81%) reported that they had been the target of some form of sexual harassment during their school lives" (Klein et al., 2010). A study done by Roscoe, Strouse, and Goodwin in 1994 on 11 through 16-year-olds, "found that 50% of girls and 37% of boys had been sexually harassed" (Klein et al., 2010). A 1998 World Health Organization's Health Behavior in School-aged Children's Survey, "reported that 52% of students experienced sexual bullying (47% of boys and 57% of girls)" (Klein et al., 2010). And an American Association of University Women (AAUW) study done in 2001 found that,

> eighty-one percent of students experience some form of sexual harassment during their school lives…This study also found that girls (85%)…experience sexual harassment ever or often (30% vs. 24% often)…In addition, 32% of students reported being afraid of being sexually harassed, with girls more than twice as likely as boys to feel this fear (44% vs. 20%). Eighty-five percent of students reported peer sexual harassment, 38% reported being harassed by a teacher or other school employee. (Klein et al., 2010)

In the same study it was, "found that adolescents' experiences with sexual harassment were most likely to occur in the middle-school or junior-high school years of sixth to ninth grade" (Klein et al., 2010). Finally, an earlier study done by Houston and Hwang in 1996, "reported that adolescents who experienced sexual harassment during childhood experienced more sexual harassment in high school than those teens who were not sexually harassed years earlier" (Klein et al., 2010).

So what kind of harassment were the students seeing? In 2000, according to Murnen and Smolak, “girls in their sample commonly experienced having an entrance blocked and being stared at” (Klein et al., 2010). More specifically, in one study, students that were sexually harassed, listed the following as the examples of how and to what extent they were harassed;

- Sexual comments, jokes, gestures, or looks (76% of girls…
- Touched, grabbed, or pinched in a sexual way (65% of girls…
- Intentionally brushed against in a sexual way (57% of girls…
- Flashed or ‘mooned’ (49% of girls…
- Had sexual rumors spread about them (43% of girls…
- Had clothing pulled at in a sexual way (38% of girls…
- Shown, given, or left sexual pictures, photographs, illustrations, messages, or notes (31% of girls…
- Had their way blocked or were cornered in a sexual way (38% of girls…
- Had sexual messages or graffiti written about them on bathroom walls, in locker rooms, etc. (20% of girls…
- Forced to kiss someone (23% of girls…
- Called gay or lesbian (10% of girls…
- Had clothing pulled off or down (16% of girls…
- Forced to do something sexual other than kissing (13% of girls…
- Spied on as they dressed or showered at school (7% of girls (Klein et al., 2010)

In a study done by Turner in 1995, "with students in grades six, seven, and eight…girls were more sensitive to verbal and physical harassment than boys" (Klein et al., 2010). Murnen and Smolak found in a study in 2000, "that girls were more likely to perceive sexual harassment as frightening whereas boys do not" (Klein et al., 2010).

Sadly, the harassment does not end in high school, "Researchers have also found that college classrooms have numerous instances of silent sexism" (Reis & Park, 2001). According to one study, "one-in-four college women claim[ed] to have been the recipient of unwanted or forceful sexual advances and as many as 25 percent of female doctoral students [reported] sexual encounters with faculty members responsible for their academic careers" (McCormick, 1995). Based on another study, "more than one in every three college men believ[ed] that a woman who says 'no' to sex really means 'yes,' or at least 'maybe.' According to one study, a shocking 30 percent of men admitted they would rape a woman if they thought they could get away with it" (Sadker & Sadker, 1994).

When students are harassed, what is the result? According to a 1993 study done by the AAUW,

> approximately 1 in 4 students (middle-school aged) who had been sexually harassed did not want to attend school or cut a class. In addition, 1 in 4 students became silent in their classes following their experience of sexual harassment…the following experiences, in rank order, [were also seen] among the students who were sexually harassed: embarrassment, self-consciousness, being less sure of themselves or less confident, feeling afraid or scared, doubting whether they could have a

> happy romantic relationship, feeling confused about who they are, feeling less popular. (Klein et al., 2010)

In another study, "33% of girls who reported experiencing sexual harassment no longer wished to attend school. Thirty-two percent of girls stated that talking in class was more difficult and 20% indicated they had received lower grades" (Klein et al., 2010). In a study by Roscoe et al. in 1994, "girls' experiences with sexual harassment creat[ed] an inhospitable learning experience" (Klein et al., 2010). In more recent studies, "Timmerman (2002) and Duffy, Wareham, and Walsh (2004) reported that sexual harassment of adolescents contributed to lower self-esteem and poorer psychological health" (Klein et al., 2010). In two other studies, one in 2004 done by Fineran and Gruber, and another by the AAUW, it was, "found that sexual harassment affected girls' behavior more than boys', with girls being taught to be fearful and avoid the situation rather than taking direct action to cease the sexual harassment…The AAUW study further reported that girls were less likely than boys to feel confident about themselves after incidents of sexual harassment" (Klein et al., 2010). Fineran and Gruber's study also found that, "sexual harassment diminished adolescents' physical and emotional health, resulting in increased post-traumatic stress" (Klein et al., 2010). Finally, Fineran and Gruber's study, "reported long-term effects from sexual harassment: depression, loss of self-esteem, lowered grades, [and] lost educational and job opportunities that affect students after high-school graduation" (Klein et al., 2010).

If a female also is gay or bisexual, it just compounds the issue. Fineran and Gruber's study from 2004 found that, "gay and bisexual students who were physically

sexually harassed had higher levels of school avoidant behavior than did heterosexual students who were physically harassed…gay and bisexual students who were verbally sexually harassed had more trauma symptoms and poorer emotional health than did heterosexual students who were verbally sexually harassed" (Klein et al., 2010).

With the mental and emotional stresses that females deal with outside of the classroom, there must be an effect on the students' mathematical self-concept inside the classroom as well, whether directly, or indirectly. Studies have shown over and over again that female students, in general, hold lower self-concepts in regards to their math and science abilities. According to Else-Quest, Hyde, & Linn (2010), even when looking with the same achievement or ability levels, male students, "felt more confident and less anxious in their math abilities and were more extrinsically and intrinsically motivated to do well" (Else-Quest et al., 2010). Even when affirmed by their teachers, there is no difference on this phenomenon. In a study done by Roeder and Gruhn (2000/2001), of female students in East Germany, when looking at these students that were of the same academic level as the male students, the female students, "estimate[d] their abilities in these subjects negatively and declare[d] that they have a lesser interest in them" (Roeder & Gruhn, 2000/2001). As early as elementary school, girls will start to doubt their abilities in math, "even when there [is] no significant difference in the achievement scores" (Tyler-Wood et al., 2012).

Test Scores Do Not Reflect Self-Concept

Female students generally tend to feel like they are just better at reading and English, whether their grades show it or not (Olszewsju-Kubilius & Turner, 2002). They, "generally have a higher verbal self-concept, while boys have a higher self-concept about

mathematics" (Muller, 1998). Again, Chouinard and Roy (2008) found, "when compared to boys with similar achievement levels, girls often demonstrate more anxiety and lower competence beliefs" (Chouinard & Roy, 2008). In yet another study by Wolters & Pintrich (1998), "females received higher average grades than males," and still showed an inconsistency between their ability and their perceived ability (Wolters & Pintrich, 1998). This same issue has been seen in females for many years. Campbell (1986) reported the same findings ten years prior, while Simplins et al. (2006) continued with the same result almost ten years later.

What is making girls look at themselves this way? In a study done by Wolters & Pintrich (1998), "females reported, on average, higher levels of self-efficacy in English than in mathematics or social studies;" (Wolters & Pintrich, 1998) reaffirming what was found in the other studies. They also found that, "fifth graders' beliefs about mathematics were more likely to be tied to their ability to do the work, while social studies beliefs were related to interest in the activities" (Wolters & Pintrich, 1998). In 2001, Koller et al. found similar results; "'We would expect a close relationship between perceived competence and intrinsic motivation such that the more competent a person perceives him- or herself to be at some activity, the more intrinsically motivated he or she will be at that activity" (Koller et al., 2001). In addition, "Support for this hypothesis was derived from evidence that students who experienced an increase in perceived competence following an educational transition showed gains in intrinsic motivation and school-related affect" (Koller et al., 2001). So does that mean that more time in these subjects is the solution? Unfortunately, Simplins et al. (2006) found that, "boys spent less time in math activities than girls. Boys,

however, had higher math self-concepts of ability at 6th grade than girls" (Simplins et al., 2006).

Again, if we look specifically just at high-achieving females, the results are not different. These students are still looking at their abilities differently than their equally skilled male counterparts. If a female student rates herself as excellent or good at mathematics, she is more likely to say that, "mathematics [is] a neutral or female domain more strongly than other females" (Forgasz et al., 2004). Kloosterman et al. (n.d.) found the same results. Regardless of their feelings of whether mathematics was a neutral domain or not, they still did not trust their own abilities. "High-achieving males had higher self-concept and higher standardized math test scores than high-achieving females. Also, high-achieving females were more influenced by their teachers and more likely than high-achieving males to regard 'hard work' as more important in their lives than 'chance or luck'" (Reis & Park, 2001). According to Williams (1998), "There is evidence to suggest that the self-concept of high achievers is actually similar to that of their average-ability peers" (Williams, 1998).

Do grades have an effect on female students' self-concept in terms of their mathematical ability? According to Olszewski-Kubilius and Turner (2002), "girls have lower math self-concepts as well as lower mathematics scores on standardized achievement tests, despite having higher math school grades" (Olszewski-Kubilius & Turner, 2002). While in 2006, Simplins et al. found, "Youths' course grades in math during 5th and 10th grade were positively associated with their math self-concept and interest in 6th grade" (Simplins et al., 2006). Finally Muller, back in 1998, found that, "girls may respond to

grades as an indicator of their mathematics ability differently from boys. Also grades (which are based on academic performance and behavior) may reflect ability differently for girls because girls are less likely to misbehave" (Muller 1998).

Standardized Tests Do Not Represent Female Students' Abilities

So it seems grades may have an effect on a students' mathematical self-concept. What happens when students have to take standardized tests? Standardized tests are a way of life for the American student; whether it be the American College Test (ACT) or Scholastic Aptitude Test (SAT) during the student's junior year in hopes to get into the college of his or her choice, or just the state mandated test that can come up anywhere from once a year to once a quarter depending on the state to check for how well that school is doing its job teaching that student. According to Sadker & Sadker (1994), "Females are the only group in America to begin school testing ahead and leave falling behind" (Sadker & Sadker, 1994). Numerous studies have shown that at the highest achieving levels, there is a continued scoring gap between males and females in standardized testing. Muller (1998) reported that, "These differences are most often found in students' performance on standardized achievement tests and strongest among the top-performing students" (Muller, 1998). Reis & Park (2001) also reported a, "decrease in gender differences on standardized measures [which] had occurred in mathematics and science during the last three decades…this decrease did not exist for talented girls in mathematics" (Reis & Park, 2001). Olszewski-Kubilius & Turner (2002) had nearly the same findings. "Although the gap in achievement test scores between males and females may be decreasing, the gap that still

remains seems largely attributable to differences in scores among the top 10% to 20%" (Olszewski-Kubilius & Turner, 2002).

> When we look at the impact of testing on female students,
>
> girls entering grade school score the same or better than boys in every sort of standardized intelligence test (except math), [but] by the time they are ready to take their college aptitude test (either the SATs or College Board Achievement Tests), girls have fallen behind boys in every academic area of testing. And this gap only deepens as their educations continue, with women doing noticeably worse than men on every graduate- and professional-school aptitude test" (McCormick, 1995)

If we look specifically at the SAT, even girls at the highest levels again, "typically score 83 points lower than a boy," at the same level (Sadker & Sadker, 1994). When looking at overall scores, Karp and Shakeshaft (1997) found, "between 1982 and 1995…females scored an average of 45.5 points less than males on the math section of the test…In addition, in the population of students designated as 'high scorers' (having scores between 750 and 800), the male-to-female ratio has consistently been 4:1 since 1992" (Karp & Shakeshaft, 1997). These results were reaffirmed by Reis and Park (2001), "Eight percent of males but only 3% of females scored 700 or greater…[of] males and females scoring 750 or higher, sex differences were even more pronounced" (Reis & Park, 2001). Even later, "In 2005, boys' average SAT I scores were 1051, while girls' scores were 1009. Thirty-four of the 42-point difference was due to sex differences in the SAT I: Mathematics" (Klein et al., 2010). Klein et al. (2010) found, "that females in advanced

high school mathematics have higher grades than their male classmates and the same female mathematics students receive lower SAT mathematics scores" (Klein et al., 2010).

How do these discrepancies in scoring effect not only females' self-esteem, but also their self-concept in mathematics and other subjects that were tested in the SAT? Let's look at the high achieving students again. First of all, in a study done by Reis and Park, "teachers were less accurate in nominating girls who were likely to do well on the quantitative subtest of the SAT than they were in naming boys who were likely to score high" (Reis & Park, 2001). Where is the disconnect? "Most [students] believe these test scores [SATs] are truer reflection of their real intelligence than report card grades." (Sadker & Sadker, 1994). Sadker and Sadker also found that, "After taking the SAT, [girls] may wonder if their excellent school grades were given for hard work rather than real intelligence" (Sadker & Sadker, 1994). And possibly, unfortunately, "female students are more apt than males to accept the SAT as an accurate assessment of their intelligence" (Karp & Shakeshaft, 1997). Finally, Klein et al. (2010) report, "Historically, the major stated purpose of the SAT has been to predict first year college grades, but it has always under predicted for females and overpredicted for males" (Klein et al., 2010).

Low SAT Scores Can Effect Scholarships

The real issues with the SAT and Preliminary Scholastic Aptitude Test (PSAT) are merely financial, "Boys score so much higher than girls on the PSAT that two out of three Merit semifinalists are male" (Sadker & Sadker, 1994). Scholarships can be won or lost by a student's Scholastic Aptitude Test-Mathematics (SAT-M) score as well (Karp & Shakeshaft, 1997). And more obviously, a lower SAT score will make it harder for a

student to be accepted into the college that student is looking to apply to. "Despite outstanding academic records, as a result of lower SAT-M scores, fewer females are admitted to the most prestigious colleges and universities. In some instances, excellent female mathematics students will not have the confidence to apply to schools that require higher scores than what they had achieved" (Karp & Shakeshaft, 1997).

The ACT is not any better. The ACT was originally written, "to mirror school learning" (Sadker & Sadker, 1994). If this is the case, high achieving girls should be doing well and there should not be the inconsistency between the scores of the girls and boys, yet, "boys' composite scores are higher and the gender gap persists" (Sadker & Sadker, 1994). More recently, Klein et al. (2010) found that, "Sex differences in the ACT composite score were minimal (boys, 21; girls, 20.9) while sex differences were small in mathematics scores" (Klein et al., 2010). These ACT scores can also have an effect financially. "In 1988, using SAT and ACT scores, New York awarded 72 percent of its Empire State Scholarships and 57 percent of its Regents Scholarships to boys" (Sadker & Sadker, 1994).

There is a disconnect in the scores between the girls and boys in the standardized tests for getting into post-secondary schooling, is this issue the tests themselves, or is it something bigger? Looking at other standardized testing, starting with the Iowa Tests of Educational Progress, "3^{rd}- through 12^{th}-grade males outperformed females at the upper percentiles (75^{th} and 90^{th}) in the math problem-solving ability and vocabulary areas" (Olszesski-Kubilius & Turner, 2002). In another school performance test, "boys outperformed girls at every grade level from grades 2-6 on the School and College Abilities Test (SCAT) when it was used off-level with high-achieving students" (Olszewski-

Kubilius & Turner, 2002). And again in, "third- through fifth-grade academically talented boys outscored equally able girls on mathematical concepts and mathematical applications subtests of the Sequential Tests of Educational Progress (STEP) and the Comprehensive Testing Program II test" (Olszewski-Kubilius & Turner, 2002). Again, there is a detriment to the discrepancies between the genders' scores. "Standardized tests…are used for entrance into gifted school programs at the elementary, middle, and high school levels…Thus, gender differences on standardized tests potentially have important consequences, especially for gifted girls, with respect to meeting eligibility requirements for programs that would further develop gifted students' abilities" (Olszewski-Kubilius & Turner, 2002).

Internationally things are not different either. Looking at both the Program for International Assessment (PISA) and Organisation for Economic Co-operation and Development (OECD) we see the same results. Else-Quest et al. (2010) found that the largest discrepancy was in math achievement, and this, "finding [was] consistent with historical evidence of gender differences in the spatial skill of mental rotation and with the neglect of spatial skill instruction in schools" (Else-Quest et al., 2010). Reilly (2012) reported that, "Gender differences across PISA partner nations…favored males" (Reilly, 2012). When looking at the OECD, Reilly (2012) reported that, "across all 34 OECD nations, there was a significant gender difference favoring males on mathematical literacy" (Reilly, 2012). Reilly (2012) did find that although there is a discrepancy in the scores of the male and female students in all the nations of the OECD, "Within the United States,

boys scored higher on mathematical literacy than girls,…the size of the gender differences was almost twice that of the OECD average" (Reilly, 2012).

Less Female Representation in Textbooks

There seems to be an ongoing issue with standardized tests. It may or may not have an effect on girls' self esteem and mathematical self-concept. There is also still an issue within the classroom as well. Girls are not seeing themselves represented in the textbooks that they learn from. Does this have an effect as well? McCormick (1995) found that, "In textbook after textbook, boys could find legions of male characters to emulate, with men dominating every list of leaders, discoverers, inventors, healers, artists, and authors" (McCormick, 1995). McCormick (1995) continues that, "boys and men were described as active agents and problem solvers and protagonists and heroes of stories and protagonists and heroes of stories while girls either failed to appear at all or were cast as passive foils and victims" (McCormick, 1995). Sadker and Sadker (1994) had the same results. "While men were involved in 150 different jobs, women were housewives. When they took off their aprons and discarded their dishtowels (the actual costume of the textbook housewife), they worked outside the home only as teachers and nurses" (Sadker & Sadker, 1994).

The discrepancy between the representations of girls and boys in books starts well before the textbooks they see in school. It begins in the books they are read as children by their parents and daycare workers even before stepping into school. In a review of two hundred children's books, "women are given traditional jobs ten times as often as nontraditional ones…Males in children's books remain in traditional roles as well…They are also overwhelmingly shown to be aggressive, argumentative, and competitive" (Sadker

et al., 2009). Even the best are not spared. "Caldecott winners from 1953 through 1971…had eleven times as many boys and men pictured as girls and women. When researchers counted animals, really people dressed in feathers and fur, the ratio became a staggering ninety-five to one. In one-third of the award winners, there were no women at all" (Sadker & Sadker, 1994). "Between 1967 and 1971, for every girl drawn in a Caldecott winner, eleven boys were pictured" (Sadker & Sadker, 1994). It doesn't stop with just a lack of representation either. "Children's literature and school texts routinely included derogatory comments about being female. For example: From the *LippincottBasic Reading Series*: 'Women's advice is never worth two pennies. Yours isn't worth even a penny'" (Sadker & Sadker, 1994). More recently, looking at two hundred Caldecott winners between 1995 and 2001, it was found that "contemporary children's books tell twice as many male-centered tales than female, and illustrations depict 50 percent more males. Although female characters appear in newer roles such as doctors, lawyers, and scientists, they are more often passive observers, watching their active brothers at work and at play" (Sadker et al., 2009). There may be improvement, but it is very little. "While more females are included, representation is far from equal, and starkly drawn stereotypes remain: competitive, creative, and active boys; dependent, submissive, and passive girls" (Sadker & Sadker, 1994).

When girls do get to school, they continue to read these books while learning to read themselves. In the past, it was more common to learn from reading textbooks. In a 1975 study of 134 elementary reading textbooks the following ratios were found, "boy-centered stories to girl-centered stories 5:2, Adult male characters to adult female

characters 3:1, Male biographies to female biographies 6:1, Male fairy tale stories to female fairy tale stories 4:1" (Sadker & Sadker, 1994). More recently, "male characters outnumber females two to one" (Klein et al., 2010). When looking at texts for proof of devotion to improvement to gender, "the four reading texts analyzed devote only 0.3% of content space" (Klein et al., 2010).

It does not matter the subject either. Even as early as elementary school, girls are already seeing boys dominate the pages of every book. And it doesn't even stop at books. "For example, in a study of elementary mathematics software only 12 percent of the characters were female. In their limited appearances, they were presented as mothers and princesses" (Sadker et al., 2009). The issue continues in the history books as well. "Studying history is a journey through time, but mostly a male journey. In telling the story of our national history, current elementary and high school social studies texts include five times more males than females" (Sadker et al., 2009). In an analysis of *Exploring Our World, Past and Present*, a sixth grade text published by Macmillan and D.C. Heath in 1992, Sadker and Sadker (1994) found,

> only eleven female names were mentioned, and not a single American adult woman was included. In the entire 631 pages of a textbook covering the history of the world, only seven pages related to women, either as famous individuals or as a general group. Two of the seven pages were about Samantha Smith, the fifth-grade Maine student who traveled to the Soviet Union on a peace mission. (Sadker & Sadker, 1994)

Again, things continue to go downhill when girls get older. As they get into high school the texts seem to mention females less and less. In an analysis of *World History: Traditions and New Directions* published by Addison-Wesley in 1991, Sadker and Sadker (1994) found,

> five times more men than women…pictured…approximately 2 percent of its attention to women. The index lists 596 men and 41 women, only four of whom are American: Ida Tarbell, Susan B. Anthony, Elizabeth Cady Stanton, and Gertrude Stein. Susan B. Anthony and Elizabeth Cady Stanton are mentioned together in a single sentence. Altogether, American women are covered in less than one page of [the] 819-page book. (Sadker & Sadker, 1994)

In an analysis of *A History of the United States* by Daniel Boorstin and Brooks Mather Kelley and published by Prentice-Hall in 1992, Sadker and Sadker (1994) found,

> The history of the nation unfolds against a backdrop of illustrations with four males for every female. Less than 3 percent of that history is about women. Only eight women in these thousand pages have as many as twenty-five lines (about a paragraph or two) written about them: Abigail Adams, Jane Addams, Rachel Carson, Dorothea Dix, Eleanor Roosevelt, and Harriet Beecher Stowe. The remaining two women in this history of the United States-Queen Elizabeth and Queen Isabella-are European. (Sadker & Sadker, 1994)

More recently, "In a popular history text published in 2005, there were eight full-page biographies of men, and only one female biography" (Sadker et al., 2009).

In subjects like English and history, it may seem like the discrepancy between the representations of the genders would be obvious. Studies analyzed by Sadker and Sadker (1994) even found that, "music texts indicate that almost 70 percent of music-related figures are male. When women appear in the text, they are singing or playing the piccolo, the maracas, or the flute. Men play a variety of instruments: saxophone, trombone, trumpet, bassoon, clarinet, double bass, and others. They also conduct groups of musicians" (Sadker & Sadker, 1994).

In a study comparing chemistry books of today to those of, "the early 1970s. Only two of the seven books that were analyzed showed improvement; on several measures, the remaining books actually got worse. Another recent study of five new science texts reveals that from two-thirds to three-quarters of drawings are of males. Not one of the five books analyzed included a drawing of a female scientist" (Sadker & Sadker, 1994).

There are a few governmental agencies that have been working on eliminating this issue. The National Science Foundation's programs, "include ADVANCE, Women in Engineering & Computer Science, and IT Workforce Research" (Klein et al., 2010). Also, the Department of Health and Human Services, specifically through both the Centers for Disease Control and Prevention and the Office of Women's Health provide,

> specific programs focused on gender includ[ing] demonstration programs in the Office of Adolescent Pregnancy Prevention…State Abstinence Education Program…Title V Social Security Act Programs…, and…abstinence-only until marriage grant programs, the Community-Based Abstinence Education/Special Programs of National and Regional Significance. (Klein et al., 2010)

Other than the NSF, "most of [the] federal assistance with gender \equity resources ended by 2003 when ED {Department of Education} decided to discontinue the WEEA Equity Resource Center and the Gender Equity Expert Panel, which was designed to encourage the production of replicable high quality and effective gender equity programs" (Klein et al., 2010). This may be part of the reason why, "the federal government needs to raise awareness among all educators in all contexts…even as local Title IX coordinators and other school officials implement policies to assess and insure gender equity in all aspects of the school climate" (Klein et al., 2010).

One possible solution is single-sex programs and single-sex education. Before moving forward with single-sex education, "educators who are concerned about advancing gender equity or even those who want to avoid lawsuits should consider using the remedial or affirmation action justifications in the 1975 Title IX regulations" (Klein et al., 2010). The 2006 regulations pose issues in such that, "educators should not implement a single-sex program unless they have clear and convincing evidence that what they plan to do will result in attaining educationally important objectives without increasing sex discrimination" (Klein et al., 2010). Regulations for single-sex classes or schools require that, "the excluded gender receives *substantially equal* educational opportunity in a single-sex or coeducational setting. Evaluations must be conducted every 2 years, at minimum" (Klein et al., 2010).

Single-Sex Education

One possible solution to dealing with the issues girls and women have in the classroom is to educate them in single-sex classes or schools. The idea of single-sex

education is a controversial one and there have been many ideas on how to implement it with less controversy. Schools that have chosen to experiment with the idea have left,

> lower and upper schools coeducational but offer single-sex middle schools since this is the time when female achievement and confidence decline. [Or] coeducational schools are trying out single-sex classes in courses like physics, where females have traditionally fallen behind. Some girls' schools…emphasize single-sex academics and coed extracurricular activities. (Sadker & Sadker, 1994)

Issues with Single-Sex Education

There is also an issue in the research behind single-sex education. Many aspects have hindered true progress, if it is possible through this strategy. Funding to track students, "in order to assess the long-term benefits…a lack of effective control groups…projects [using] the single-sex classroom to do more team projects and hands-on demonstrations while the students in mixed classrooms are subject to the same static lectures with no hands-on or active learning experiences" (Klein et al., 2010). In the U.S. we do not have significant research comparing Title IX girls and boys only schools to coed schools as a control. When comparing these schools, the research must include, "comparisons on sex stereotyping, as well as achievement, attitude, college enrollment, and career choices. Research must examine the culture of single-sex schools, including classroom interactions, curricular content, school climate, and organization" (Klein et al., 2010). If we could continue the research, even through, "small-scale studies of single-sex schools when they are well matched with comparable male and female and coed schools…[the researchers] should be able to document purposeful strategies used to decrease sex discrimination in

outcomes and to document efforts to counteract sex stereotyping in the philosophy and practices of the school" (Klein et al., 2010). We can then create, "a database of good-quality evaluations of single-sex interventions (schools, classes, and even after-school programs) [which] should be developed, and patterns among related clusters of interventions [can] be described" (Klein et al., 2010).

We have been lacking research in single-sex classrooms as well. "Single-gender classroom success, however, was untested in the public school sector" (Brown & Ronau, 2012). In the UK they have had a chance to study single-sex education. Researchers, "are firmly against a 'gendered pedagogy that emphasizes essentialist constructions of boys' and girls' learning styles'" (Klein et al., 2010).

Results from Research

The results from research that has been done has shown mixed results, but more towards a positive outcome for single-sex education. "An article in the October 27, 1993, *Education Week* stated that 'girls in all-girl schools take math and science courses at double the national average, do well in physics, and according to a study by Hunter College, outperform girls in coed schools on the AP calculus exam'" (Gerrity, 1994). Sadker and Sadker (1994) found that girls were benefitting from single-sex schools. "Girls in single-sex schools have higher self-esteem" (Sadker & Sadker, 1994). Girls have an increased level of self-esteem because, "all-female education provides 'an atmosphere these girls may well never find again in their lives: an island in our culture that is about women…one where their major responsibility is to learn and to be themselves" (Sadker & Sadker, 1994). The single-sex schools, "helped [girls] develop self-confidence, assertiveness, and a strong

sense of identity" (Sadker & Sadker, 1994). Riegle-Crumb et al. (2006) found that when in an all girls school, "self-concept, a key element in girls' achievement and persistence in science and math, also tends to increase" (Riegle-Crumb et al., 2006). King et al. (2010) studied a school district in 2007 that, "launched two single-sex middle-school academies…Grades and test scores improved, student attendance increased, discipline referrals decreased, and teachers felt more effective" (King et al., 2010). "Streitmatter studied one all-girls private school…where students reported [being] less distracted in all-girls settings, and having more positive attitudes toward math and science" (Klein et al., 2010). According to Brown and Ronau (2012), "researchers have shown that female students in single-sex schools outperform girls at coed schools within the private school sector" (Brown & Ronau, 2012). They also found that, "90% of the student population take[s] two full years of science and 'go[es] on to major in sciences at Stanford, UCLA, Yale, Princeton, Johns Hopkins, and yes, Harvard'" (Brown & Ronau, 2012).

These same mixed results, but more positive than negative, are seen when looking at just single-sex classrooms within coeducational schools, or some other form of single-sex grouping of students. Guzzetti and Williams (1996) found that, "females became more active participants when placed in same-sex groups" (Guzzetti & Williams, Sept. 1996). Lindstrom and Tracy (2003) had the same results. "Single-sex lab groups…'force[d]' girls to experience academic leadership as well as hands-on use of scientific equipment" (Lindstrom & Tracy, 2003). Klein et al. (2010) found that, "students reported [being] less distracted in all-girls settings, and having more positive attitudes toward math and science," in, "all-girl math and science classes in public coeducational schools" (Klein et al., 2010).

"Durost reported that girls enrolled in 'more math and science courses in high school, were more likely to consider a career involving math, had more self-confidence, and were more likely to show an increase in math scores from the eighth to the eleventh grade," when they were in single-gender middle school mathematics classes (Brown & Ronau, Feb. 2012).

Some studies did show negative results to single-gender education. Rodrich and Tracy (2001) found that, "females in [an] all-girls class tended to engage in note passing and social talk more than girls in the co-ed classes" (Rodrich & Tracy, Sept. 2001). The findings showed that stereotypical behavior intensified. "Females…tended to 'over support' one another, at the expense of engaging in healthy academic competition…Members of the all-girls class showed evidence of learned helplessness" (Rodrich & Tracy, Sept. 2001). Studies from AAUW show mixed results as well. "For example, girls reported an increased positive attitude and 'comfort level' toward science and mathematics, yet they showed a nonsignificant increase in science and math test score, grades, and standardized aptitude tests" (Rodrich & Tracy. Sept. 2001). Klein et al. (2010) reported that the, "research on single-sex schools is 'inconsistent,'…some studies point to higher achievement for females in single-sex schools (not classes)" (Klein et al., 2010). Klein et al. (2010) further reports that the research from all-girl schools has its critics. The main, "point that it is extremely difficult to know just how much of a role *selection bias* plays in their overall success" (Klein et al., 2010). There is also the thought that single-sex schools will limit issues with sexual harassment and distractions from the opposite sex. "Some have suggested that same-sex bullying and sexual harassment is just as prevalent in single-sex schools as in mixed sex schools…[and] the distraction argument makes the false

assumption of heterosexuality and ignores the issues confronting lesbian, gay, bisexual, or transgender students who may be more distracted in a single-sex classroom" (Klein et al., 2010). A different study,

> found that the sex-segregated schools increased sex discrimination…Boys tended to be taught in more regimented, traditional, and individualistic fashion, and girls in more nurturing, cooperative and open environments…the creation of separate academies for boys and girls on the same campus led to a dichotomous understanding of gender, where girls were seen as 'good' and boys were seen as 'bad.' (Klein et al., 2010)

Klenke (2012) found mixed results in a study, "conducted in the Republic of Trinidad and Tobago suggest[ing] that single sex schooling may be beneficial only for girls who 'prefer a single sex environment,' but is not 'inherently beneficial for boys or most girls'" (Klenke, 2012). Brown and Ronau (2012) also reported, "no significant difference in males or females regarding attitudes toward learning mathematics or science when separated by mixed- or single-gender class types. The only noted significant difference was with regard to science confidence when we combined all students" (Brown & Ronau, Feb. 2012).

Benefits of Single-Sex Education

Even though studies are mixed, while the studies are more positive, they do show that the benefits do not stop in high school. "Women from single-sex colleges benefit, too, exhibiting positive self-esteem and high academic and career achievement" (Sadker & Sadker, 1994).

> Graduates from women's colleges attain more degrees in nontraditional fields such as economics, life science, physical science, and mathematics. They are two or three times more likely than their coeducational peers to enter medical school; and, as advocates of women's colleges are quick to point out, their graduates are well represented in Fortune 500 companies and at the highest levels of government. (Sadker & Sadker, 1994)

Critics ask if the benefits can also transfer after the single-sex schooling is done and advocates will point out that again the benefits outweigh the negatives. "After years spent as first-class educational citizens, girls develop assertiveness, self-confidence, and leadership, skills that are typically acquired by the higher status gender. And this training, they say, endures" (Sadker & Sadker, 1994). Streitmatter (1998) also found the same results. Even though the critics felt that, "when they re-enter an integrated situation where they must compete with boys, they may be unable to do so. There is some evidence to the contrary" (Streitmatter, Nov. 1998). According to Sadker and Sadker (1994), it seems that the critics, "of girls' schools [seem to be] those who had graduated during the 1950s" (Sadker & Sadker, 1994). Younger women viewed the idea more positively. Another issue that some critics have with single-sex schools is that the female students receive the benefits, while, "leaving boys and the nation's coeducational system unchanged" (Sadker & Sadker, 1994).

Klein et al. (2010) found that,

> single-sex schools are often the most sexist, with teachers and students engaging in 'gender reinforcement' or 'sex-role stereotyping.' It is important to conduct

> research in both coed and single-sex environments on the most effective ways to go from awareness of gender inequalities in classroom interaction to actual behavioral changes where teachers and students routinely interact in gender equitable ways. (Klein et al., 2010)

If we teach to some, "supposed gender differences, what is the percentage of students who *don't* learn best in that way?" (Klein et al., 2010). Since most studies are missing an appropriate control school, "they fail to address the possibility that any achievement of other outcome differences may result from the unplanned differences in instructional or curricular aspects of the schools being compared and not the effect of planned single-sex or coed intervention per se" (Klein et al., 2010).

Other limitations in the research done on single-sex schooling includes that most of the research examines just, "girls schools, but state[s] their results in terms of single-sex versus coed schools, [and] it would be inappropriate since there would be no reason to assume that the positive or negative results also pertained to boys schools" (Klein et al., 2010). It is also difficult to generalize findings from some single-sex research, because, "numerous studies have been conducted internationally or in U.S. private schools or colleges" (Klein et al., 2010). This makes it hard to tell what the results might indicate in a public school.

Ways to Improve Single-Sex Education

One improvement that can be done to the research on single-sex education is through teacher training. Klein et al. (2010) found in multiple studies that there was a lack of teacher training for actual gender-related pedagogy. When looking at dual academies,

where boys and girls are just taught in separate classes; "they were primarily designed to increase school choice, but little thought or teacher training was provided to attend to any gender consciousness issues raised by this overt sex segregation" (Klein et al., 2010).

> Hubbard and Datnow found that the smaller classes and increased resources achieved through additional funding made a bigger difference to 'at-risk students' than the single-sex classes…there was little attention to the purposes of single-sex instruction to either address common socialization related needs of the male and female students or to counteract sex stereotyping. (Klein et al., 2010)

There has been an increase in single-sex education in the U.S. "While only five public single-sex high schools were still operating in 1996, a decade later, that number had jumped to over 30. In addition to new single-sex schools, school districts [were] also creating …single-sex classrooms with coed schools" (Sadker et al., 2009). With the 2006 changes to Title IX, "schools can now sex-segregate students without any specific reason" (Sadker et al., 2009). "If dual academies increase in number, it may be possible to design rigorous comparisons of all-male and all-female groups [that are] fairly well-matched…, or perhaps even study matched sex-segregated classes if the nature of the treatment to decrease sex discrimination is clear" (Klein et al., 2010). The 2006 Title IX changes also require two year evaluations (Klein et al., 2010). This allows for better regulation of the instruction, and comparable pedagogy between the different classes/schools.

How do girls feel about themselves after working in a single-sex environment? According to Guzzetti and Williams (1996), if girls were allowed to work in all-girl small groups or labs they would participate more because they felt more secure. Sadker and

Sadker (1994) found girls in an all-girl science room, "literally burying her [the teacher] under an avalanche of interrogation, but as we watched, we [became] convinced they were driven by genuine curiosity and a desire to understand" (Sadker & Sadker, 1994). Streitmatter (1998) had a girl report, "It seems as though I don't work as hard as I used to [in mixed-sex classes] but I'm getting just as much done" (Streitmatter, Nov. 1998). Girls also said they found, "enjoyment from being with only girls and feeling less pressure to 'perform for boys'" (Streitmatter, Nov. 1998). Lastly, also from Streitmatter's research,

> Although only 3 of the 12 girls reported that they registered for the single-sex class because they wanted to participate in a girls-only experience (the other 9 said they enrolled because it was the only class that fit their schedule), all of them spoke of recommending it to other girls because it was fun and made learning easier than they imagined it would be in a mixed setting." (Streitmatter, Nov. 1998)

Single-sex schooling has gone through trends in U.S. education and is currently on a trend of dual academies being the most popular version. All types of gender specific schooling has a lot of research that can still be done to see what may be best for all students and hopefully we will see school districts willing to continue to innovate in ways to help students learn.

Biological Differences Between the Genders and Learning

In the late 1800s, it was believed the men and women's biology affected their intelligence. Women were told, "prolonged coeducation was physically dangerous to [their] reproductive health…During the teenage years girls developed their reproductive organs, and 'periodicity' (menstruation) was of central importance. If young women

attended school during formative adolescence, blood would be diverted from these reproductive organs to the brain" (Sadker & Sadker 1994). The superintendent of Detroit's public schools in 1889 was so moved by this that he worked on getting an elevator for the women so they wouldn't strain themselves. It became such a wide-spread theory that people believed, "women were often physically unsexed by the strains of study" (Sadker & Sadker 1994).

More recently, physicians relied on craniology as a means of determining intelligence. "Craniology taught that brain size revealed intelligence" (Sadker & Sadker 1994). Because of childbirth, women naturally have smaller skull sizes then men. And then there is Charles Murray, "coauthor of *The Bell Curve* in 1994, [who] continues to argue [even into 2005] that male dominance in the mathematical and theoretical fields can be explained by their larger brain mass" (Klein et al. 2010).

Today, most neuroscientists agree that very few actual biological brain differences exist between boys and girls. One difference that does exist would be that, "boys' brains finish growing a year or two later during puberty" (Eliot 2010) than girls' brains. This difference does not affect mental development. Also, "boys' brains are about 10 percent larger than those of girls" (Eliot 2010). The area of the brain that does depend on self-regulatory abilities is the prefrontal cortex and neuroscientists have not been able, "to show that this area develops earlier or is more active in girls" (Eliot 2010).

In the most recent research, studies have shown that hormone fluctuations may affect student learning and learning styles. "Women's performances at certain tasks changed throughout the menstrual cycle as levels of estrogen varied. High levels of the

hormone were associated not only with relatively depressed spatial ability but also with enhanced speech and manual skill tasks" (Kimura, 2002).

Synthesis of the Literature Review

Many factors are making girls not do as well as boys in mathematics, science, and engineering classrooms. These stem from historical, stereotype threat, internal self-esteem and self-concept issues, as well as external issues with curriculum, parents, teachers, counselors, and administration. The background to gender equity is a never-ending discussion in itself and I did my best to cover what I could without deciding to devote the rest of my career to this endeavor. In the next chapter I will detail how I'm going to take this information and set up my research in my classroom to try to combat the gender equity issue at a scale that I may be able to see a difference.

CHAPTER THREE

Methods

Introduction

Research on gender equity in education shows that there is still more work to be done to improve female students' learning in the math and sciences. To research and evaluate my capstone question, How can a self-esteem curriculum in a mathematics classroom increase the confidence and ability of female students?, I decided to teach a self-esteem curriculum to classes at the high school level with single-sex and mixed-gender grouping.

Setting

I performed my research at the high school I teach at. In the 2016-2017 school year, the students at my school and in my classes consisted of over 95% free and reduced lunch. The main ethnicities in my school were African American, Asian American (mostly Hmong and Karen cultures), Hispanic, and European American. The classes involved in my research consisted of one all-male Geometry class, one all-female Geometry class and one mixed gender Geometry class.

The school I teach at is an inner city high school. The school is a STEM magnet for the district I am in. We are a full secondary school that starts at 6th grade and continues through 12th grade. We have two focuses that students can enter into at the high school level, either engineering or biomedical science.

The school consists of mostly Caucasian middle class teachers and staff. There are two African American teachers and an African American principal. The mathematics department consists of two women and one man and the science department consists of two men and one woman. Overall, there are more female teachers in the school than male.

Participants

My participants consisted of students from 5 geometry classes; three that I taught and two that were taught by a coworker. The students in the classes were in grades 9th through 12th grade. There were a total of 121 students, with 56 males and 65 females. During the course of the research, 2 students left the school, 2 students started at the school, and 4 students transferred to a different teacher.

Of the 117 remaining students, 10 had IEPs and 40 qualified for ELL services. 26 students were part of the AVID program in school.

Since almost all of my students were under the age of 18 years old, I had their parents or guardians fill out a consent form for my research either appropriate to being a student in one of my classes or one of the control classes. (See Appendix A)

Methods

I used a mixed method approach to my research by collecting both qualitative and quantitative data (Creswell, 2009). I chose to use a mixed method approach since I really

wanted to see if students were seeing any difference in their self-concept and self-esteem as well as their actual mathematics ability. Looking back to chapter two and Klein et al. (2010), students that are being harassed are less confident and if they are less confident they are less likely to attend school, more likely to skip classes, and more likely to suffer in class. I felt that the only way to try to see if my students were seeing any improvement in their self-esteem or self-concept would be through qualitative measures, while it would be easy to see an improvement to mathematical ability in a quantitative approach.

I received quantitative data from assessment tests of the actual geometry units being studied in the classroom. The geometry professional learning community had pre- and post-tests for each unit (see Appendix B). For qualitative data, I administered surveys to the students to assess their self-esteem, self-confidence, and self-concept level, before and after the research (see Appendix C).

The surveys were developed by me by searching for self-esteem, self-confidence, and self-concept online. I filtered through different survey statements to look for the best that I felt would ask what I wanted to really evaluate in my students. I also added some specific statements of my own that dealt with mathematics ability. I gave the surveys to students under the pretense that it was simply surveys for my masters. Students at our school fill out surveys often for different reasons so they are not surprised if they are asked to fill out a survey.

Data Analysis

For my research, I taught three Geometry classrooms the exact same curriculum for one quarter during the fall semester of 2016-2017. At the same time, my coworkers also

taught Geometry classes which were learning the same curriculum. The students in my classes were then taught using a self-esteem, self-confidence boosting curriculum within the general Geometry classroom. The self-esteem curriculum consisted of community building activities, self-esteem improving activities, and self-concept activities that I found on the internet. I included some examples in Appendix D. One of my three classes was put into single-sex groups the entire quarter. Another one of my classes was put into single-sex groups while working on the self-esteem activities, but was in mixed-gender groups the rest of the time. The last class was always in mixed-gender groups.

I administered a survey to all the students to access their attitudes on mathematics, their confidence in mathematics, and their opinions toward school in general. After conducting the survey, I began teaching the classes by administering a pre-test to check for prior understanding of the subject matter to determine any improvement throughout the unit. The students were then taught the same curriculum, including the same assignments, same quizzes, and same lectures. Finally, I ended the research with a post-test given to all students to see any improvement on their learning.

I also gave another survey to conclude the research. I asked the students how they felt after the class was over. Students were reassessed on their attitudes in mathematics, confidence in their ability, and feelings toward school. The pre-test and post-test results would show if there was improvement and learning by the students in the different classes. The amount of improvement will then be compared between the classes to see if there was a more significant improvement in the single-sex classrooms or in the mixed-gender

classroom. The different genders' results were also compared to each other as a group as well.

The incoming and outgoing surveys were used to show if there was an improvement in the general confidence of the students within the single-sex or gender mixed classrooms. The surveys were also compared between the girls and boys in the single-sex classes, as well between the girls and boys in the mixed gender class.

Research Summary

Through the use of surveys and academic test results, I was able to see the effects of teaching a self-esteem curriculum within a high school mathematics classroom and the use of single-sex versus mixed-gender grouping on students. The results of this research will be examined in the following chapter.

CHAPTER FOUR

Results

Introduction

By looking at 150 different geometry students' pre- and post-assessments on a specific unit, as well as a personal survey of their feelings about math curriculum and school in general, I was able to get an idea of how they felt about whether my research was making a difference on their learning. How can a self-esteem curriculum in a mathematics classroom increase the confidence and ability of female students?

Self-Esteem Survey

To start the process, I had all the participants fill out a survey on self-esteem, self-concept, and overall feelings toward mathematics and school. This survey can be seen in Appendix C.

The survey involved asking the students their thoughts on their self-esteem, self-concept, as well as how they felt about mathematics, school, and general demographics to separate the different students into preferred analytic groups.

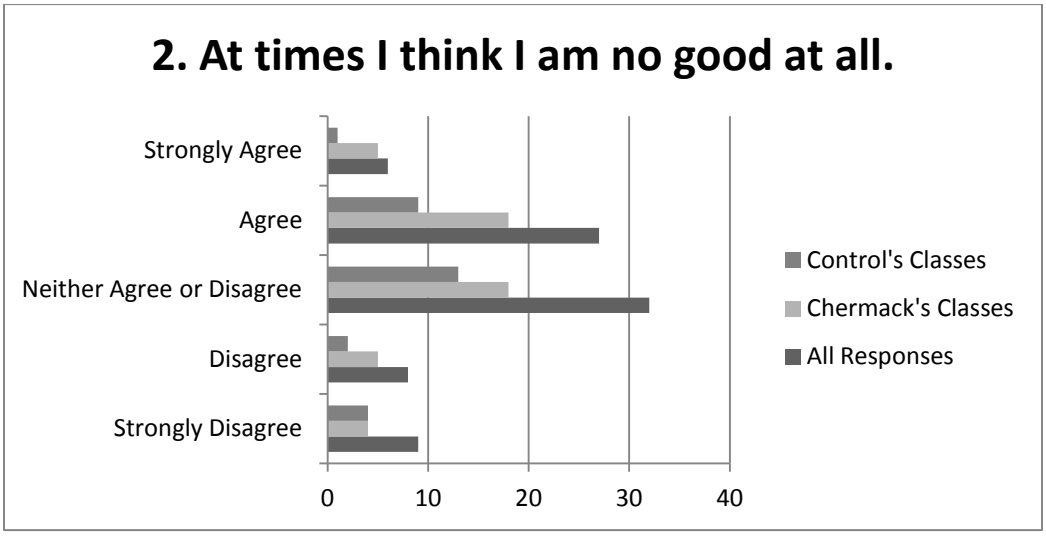
Results from first Self-Esteem Survey

I was able to receive 86 responses from the first self-esteem survey. Of those students that responded, three needed to be removed from the data due to lack of parental consent. Another three students were removed from the data due to not having taken the follow-up survey at the end of the research.

While looking at all of the student responses, I chose to examine the following self-esteem related questions from the survey: 2. At times I think I am no good at all. 4. I am able to do things as well as most other people. 5. I feel I do not have much to be proud of. 6. I certainly feel useless at times. 8. I wish I could have more respect for myself. And 21. I care too much about my weight and body shape.

Figures 4.1-4.3 show the results to question #2.

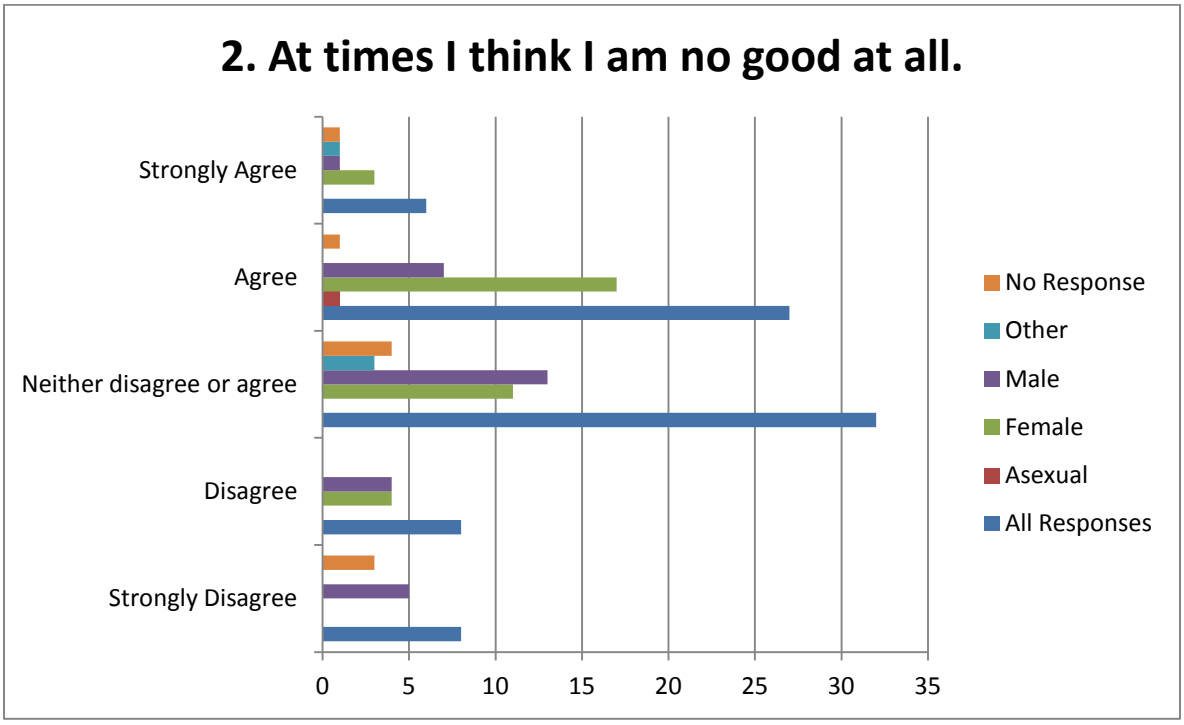
Figure 4.1



When looking at this first question, I was wondering if the double-negative may have confused some of the students. Looking at the first graph, we can see that the students

overall did not show much of a difference between classes. There was mostly a normal curve with a slight skew toward the agreement of not feeling good at all.

Figure 4.2



I find it interesting to see that after comparing this question by gender, you can start to see some discrepancy in the responses. Female responses definitely are more skewed towards the agreement side, while the male responses are more skewed toward the disagreement side of the graph. The other genders, asexual and no response answers were too insignificant a number to find a pattern.

Figure 4.3

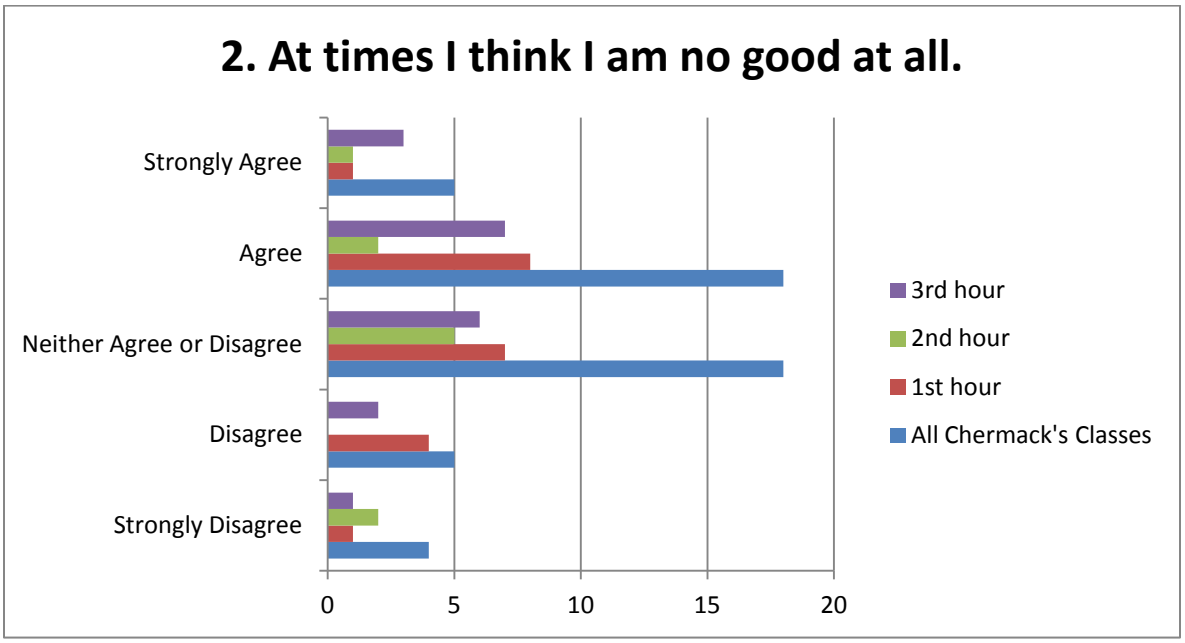
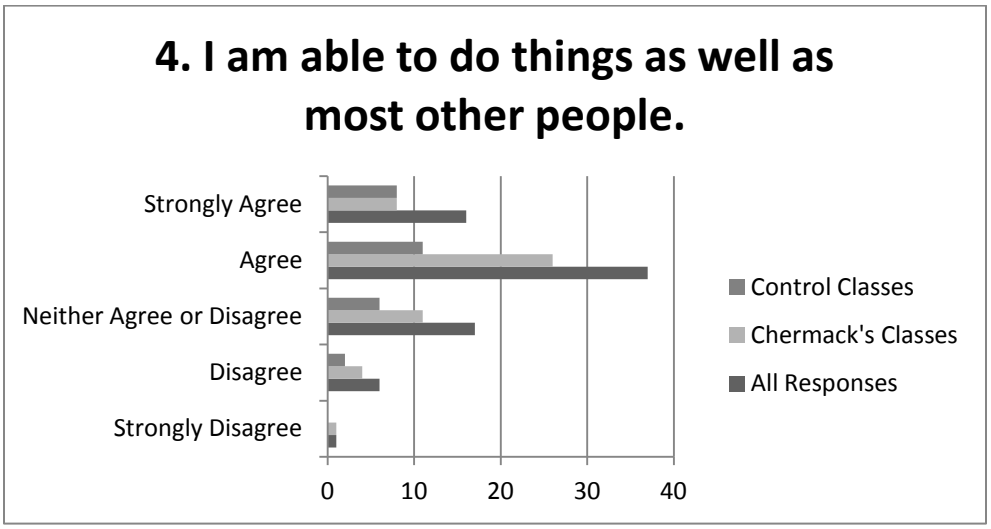


Figure 4.3 shows an interesting distinction between the gender-segregated class and the other two classes that I am teaching. In the class that is being kept in gender-segregated groups, there was more of a classic normal curve on this question, while in the other two classes, there was more of a skew toward the agreement side of the graph showing that the students felt they did not feel they were good at all.

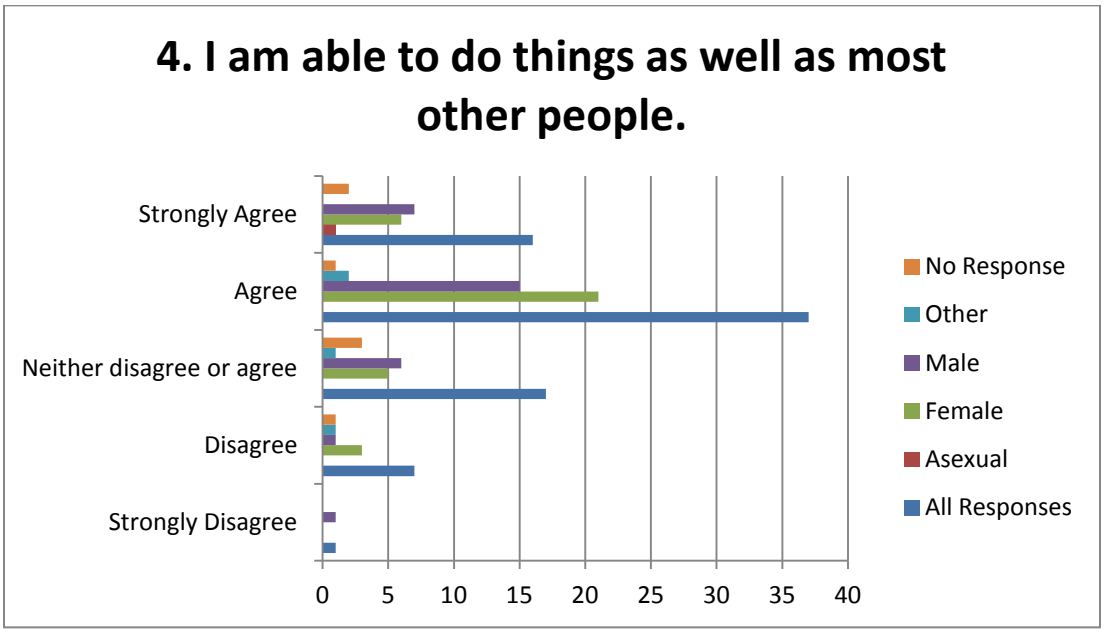
Figures 4.4-4.6 show the results of question #4.

Figure 4.4



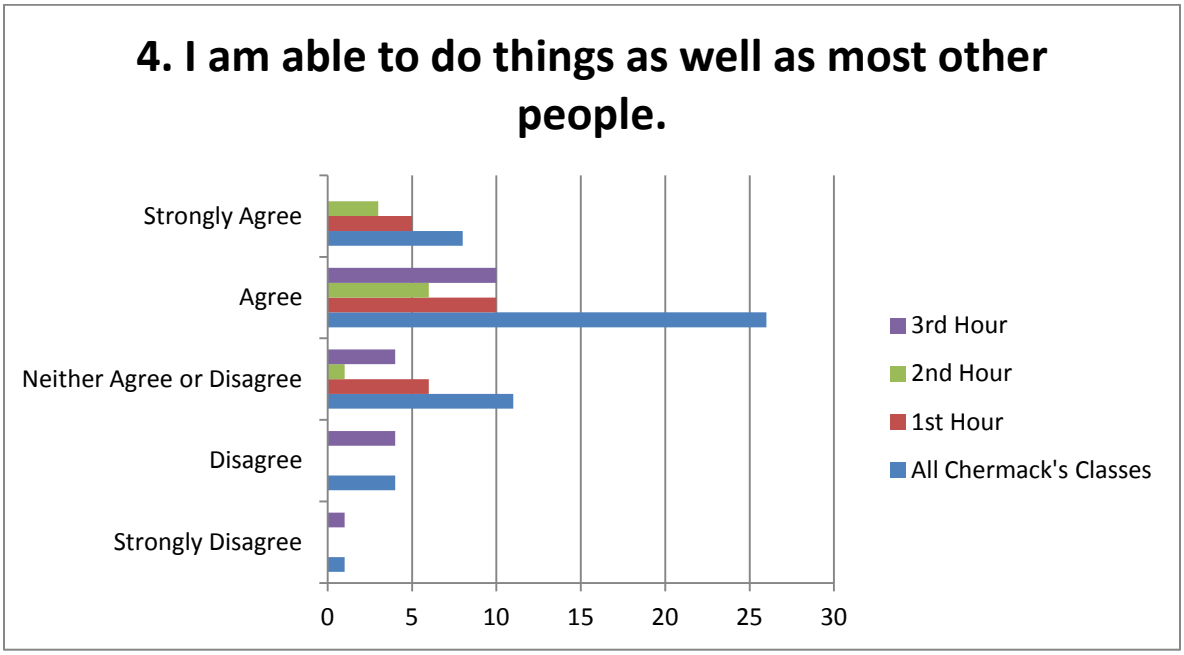
Looking at *Figure 4.4*, we can see that there really was no discrepancy again between the classes in their responses to question 4. I found a normal curve with a definite skew toward the agreement side of the statement on whether the students felt like they were able to do things as well as most other people.

Figure 4.5



Opening this question up to gender did not show any significant differences in the responses between the different genders.

Figure 4.6



In this question, there was discrepancy between the gender-mixed grouping at all times class and the other two classes. In my gender-mixed classes, those were the only students that gave disagreeing responses to this question.

Figures 4.7-4.9 show the results from question #5.

Figure 4.7

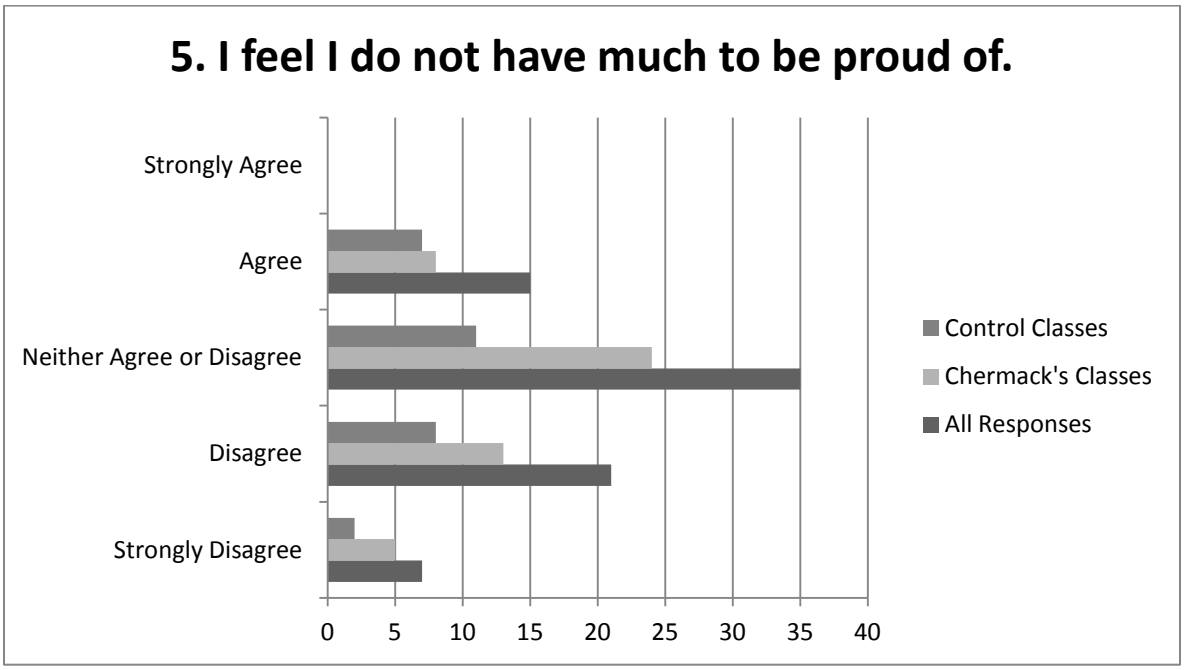
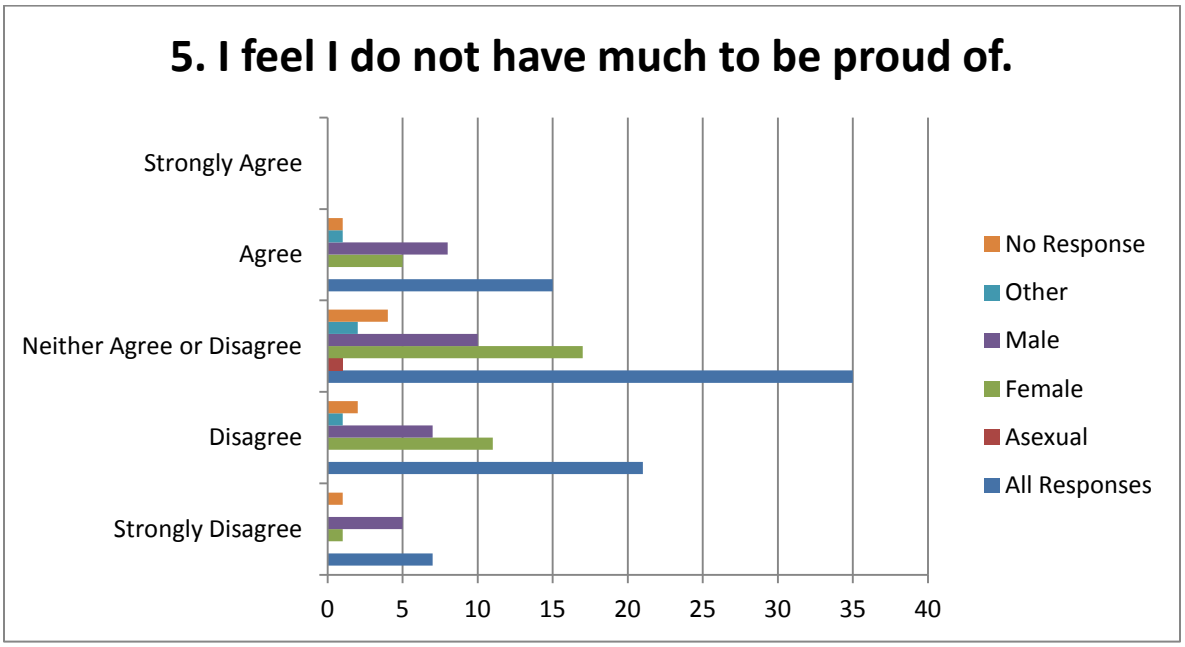


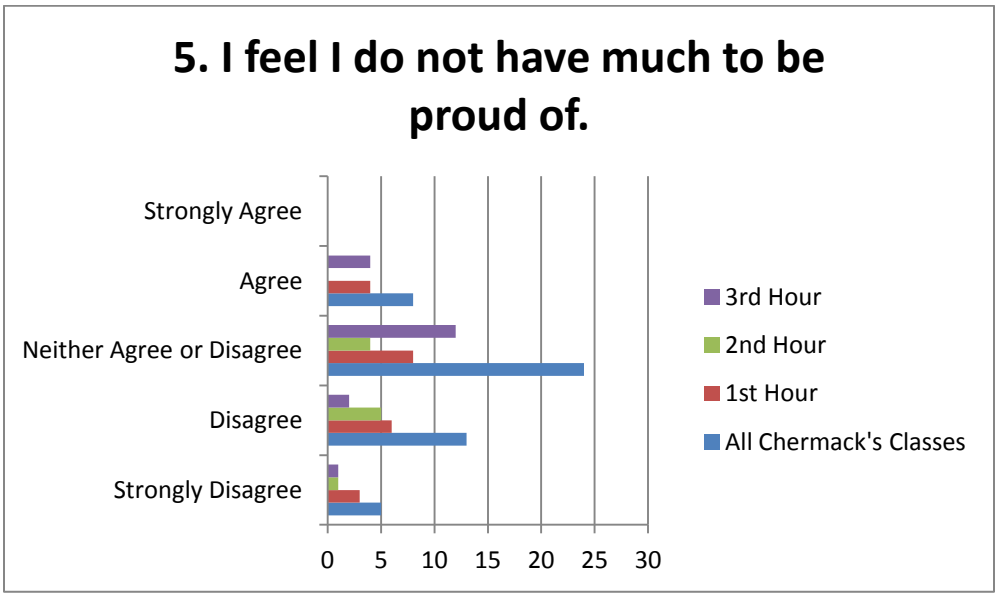
Figure 4.7 showed that across all the classes, most students felt positive about themselves if they were understanding the double-negative in the statement. The graph showed the responses skewed towards the disagreement to the statement that the students felt they did not have much to be proud of.

Figure 4.8



Looking at *Figure 4.8*, I can see what looks like the beginning of the female responses skewing more towards the disagreement side of the graph, while the male responses are still more shaped like a normal curve.

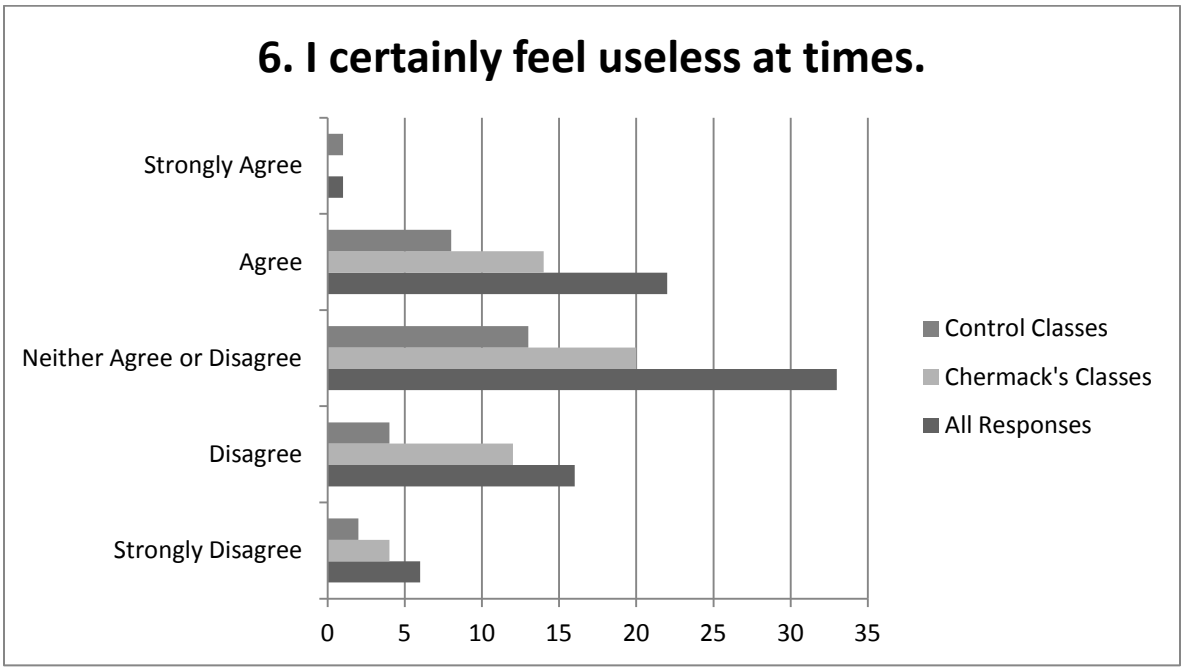
Figure 4.9



All three classes showed differences in how they responded to this question. The gender-segregated grouping class (2nd hour) showed more of a tendency to disagree with the statement that they felt they did not have much to feel proud of. The gender-mixed grouping class (3rd hour) showed almost all neutral responses, while the class that had gender-segregation only during their self-esteem curriculum (1st hour) showed more of a normal curve with a skew towards the disagreement side of the graph.

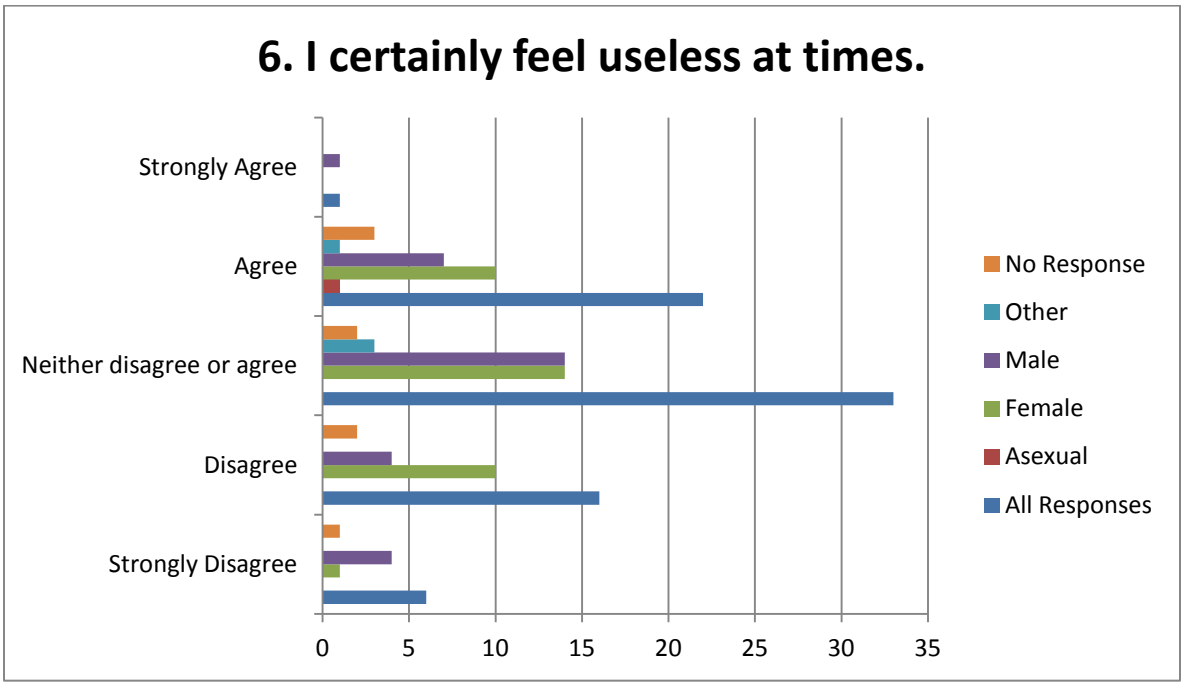
Figures 4.10-4.12 show the results from question #6.

Figure 4.10



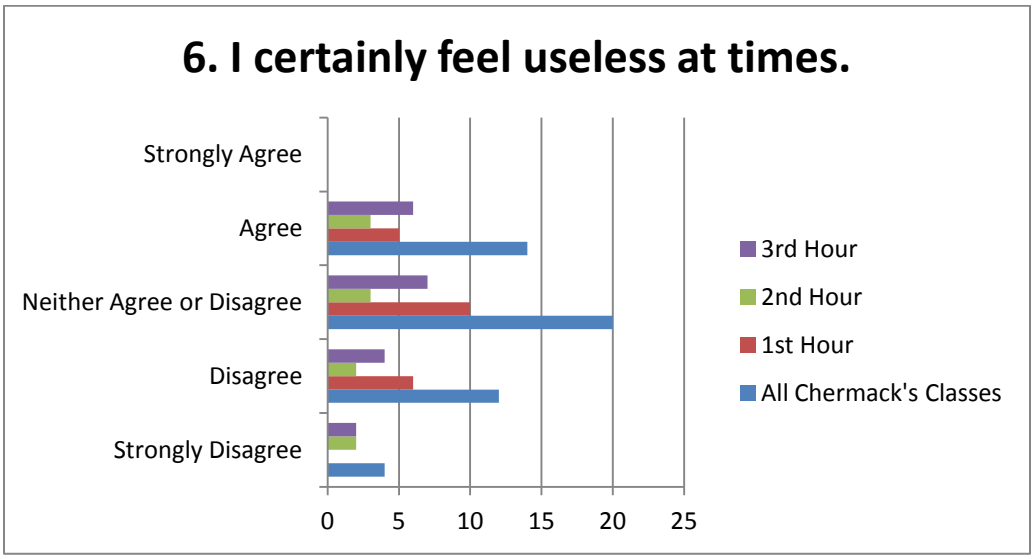
This was probably the first question I could see a discrepancy at the class level. It looked like in the control classes, the responses were shaped like a normal curve, while in my classes, the responses were more skewed in the disagreement side of the graph showing the students disagreed with the statement that they felt useless at times.

Figure 4.11



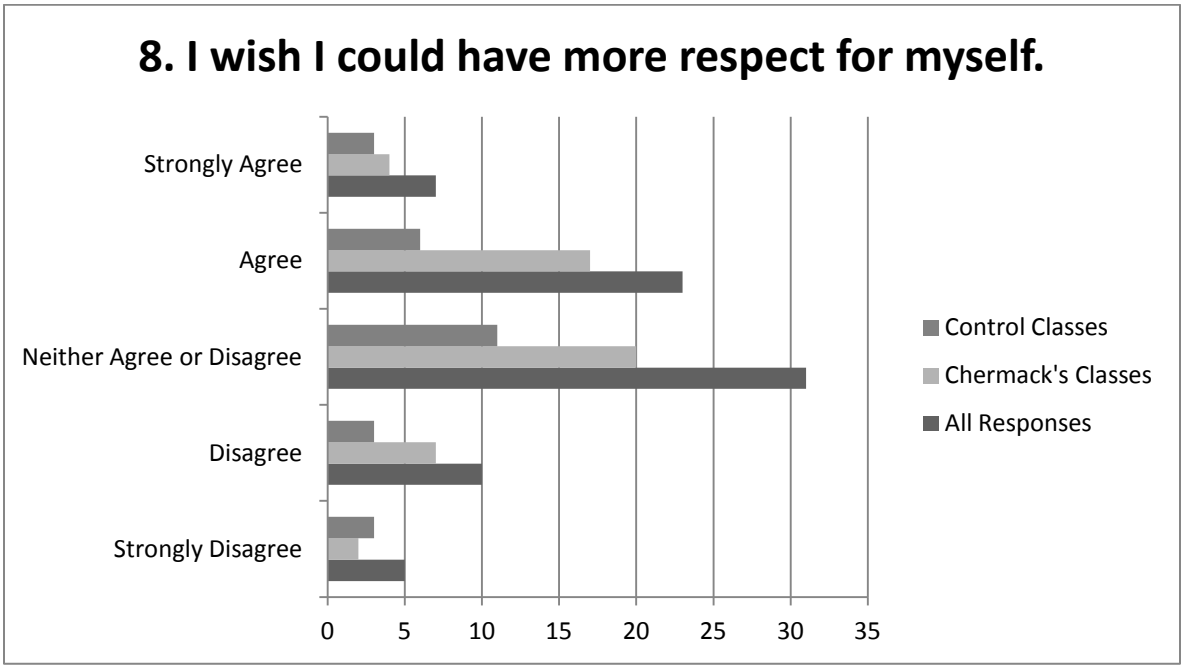
Looking at *Figure 4.11*, I can see that the discrepancy on this question continues while looking at the genders. Males seemed to be more of a normal curve, while females were skewed more towards the disagreement side of the graph.

Figure 4.12



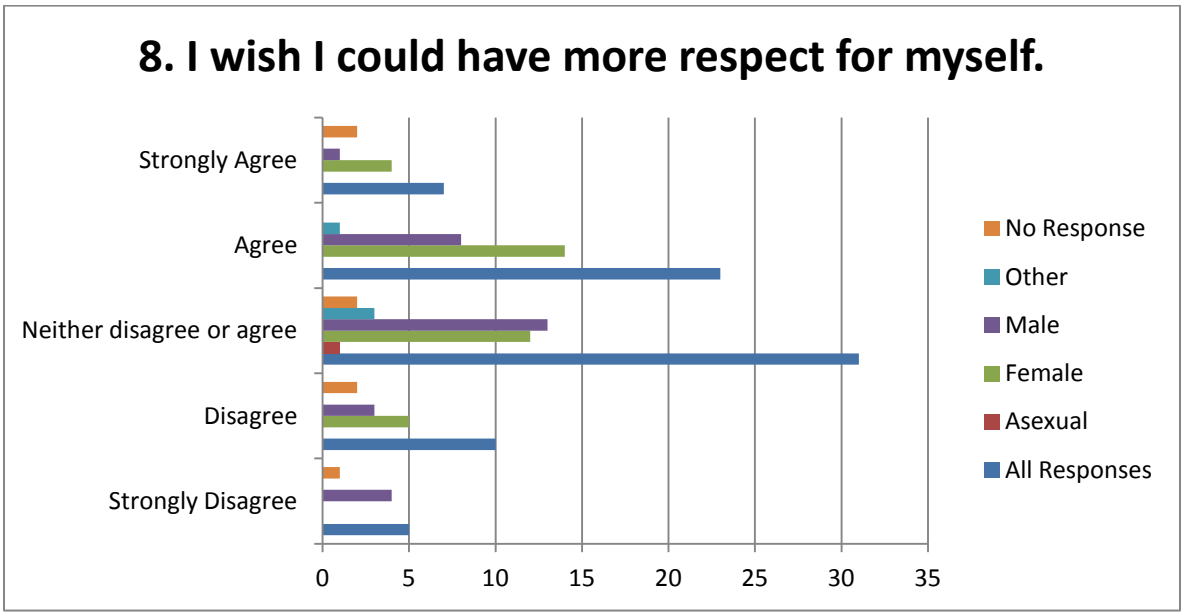
There really didn't seem to be much of a discrepancy between my three classes. Figures 4.13-4.15 show the results from question #8.

Figure 4.13



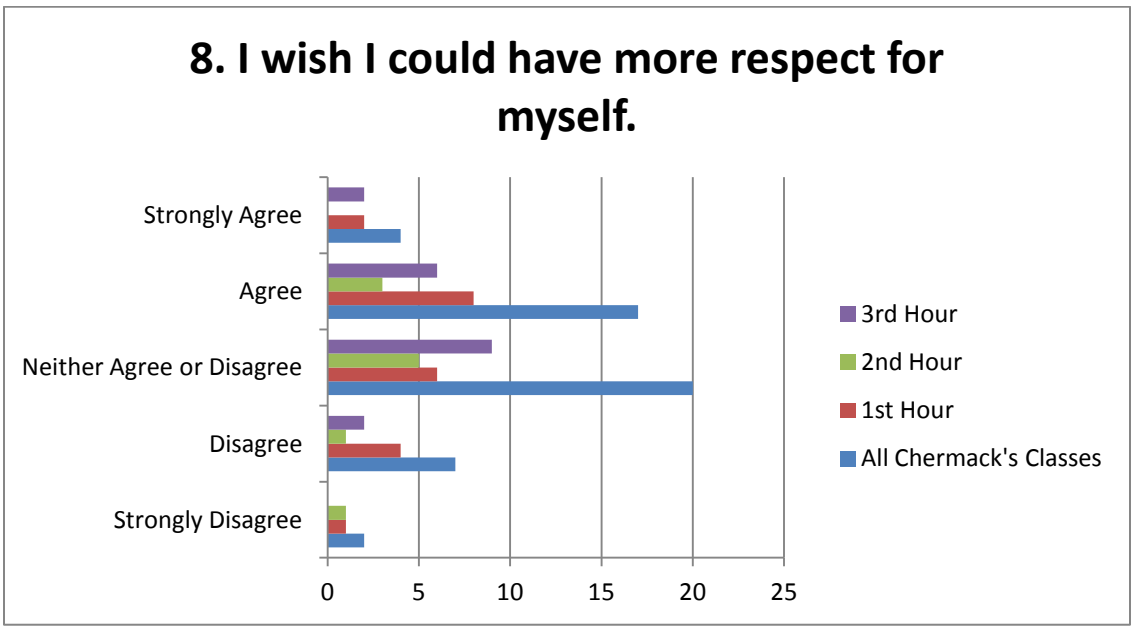
Looking at this question, there was little discrepancy between the classes, except the control class had more students that were confident enough choosing an extreme disagreeing response to wishing they had more respect for themselves. Otherwise, both classes showed mostly a normal curve in their responses.

Figure 4.14



Looking at *Figure 4.14*, I can see a definite difference in the genders. Males had more of a skew towards the disagreement side of the graph, while females skewed more towards the agreement side that they do wish they could have more respect for themselves.

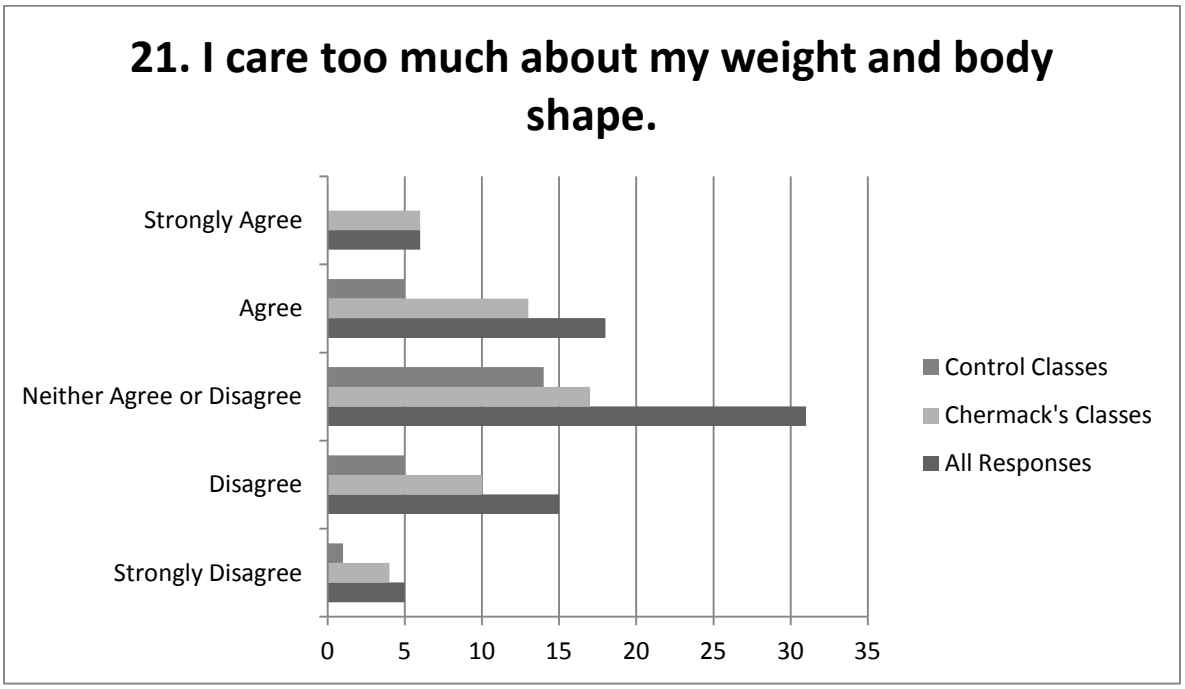
Figure 4.15



There was definitely a discrepancy between all three of my classes in their responses to this question. The gender-segregated grouping class showed more of a tendency toward disagreeing with the statement that they felt they wish they could have more respect for themselves. The gender-mixed grouping class showed more of a tendency toward agreeing with the statement and the class that had gender-segregation during the self-esteem curriculum showed more of a normal curve.

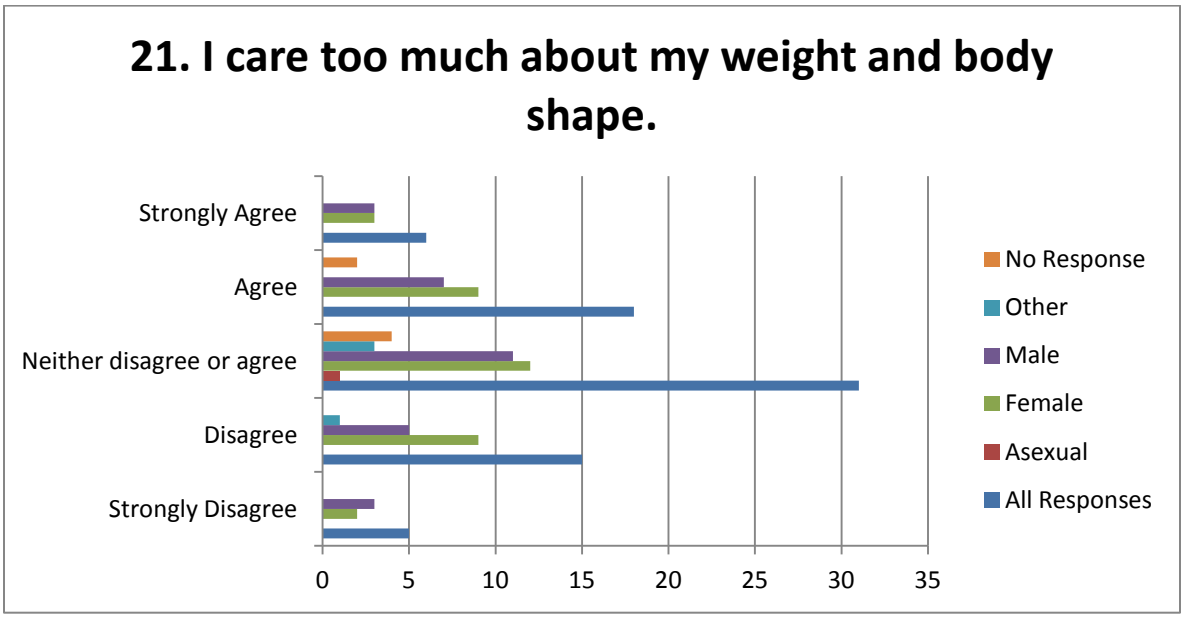
Figures 4.16-4.18 show the results of question #21.

Figure 4.16



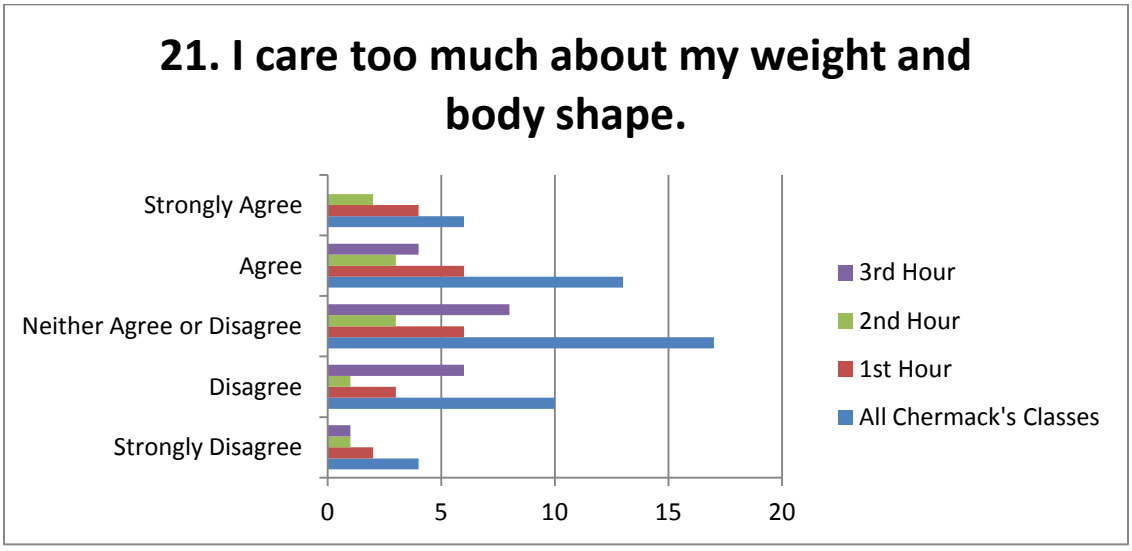
Looking at question 21, there was little difference in the classes. Both classes showed mostly a classic normal curve.

4.17



Looking at *Figure 4.17*, I can see a very slight discrepancy between the male and female responses. Both are showing normal curves, but the male responses are slightly skewing towards the agreement side of the graph that they do care too much about their weight and body shape.

Figure 4.18

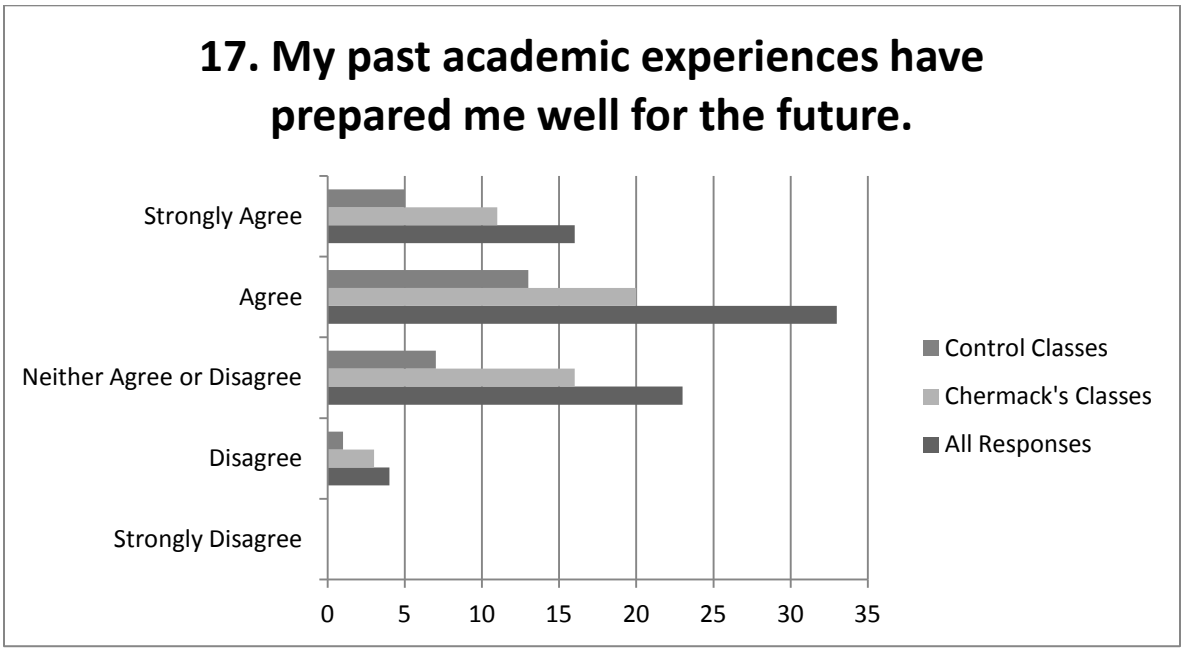


This question did not show a very discernible difference between my classes. For the most part they all showed a flattened normal curve when responding to this question.

I chose the following questions to analyze further that looked at how students responded to school and their feelings of math as a subject: 17. My past academic experiences have prepared me well for the future. 18. I get the grades that I want in my classes. 22. I like math class. 23. I receive good grades in my math classes. And 24. My math classes reflect how well I really understand math.

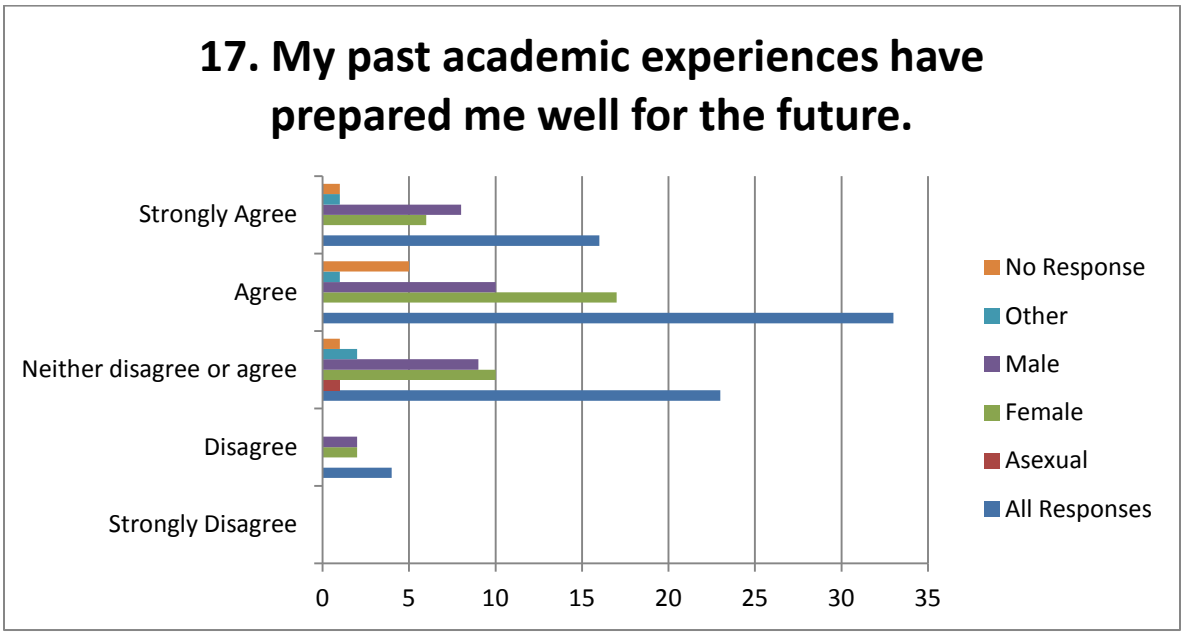
Figures 4.19-4.21 show the results from question #17.

Figure 4.19



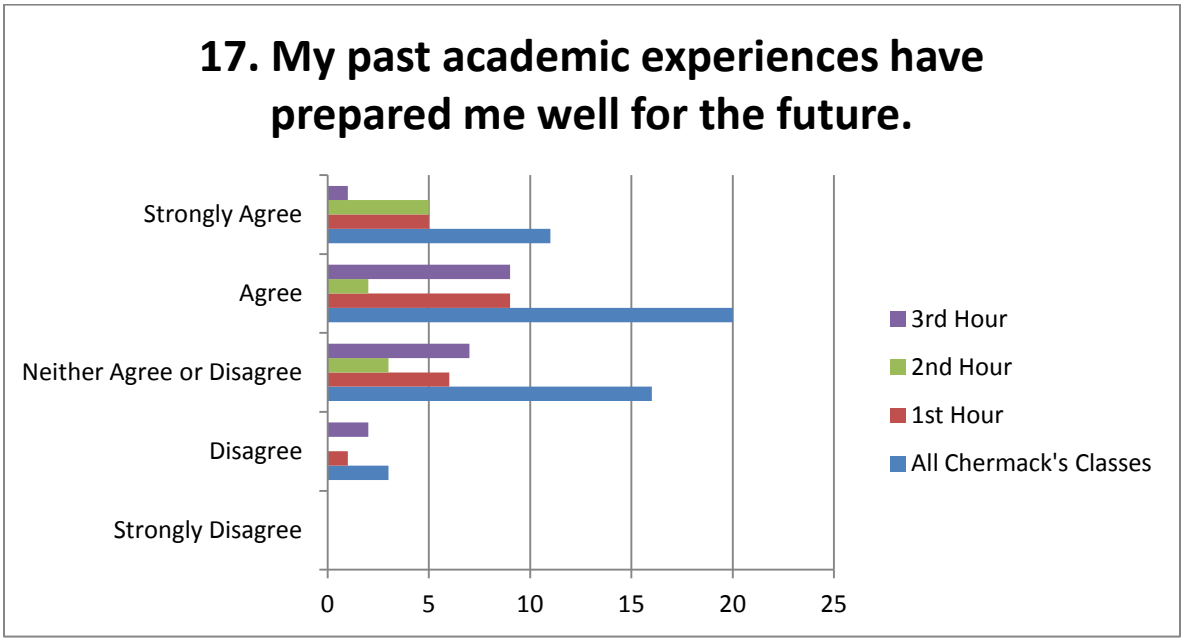
Looking at question 17, students felt mostly positive about their past academic experiences. And looking at *Figure 4.19*, it seems like there was no discrepancy between the classes on how the students perceived their past academic experiences.

Figure 4.20



Looking at *Figure 4.20*, there also seemed to be no discrepancy between the different genders no their perceptions of their past academic experiences.

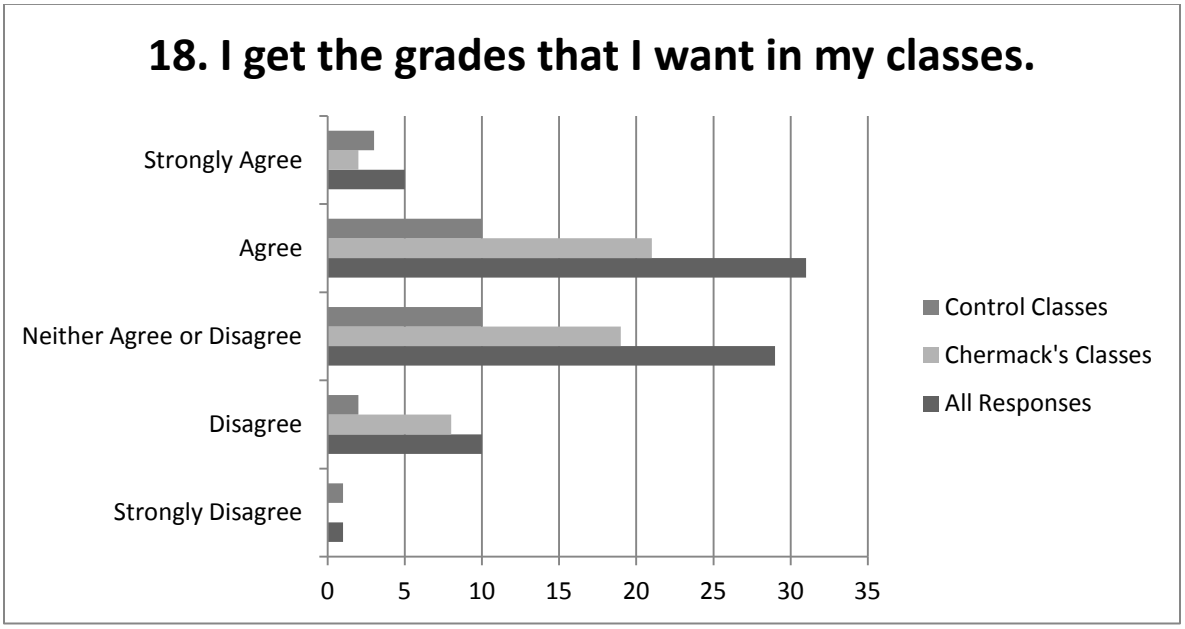
Figure 4.21



Even though all of my classes show a trend toward the positive side of the graph, the gender-segregated groups class has a much stronger trend toward the agreement side showing how they felt their past academic experiences prepared them for the future.

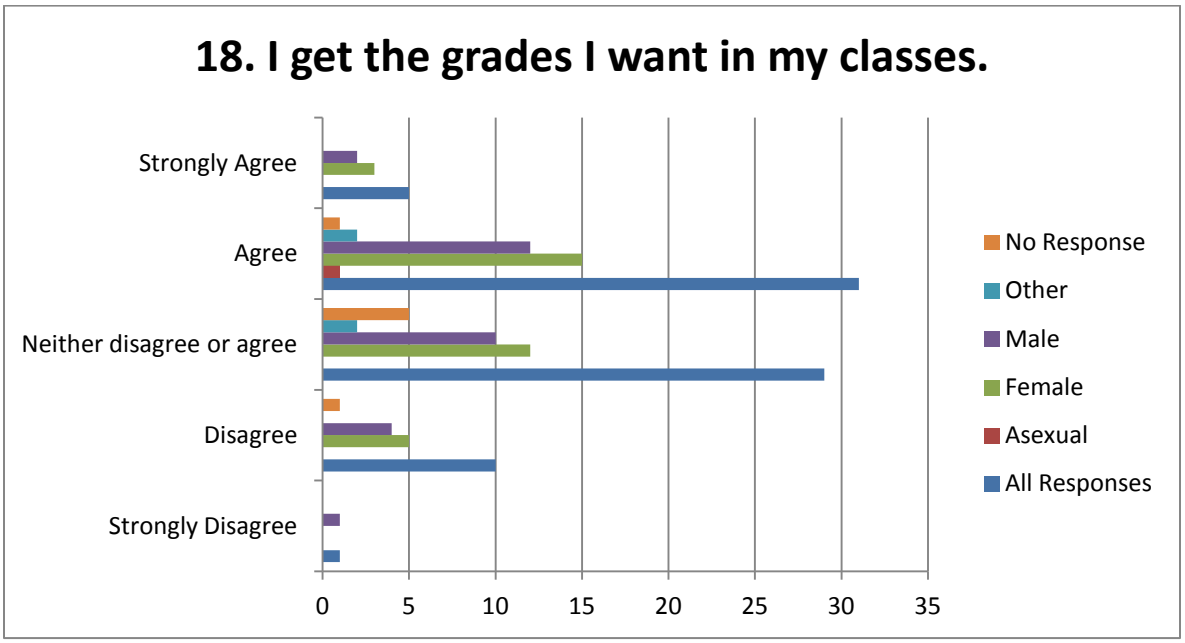
Figures 4.22-4.24 show the results from question #18.

Figure 4.22



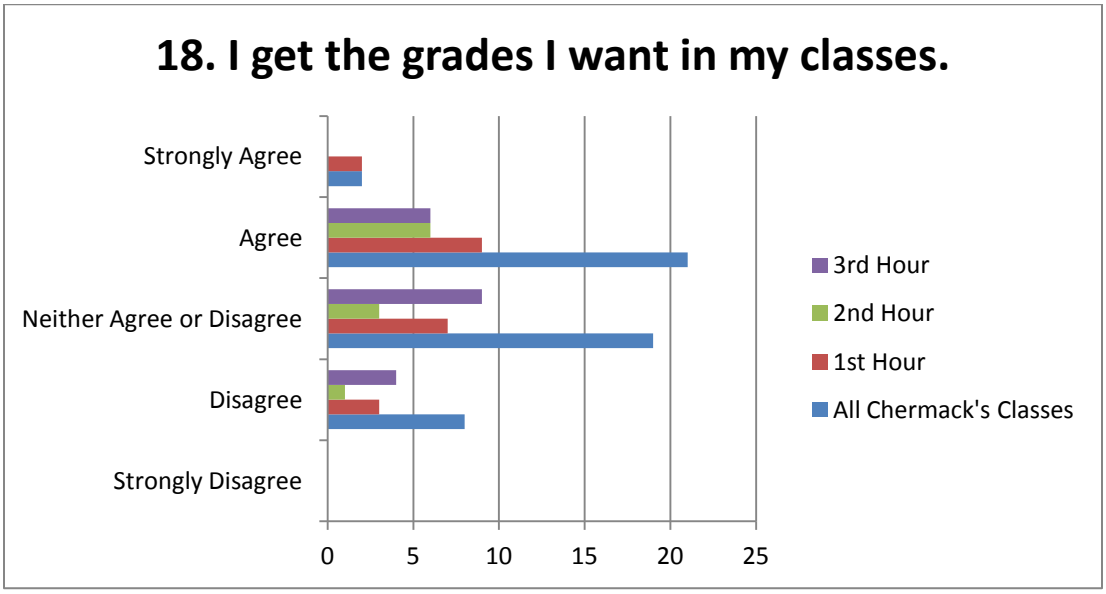
Looking at this question, there seemed to not be a discrepancy between the classes. The students mostly felt they were getting the grades they wanted in their classes and all classes showed these results.

Figure 4.23



Again, when looking at this question by gender, there still seems to be no discrepancy in how the students responded. Both male and female students felt more positively about their grades.

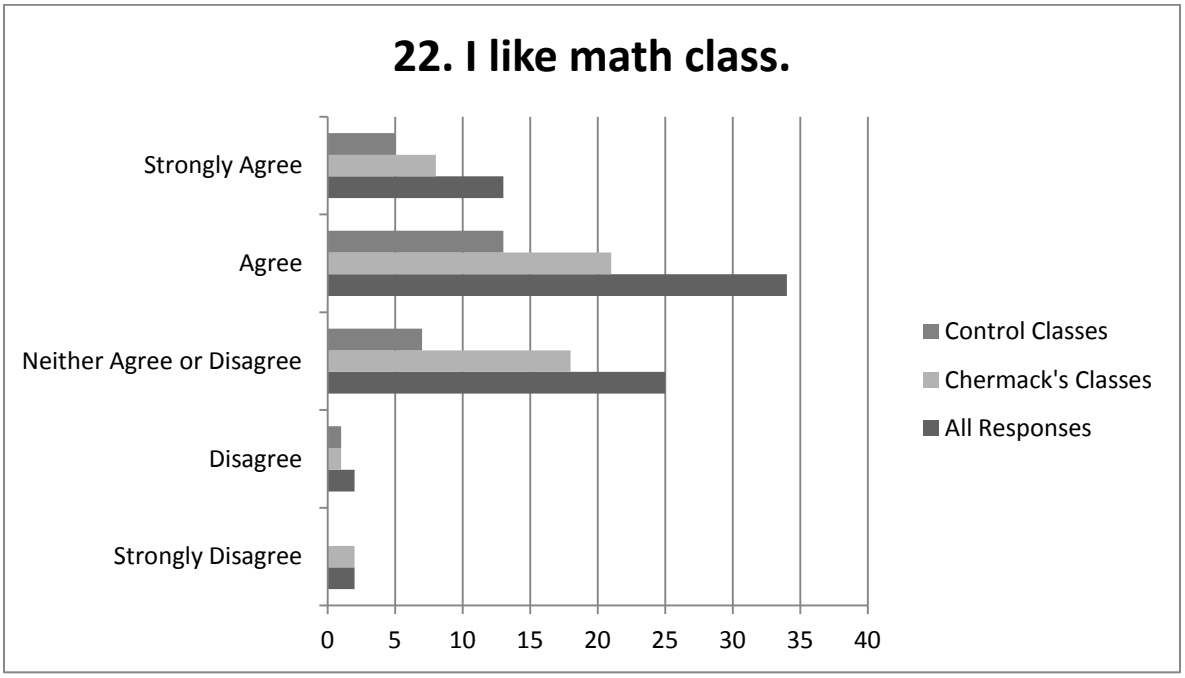
Figure 4.24



This question showed no real discrepancy between my classes.

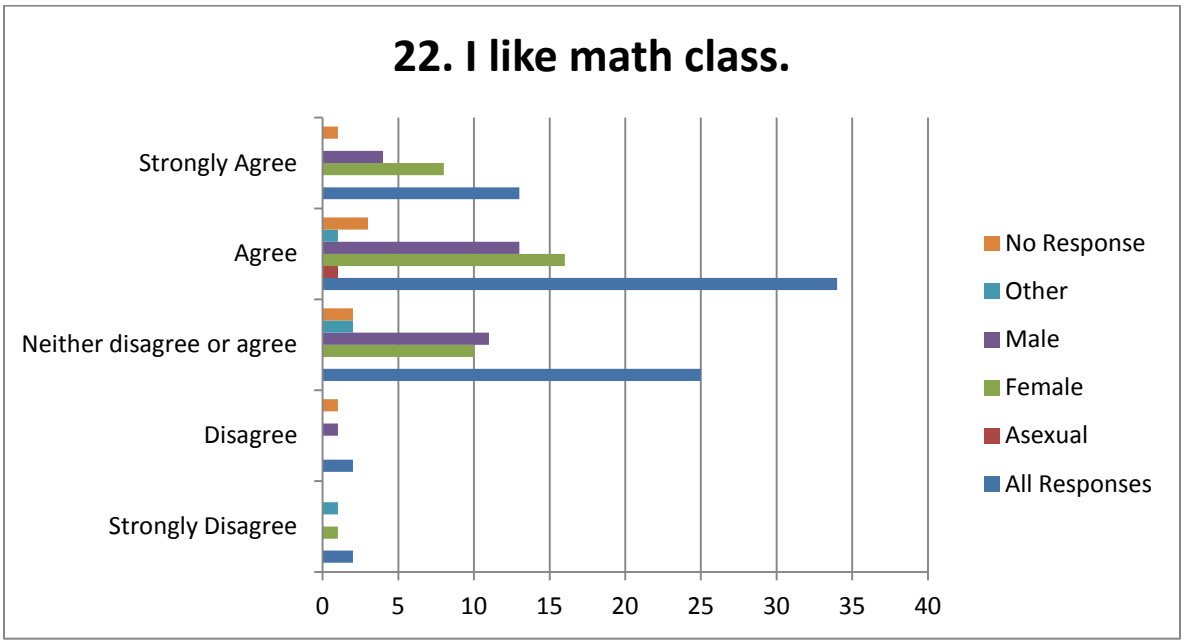
Figures 4.25-4.27 show the results from question #22.

Figure 4.25



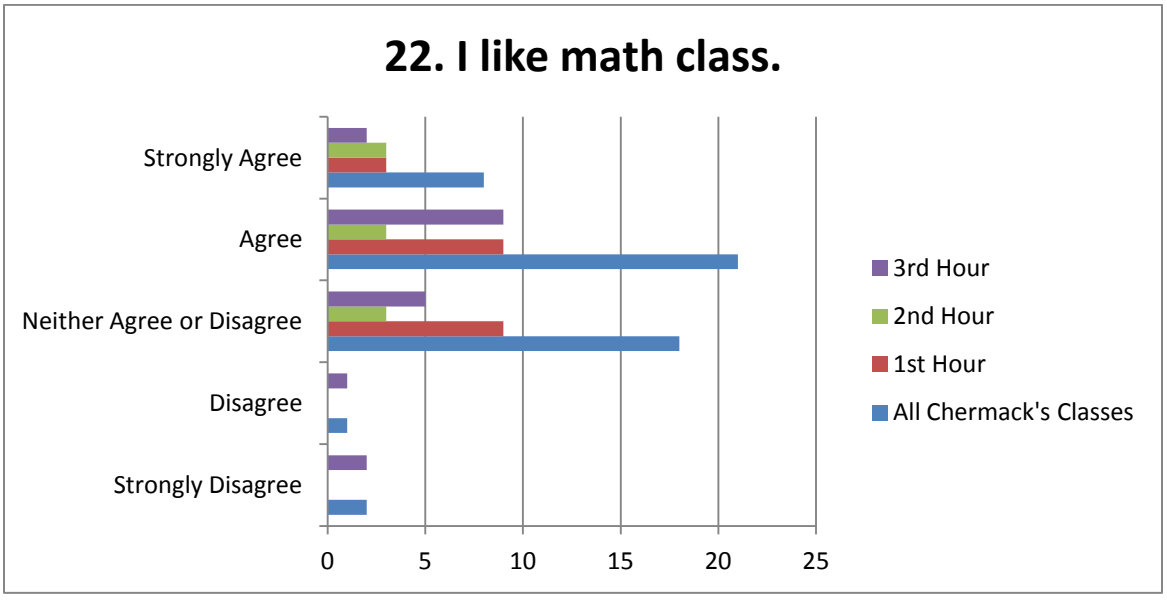
When the students were asked about math class, most students felt positive about it. Looking at *Figure 4.25*, I saw that control classes may have been slightly more skewed towards the positive than my classes, but overall, all the responses skewed towards the affirmative.

Figure 4.26



I again don't see much discrepancy between males and females in their responses to how well they like math class. Overall, most of the students agreed to the statement that they liked math class.

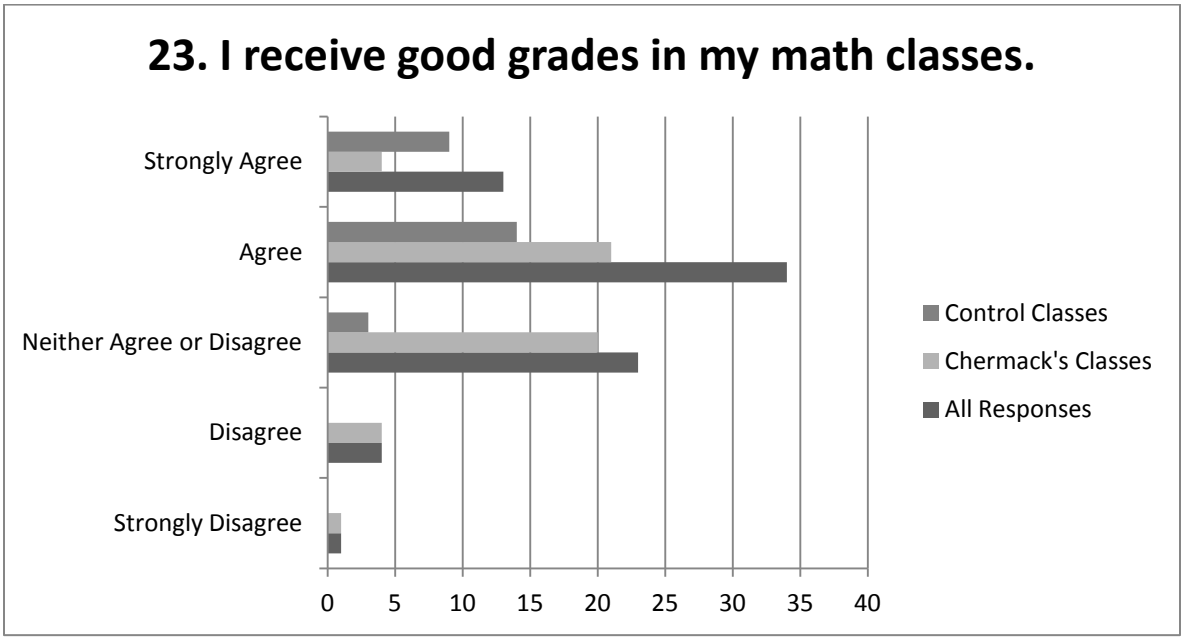
Figure 4.27



Both the gender-segregated grouping class and the partial segregated class showed more of a positive response to this question. My gender-mixed grouping class did have a few negative responses when asked if they liked math class, even though their overall responses skewed toward the positive end of the graph.

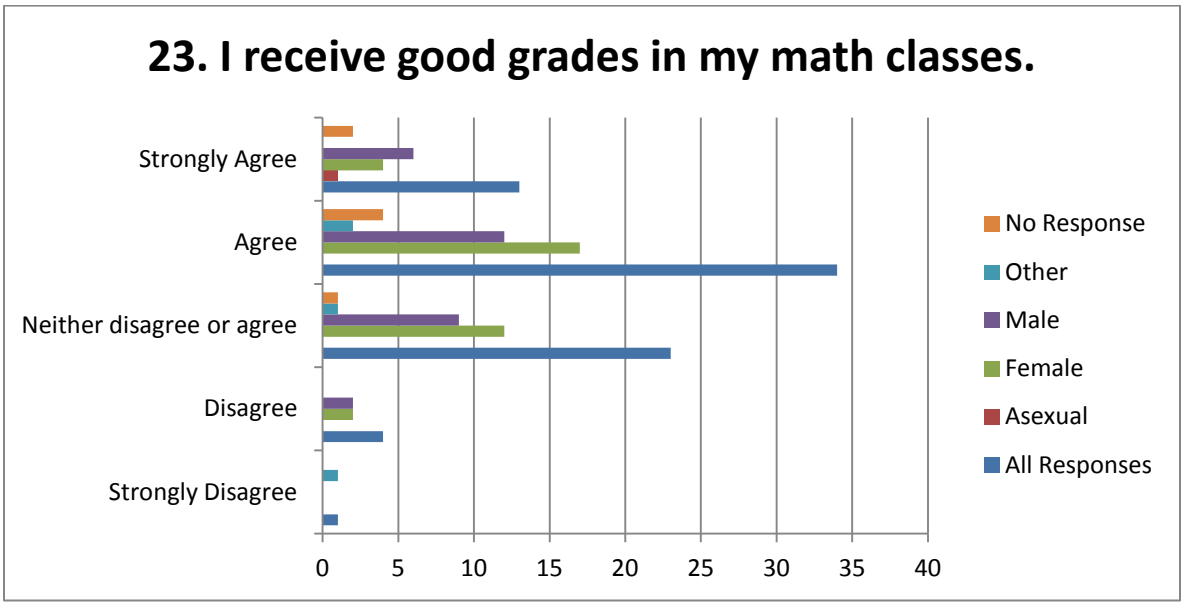
Figures 4.28-4.30 show the results from question #23.

Figure 4.28



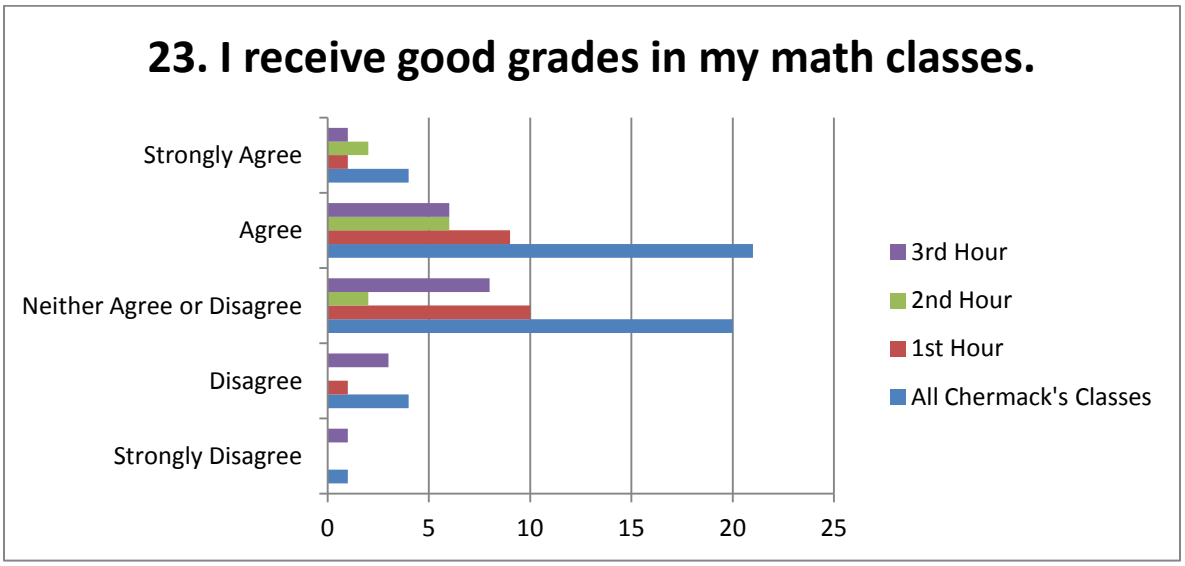
There was some discrepancy between the classes in question 23. The control classes were more skewed toward the agreement side of the graph that the students felt they receive good grades in their math classes. In my classes, the numbers were only very slightly skewed that way from a normal curve.

Figure 4.29



Unlike the graph on the classes, when looking at gender, there seems to be no discrepancy between the genders in how they feel about the statement. Females and males both mostly agree that they receive good grades in their math classes.

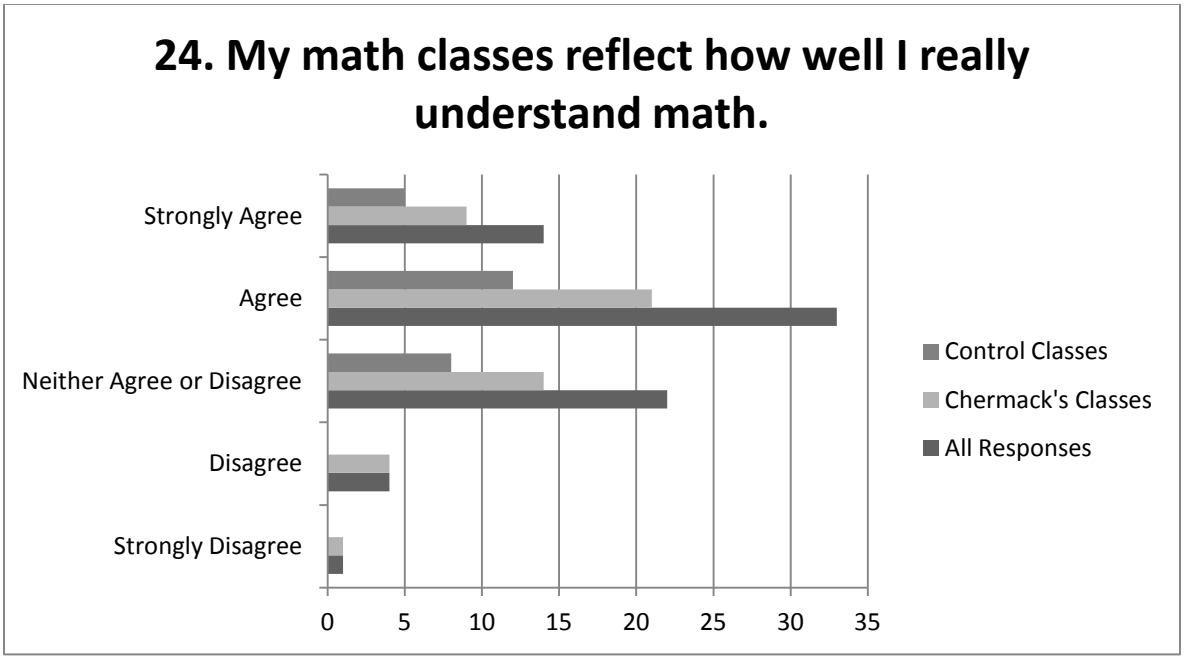
Figure 4.30



This question showed a little discrepancy with the gender-mixed grouping class having a few negative responses to the question about receiving good grades in their math classes, while the other classes were more neutral and slightly positive.

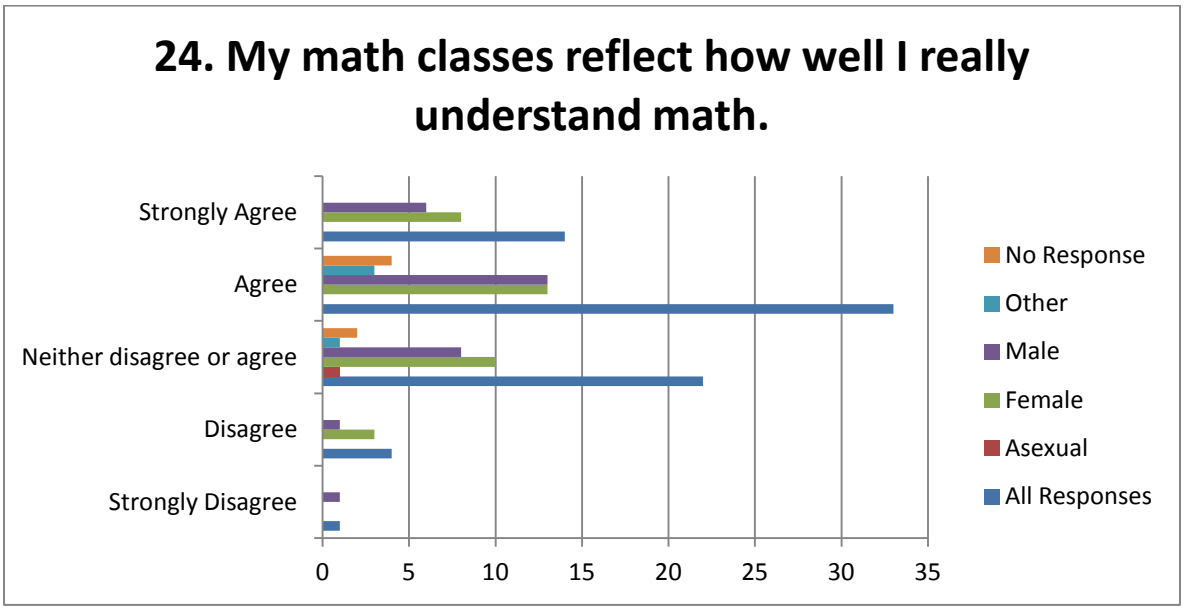
Figures 4.31-4.33 show the results from question #24.

Figure 4.31



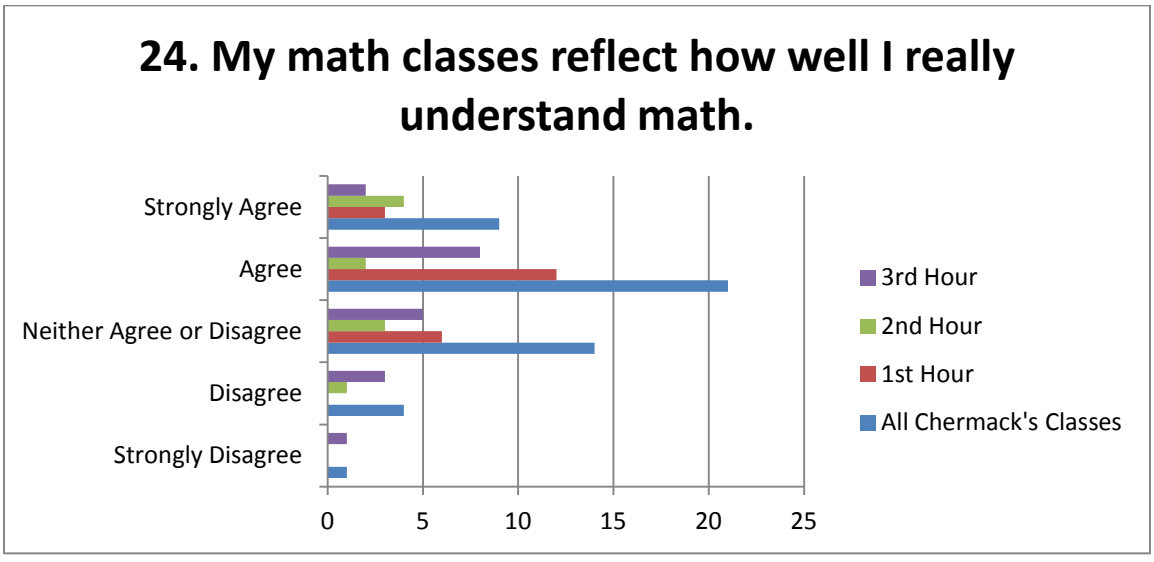
Looking at this question, there seems to definitely be a discrepancy between the classes. In the control classes, the students' responses skewed heavily toward the agreement side that they felt their math classes reflected how well they really understood math. In my classes, there was less of a skew toward the agreement side from a normal curve.

Figure 4.32



Unlike with the graph on class distinctions, looking at gender, there seems to be less of a difference in the response between the genders on how they felt about this statement. Even though there were a few disagreeing responses, most students felt they agreed with the statement that their math classes reflect how well they really understood math.

Figure 4.33

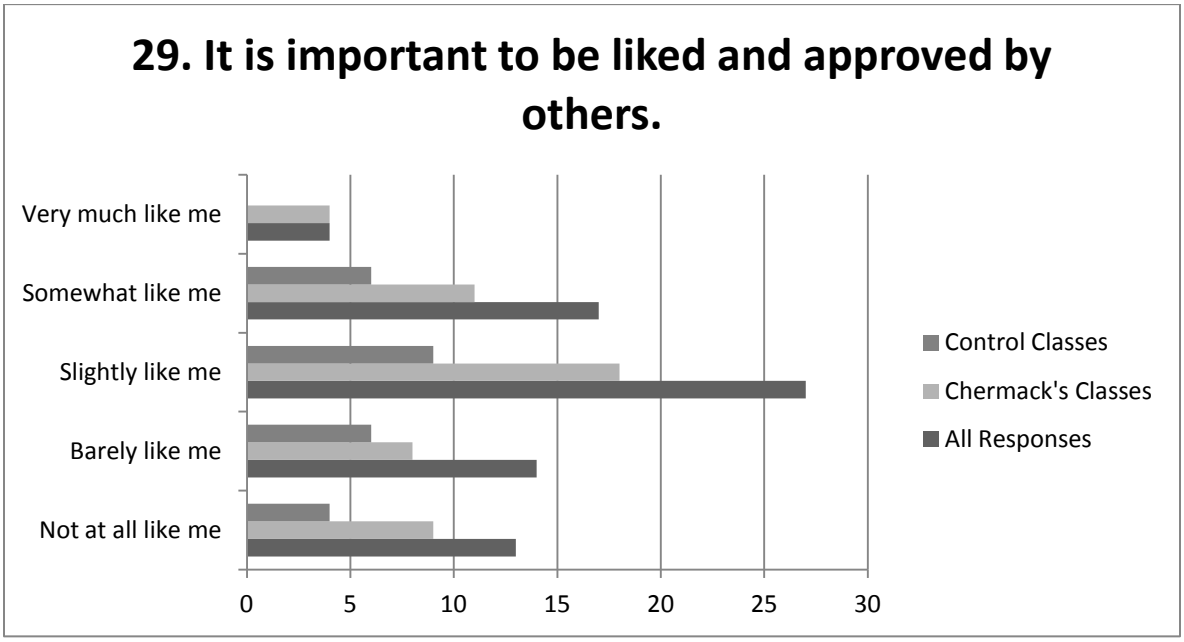


There was discrepancy between the classes on this question. While they all showed a tendency toward the positive end of the graph, the gender-mixed grouping class had the most outlying negative responses, while the partial gender-segregated grouping class showed no negative responses to feeling like their math classes reflected how well they really understood math.

And finally, the following questions from the self-concept section I decided to look at more detail: 29. It is important to be liked and approved by others. 47. I do things that are not in my best interest in order to please others. 49. I find it difficult to say "no" to people. And 57. I censor what I say because I am concerned that the other person may disapprove or disagree.

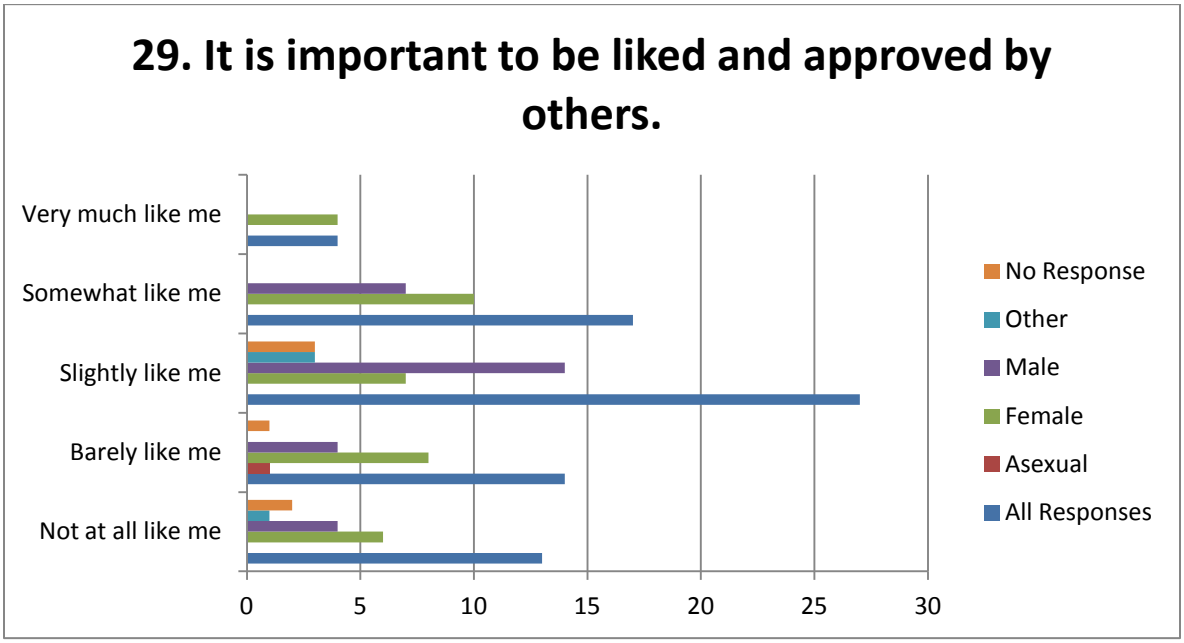
Figures 4.34-4.36 show the results from question #29.

Figure 4.34



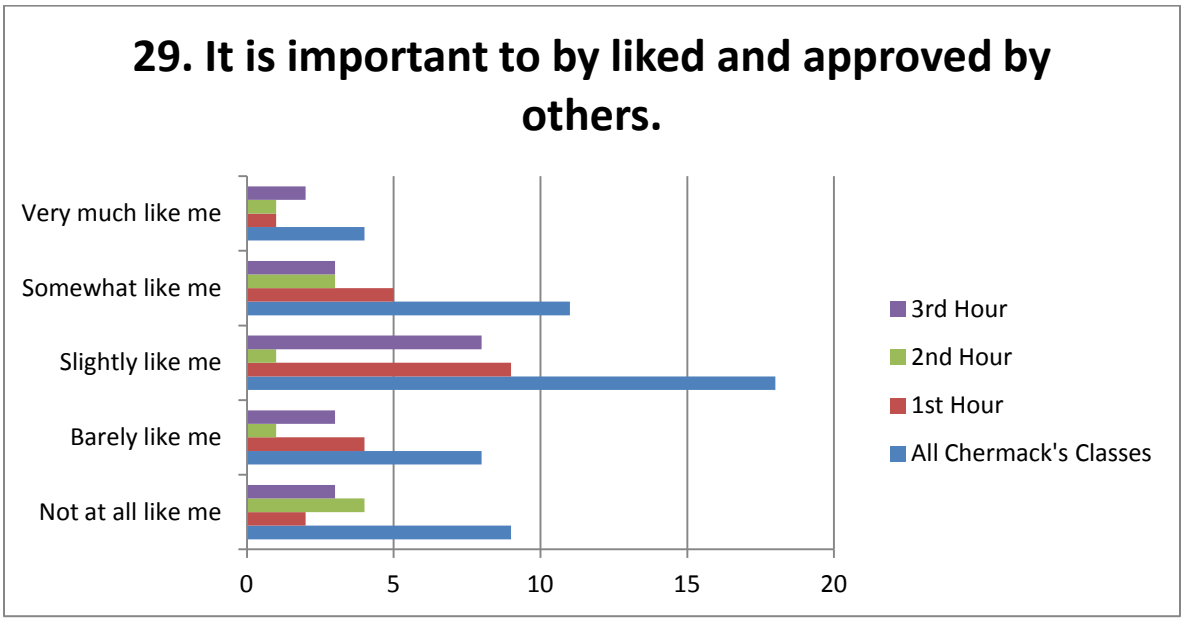
Looking at *Figure 4.34*, I saw that there was definitely a difference between how the control classes responded to question 29 and how my classes did. The control classes had a normal curve, while in my classes, I saw a normal curve, but an anomaly at the extreme negative where the curve went back higher again. So I had more responses again for students that disagreed with the statement that they felt it was important to be liked and approved by others.

Figure 4.35



Again, looking at *Figure 4.35*, I can see a discrepancy when looking at the genders as well. The male responses show a spike in the neutral response at an attempt for a normal curve, while the female responses are just flat across all the responses with no pattern at all.

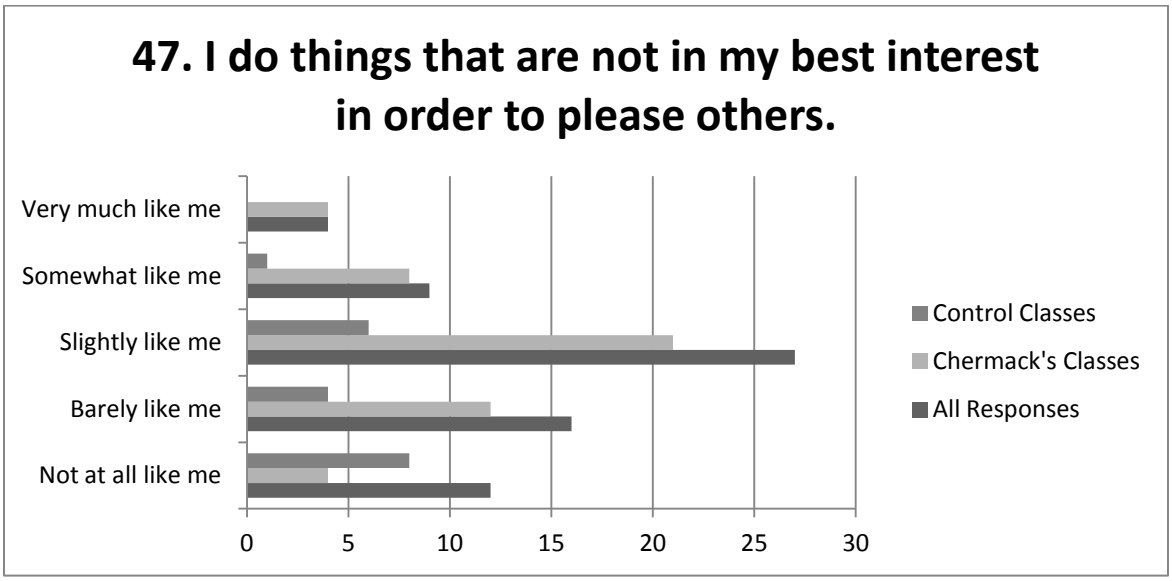
Figure 4.36



When responding to this question, the gender-segregated grouping class showed a slight tendency toward the negative end of the graph that they did not feel it was important to be liked and approved by others. My other two classes showed more of a normal curve when responding to this question.

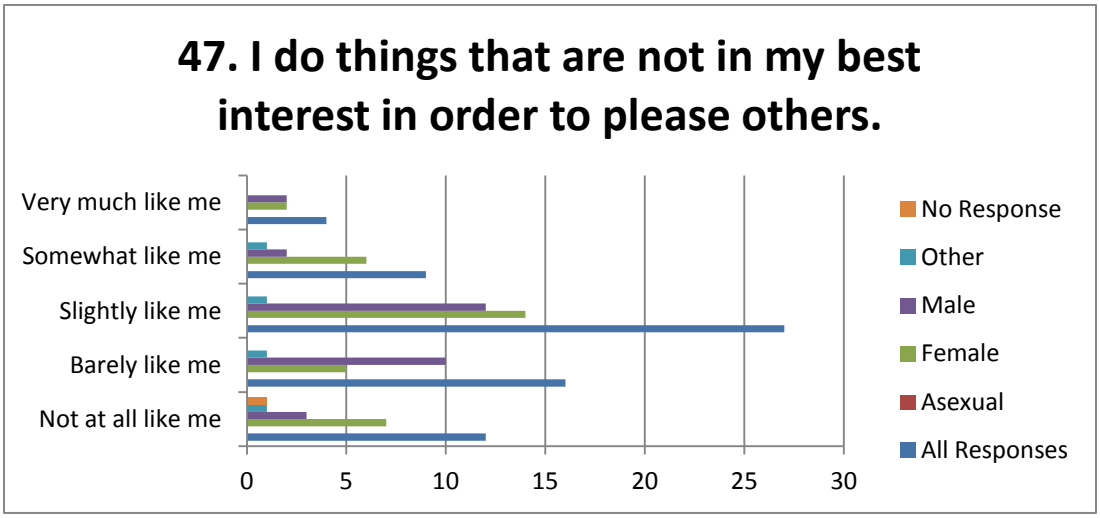
Figures 4.37-4.39 show the results from question #47.

Figure 4.37



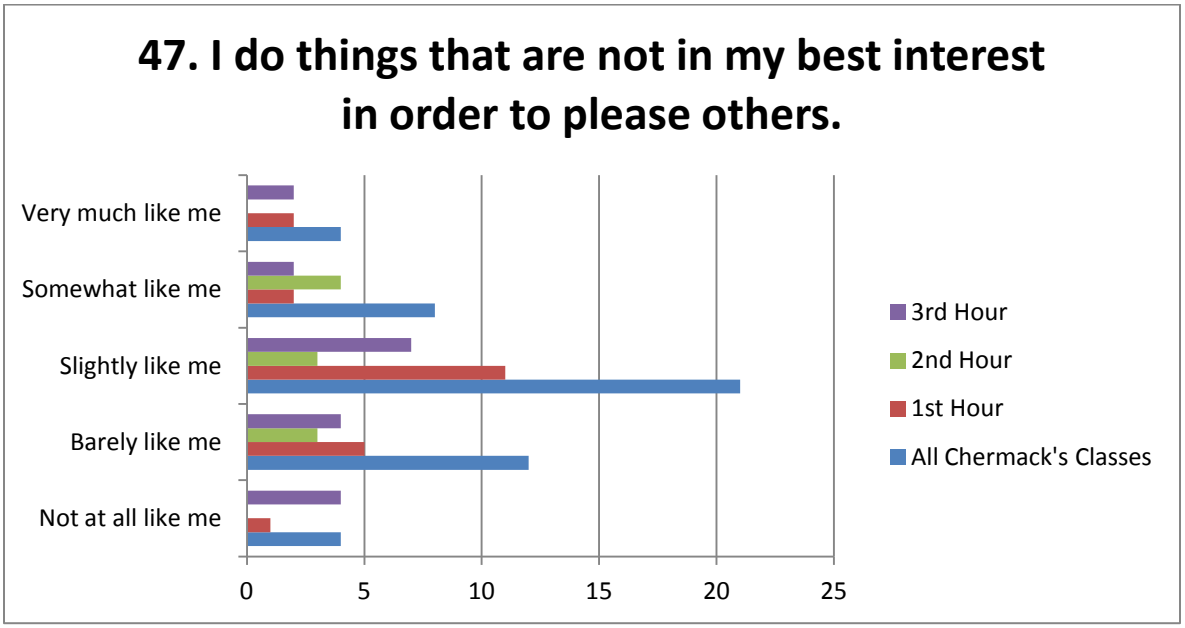
Looking at question 47, there again is a discrepancy between the classes. In the control classes, there seems to be a skew towards the negative response that those students did not feel they did things that were not in their best interest in order to please others. While on the other hand, looking at my classes, I saw more of a normal curve in the responses.

Figure 4.38



Looking at *Figure 4.38*, I saw that both the male and female students showed a normal curved skewed towards the negative response that they do not feel they do things that are not in their best interest in order to please others. The way of the skew was slightly different for the genders. The male skew was a normal shift, while for the females, there was just a spike again in the extreme negative answer.

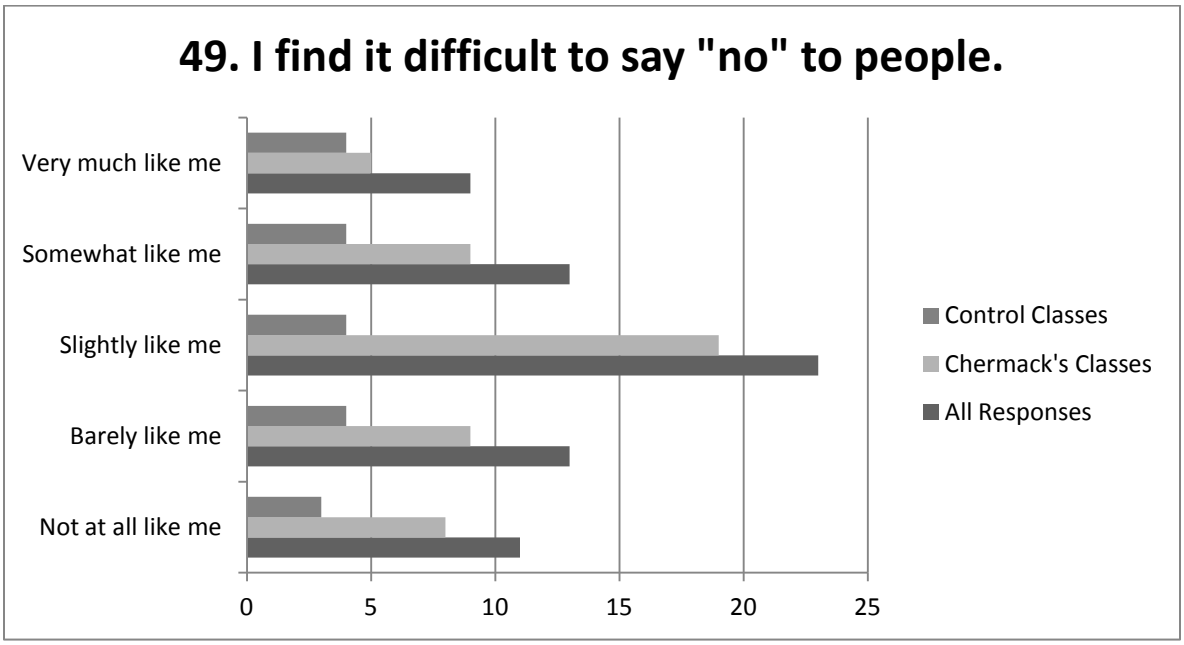
Figure 4.39



There really was no discrepancy in my classes and their responses to this question.

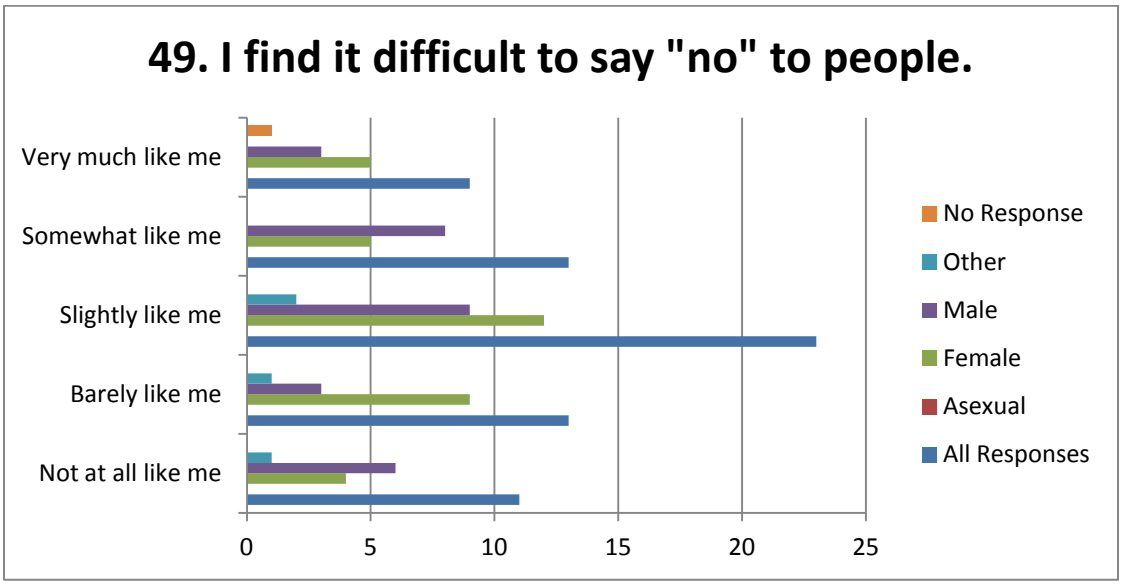
Figures 4.40-4.42 show the results from question #49.

Figure 4.40



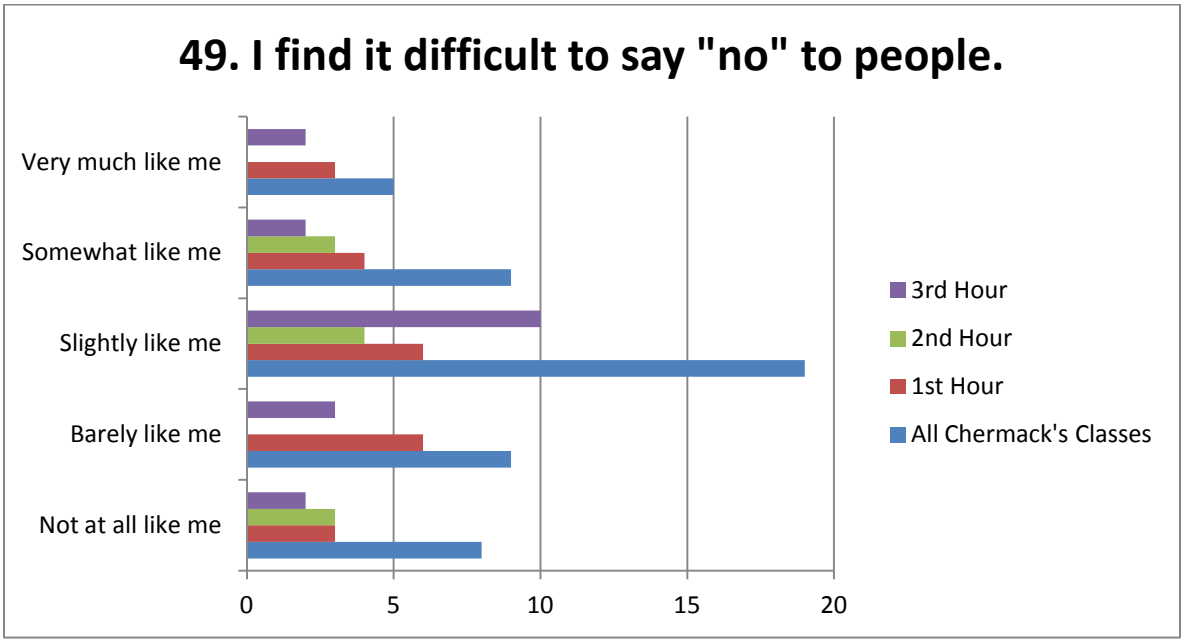
There is a definite difference in the classes in question 49. In the control classes, the students' responses were flat across the graph, with no discernible pattern. In my classes, there was a normal curve that started to show in the responses.

Figure 4.41



When looking at question 49 by gender, there is a slight difference between the male and female responses. The female responses almost show a normal curve, but a slight skew to the negative response stating the students do not find it difficult to say “no” to people. Looking at the male responses it is hard to see a pattern, but there are spikes in the neutral and negative responses as well.

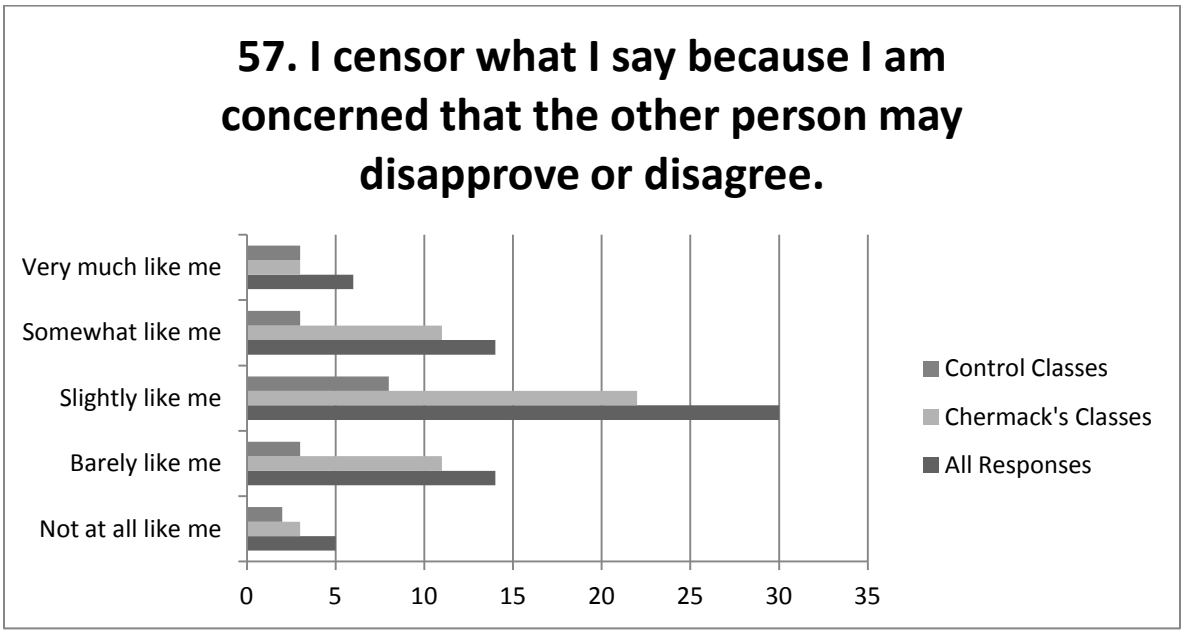
Figure 4.42



There was a definite discrepancy between my classes on this question. My gender-mixed grouping class showed a normal curve when responding to the statement about if they feel it is difficult to say “no” to people. My gender-segregated grouping class really was a flat response across the graph as well as the partially gender-segregated grouping class.

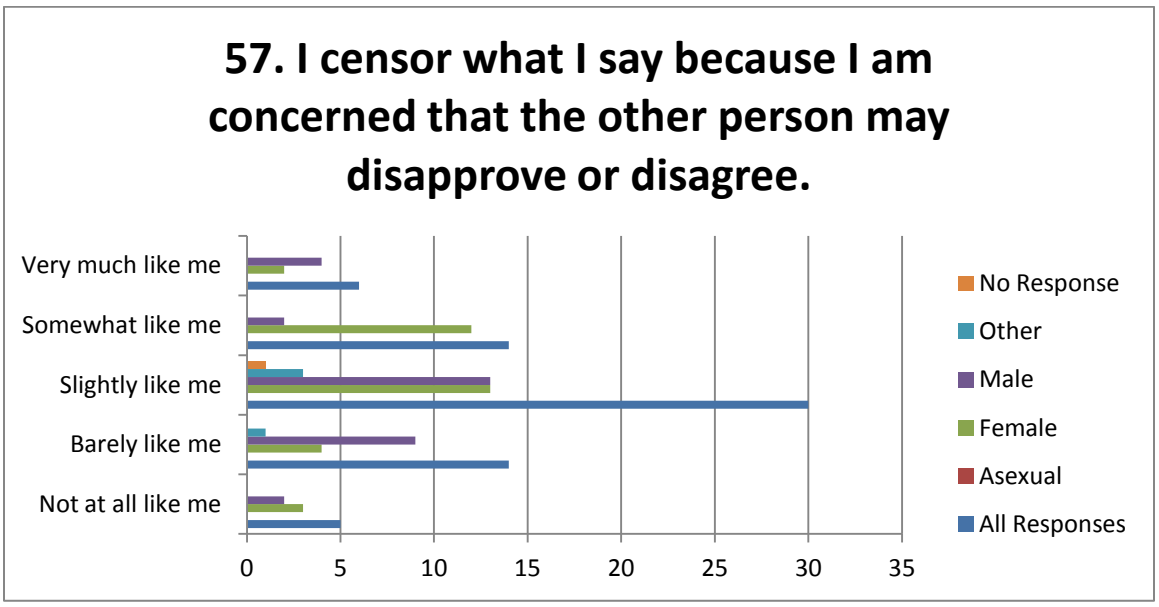
Figures 4.43-4.45 show the results from question #57.

Figure 4.43



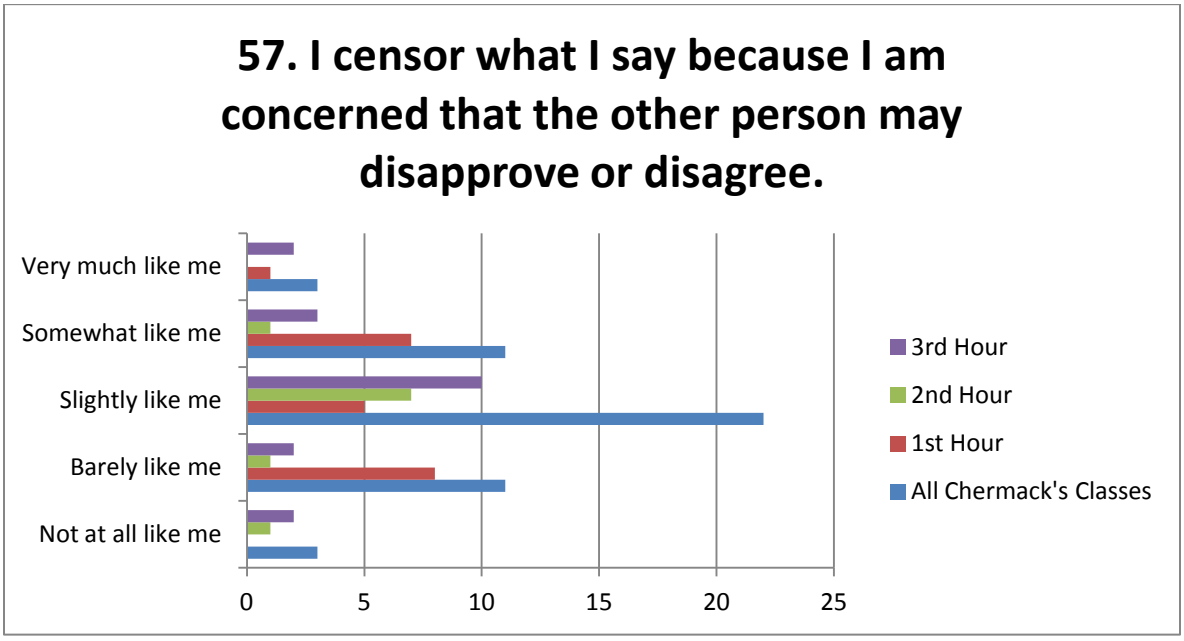
With the results of question 57, there seems to be little difference between the classes. Both classes seem to show a normal curve, while my classes are more of a distinct normal curve than the control classes.

Figure 4.44



Looking at *Figure 4.44*, I still saw little difference in the responses between the genders. The female responses had a skewed normal curve toward the positive response that they agreed with the statement that they censor what they say because they are concerned that the other person may disapprove or disagree. On the other hand, the male responses were more slightly skewed toward the negative response with a slight spike at the positive end as well.

Figure 4.45



There was a discrepancy between my classes on how they responded to this question as well. Looking at *Figure 4.45*, I saw that in both the gender-segregated grouping class and the gender-mixed grouping class, the students responded in a normal curve to the statement that they believe they censored what they said because they were concerned that the other person may disapprove or disagree. My partially gender-segregated grouping class showed more of a flatted response to this question.

Self-Esteem Curriculum

Implementation

At my school, we had a different schedule every Wednesday to accommodate for an advisory class. This schedule shortened all the other classes except for the class that resided around the lunch hour. Because of this different schedule, many teachers chose to teach things significantly differently on Wednesdays than the rest of the week. In the past, I had used Wednesdays as a review and retake day for my students and I still planned on trying to keep that as part of my agenda. With permission from my principal, I used my Wednesdays to implement the self-esteem curriculum that I found.

Every Wednesday I would prepare a new activity for my class that would involve community building, improving self-esteem and self-concept. My students came to know Wednesdays as Community Wednesdays and they found some of the activities fun, but other activities they did not get too much in to. Many students would ask, "Are we playing a game today?" when Wednesday came around, because they looked at the community building activities as games.

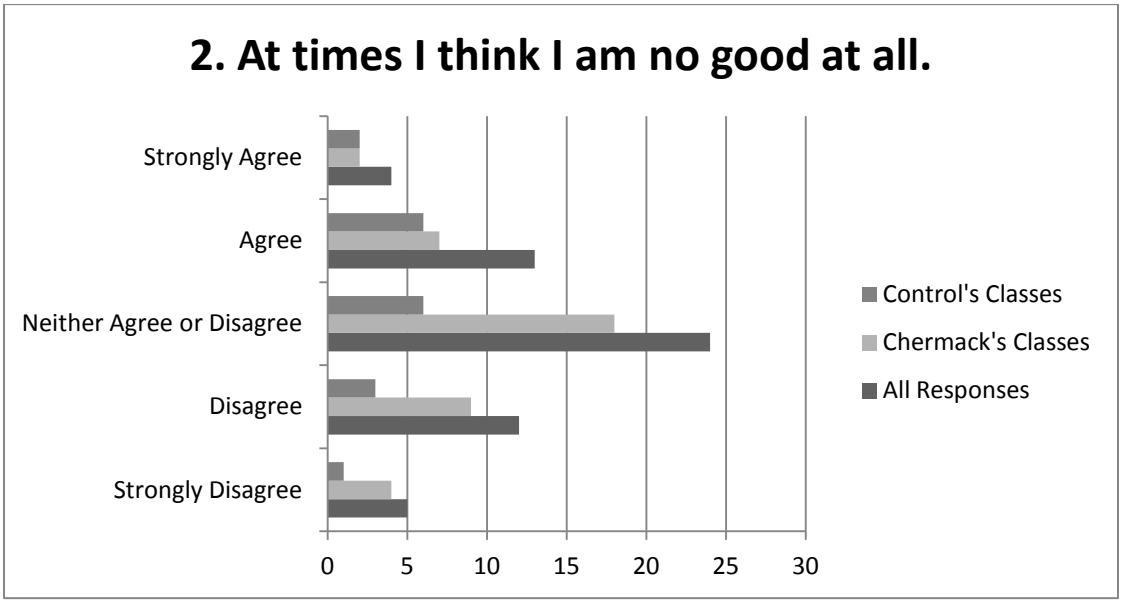
The students did not really see a connection between the self-esteem curriculum and improving their math scores. I mentioned that I was working on my masters to my students, so that is why we were going to be doing the community building activities, so they were aware that there was a specific purpose, but I don't know if they really noticed the connection to improved self-confidence either.

Results from final Self-Esteem Survey

I was able to survey 78 students for the final self-esteem survey. I had to drop 18 surveys because the students did not take initial surveys to compare to their information to. The following shows the results from the same questions that were examined in the first self-esteem survey.

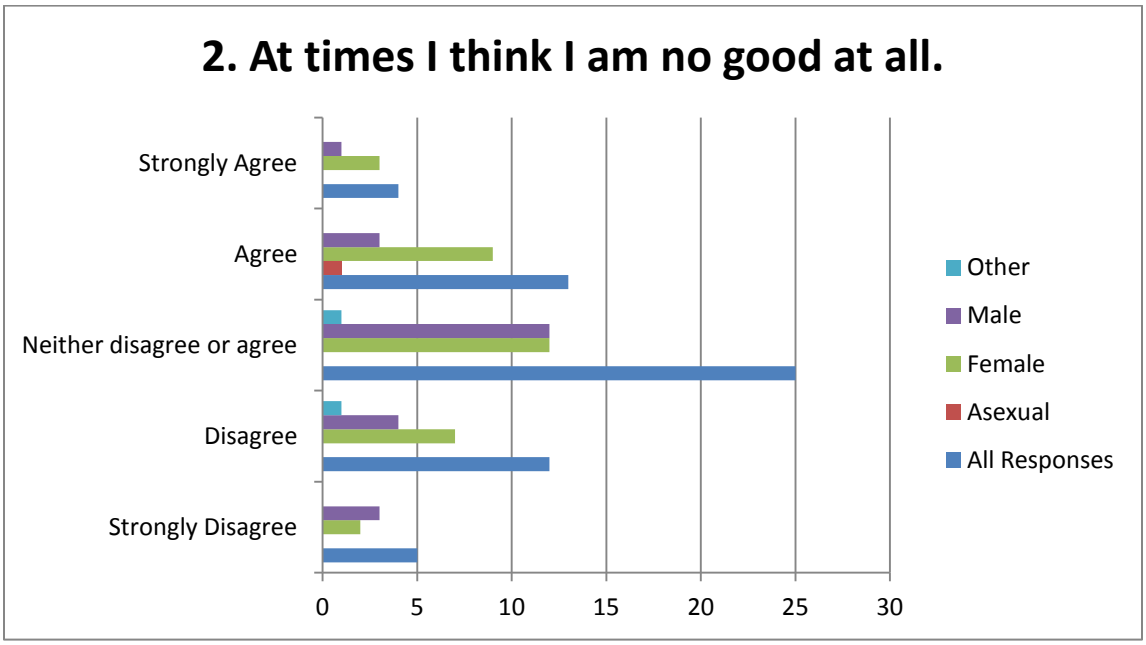
Figures 4.46-4.48 show the results from question #2.

Figure 4.46



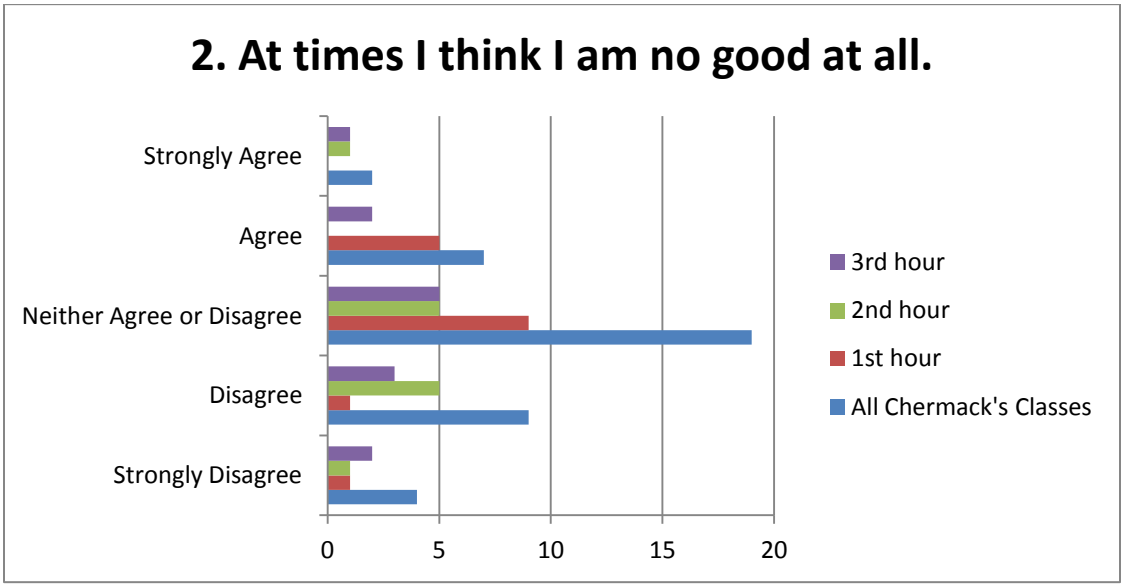
There is a significant difference between my classes and the control classes now in this question. My classes are definitely more skewed towards the disagreement side of the graph saying that those students do not feel they think they are no good at all. The control classes, on the other hand, skewed more towards the agreement side of the graph.

Figure 4.47



There really was no discrepancy between how the females and males responded to this question. All respondents responded in a normal curve.

Figure 4.48



There was a definite discrepancy between my different classes on this question. My mixed-gender grouping class showed a normal curve in response to this question. The partial gender-segregated grouping class started to skew towards the disagreement side of the graph. Finally, my fully gender-segregated grouping class showed a much stronger skew towards the disagreement side of the graph for this question.

Figures 4.49-4.51 show the results from question #4.

Figure 4.49

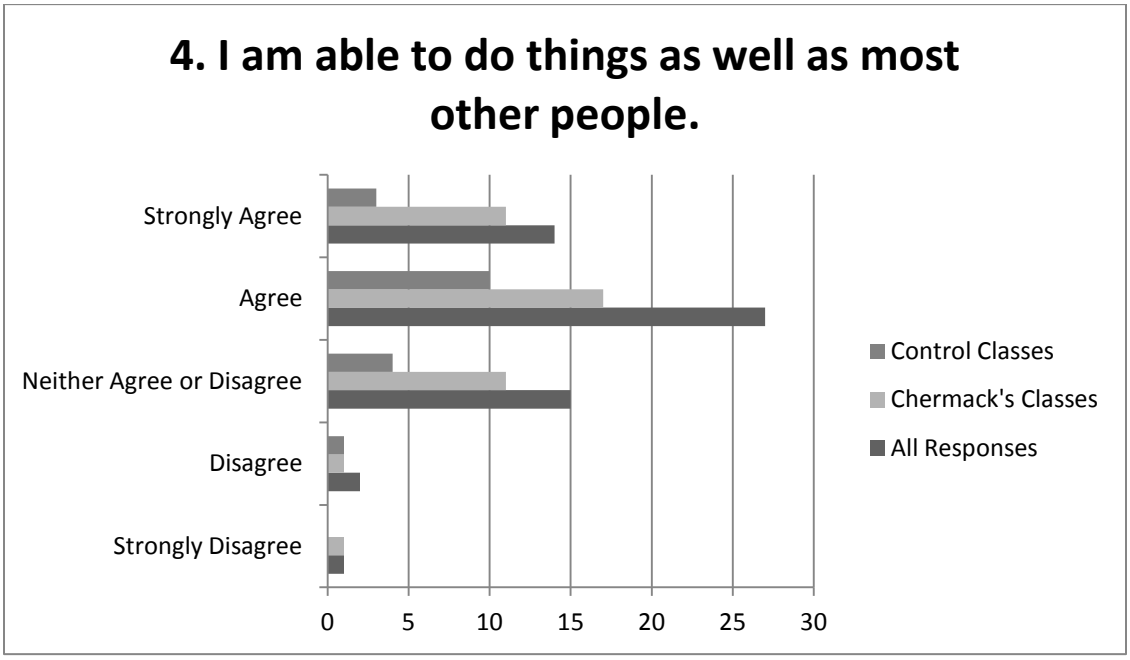
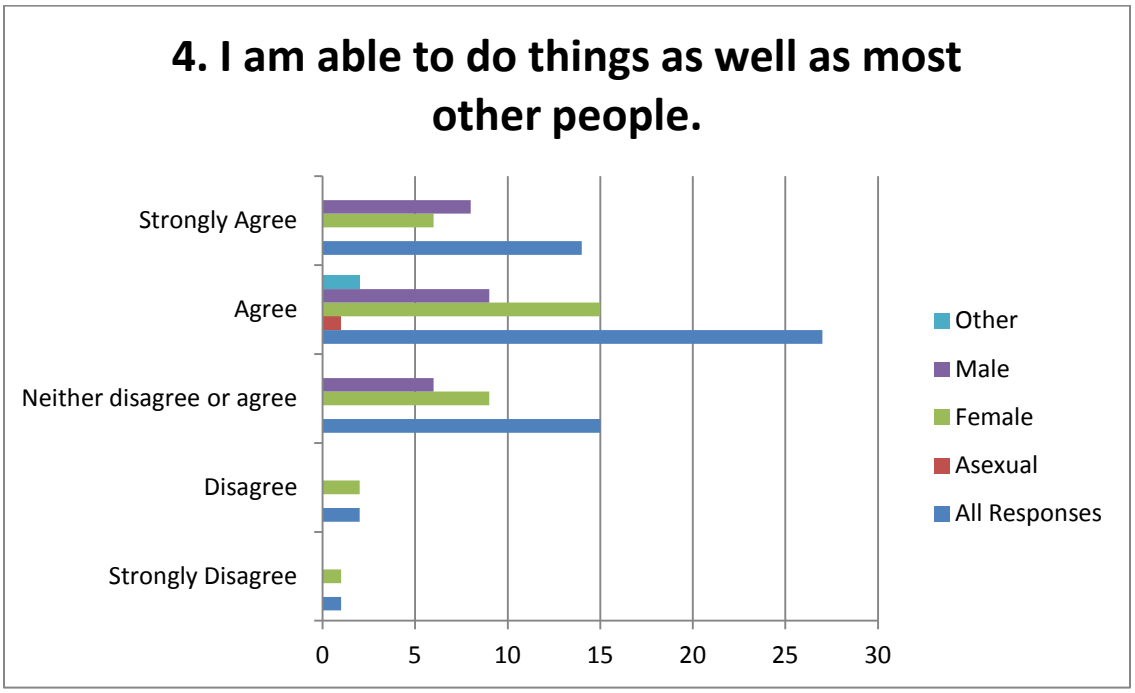


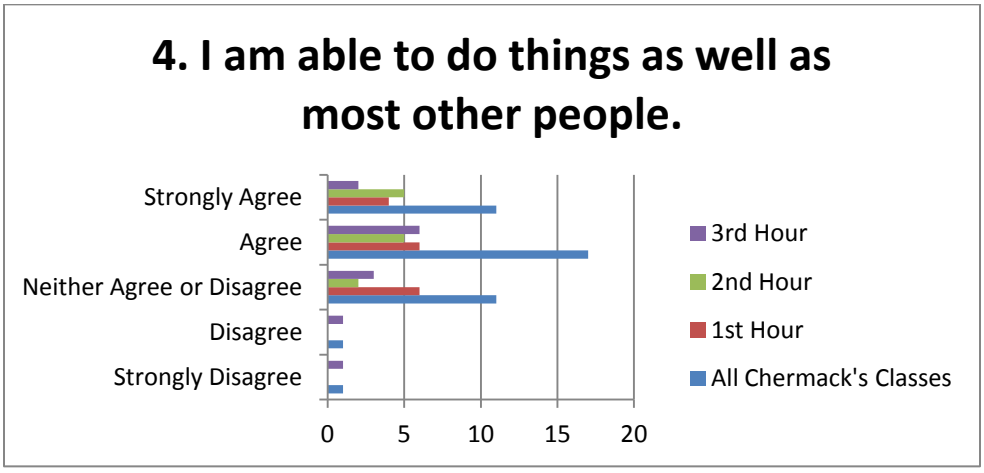
Figure 4.49 shows that there really was no discrepancy between the control classes and my classes in their responses to this question.

Figure 4.50



Looking at Figure 4.52, I saw that both the male and female respondents skewed towards the agreement side of the graph, but the males skewed harder towards the agreement side showing a stronger agreement to the statement that they felt they were able to do things as well as most other people.

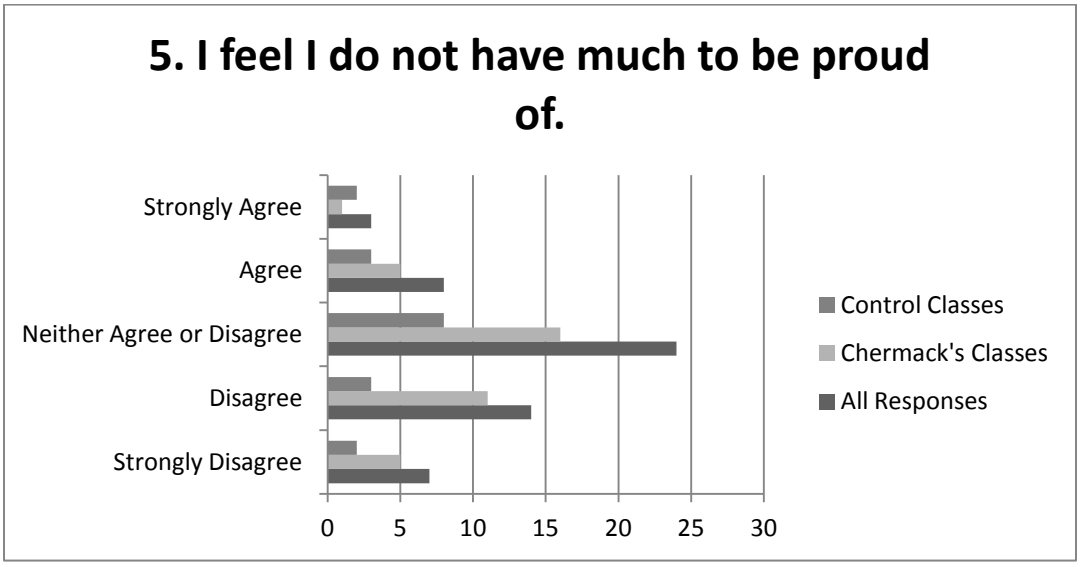
Figure 4.51



Looking at my classes individually, I saw that all of my classes skewed towards the agreement side of the graph on this question, but the mixed-gender grouping class had the weakest trend while the gender-segregated grouping class had the strongest towards the agreement side of the graph.

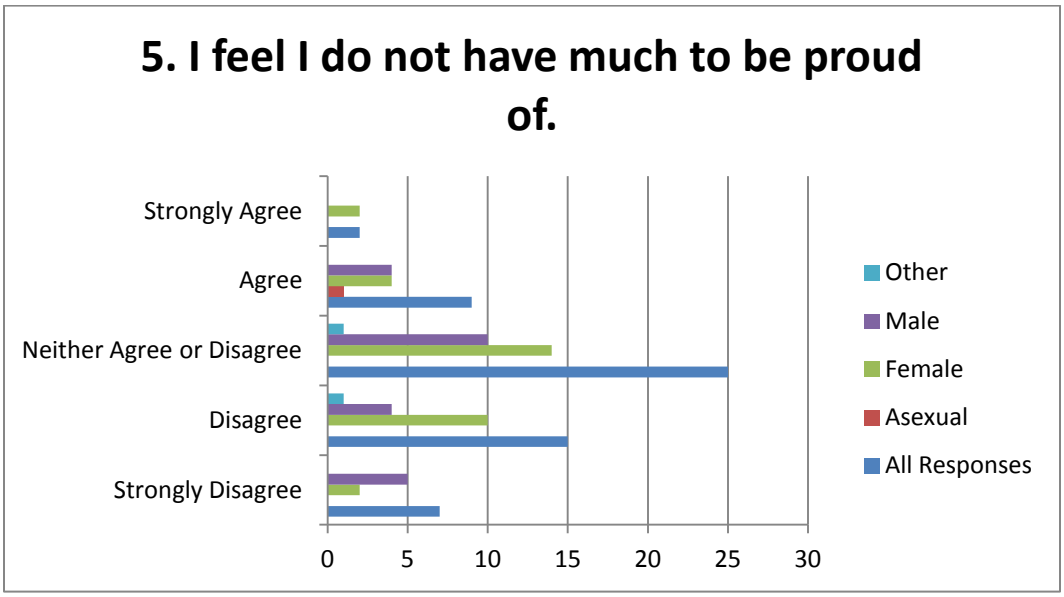
Figures 4.52-4.54 show the results from question #5.

Figure 4.52



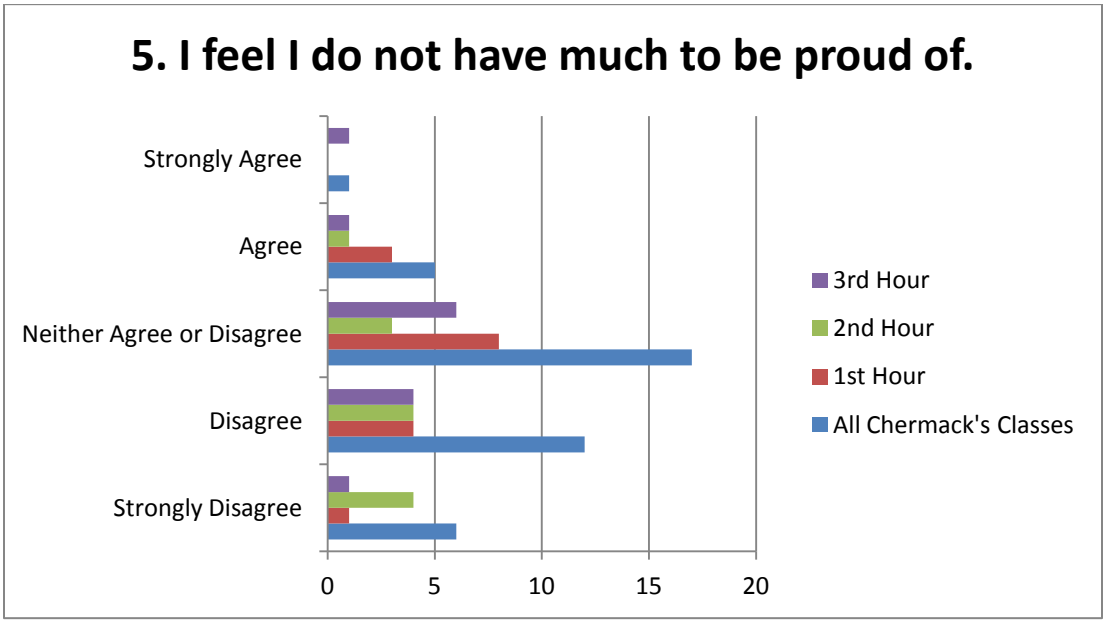
There wasn't a significant difference between my classes and the control classes, but my classes had a slight skew towards the disagreement side of the graph for this question saying that the students felt that they did not agree that they did not have much to be proud of.

Figure 4.53



Looking at Figure 4.53, I saw that both the females and males responded similarly to this question. I saw a normal curve for both genders.

Figure 4.54



This question showed that all of my classes skewed towards the disagreement side of the graph, but the gender-segregated grouping class had the strongest trend, while the mixed-gender grouping class had the weakest trend to that side of the graph.

Figures 4.55-4.57 show the results from question #6.

Figure 4.55

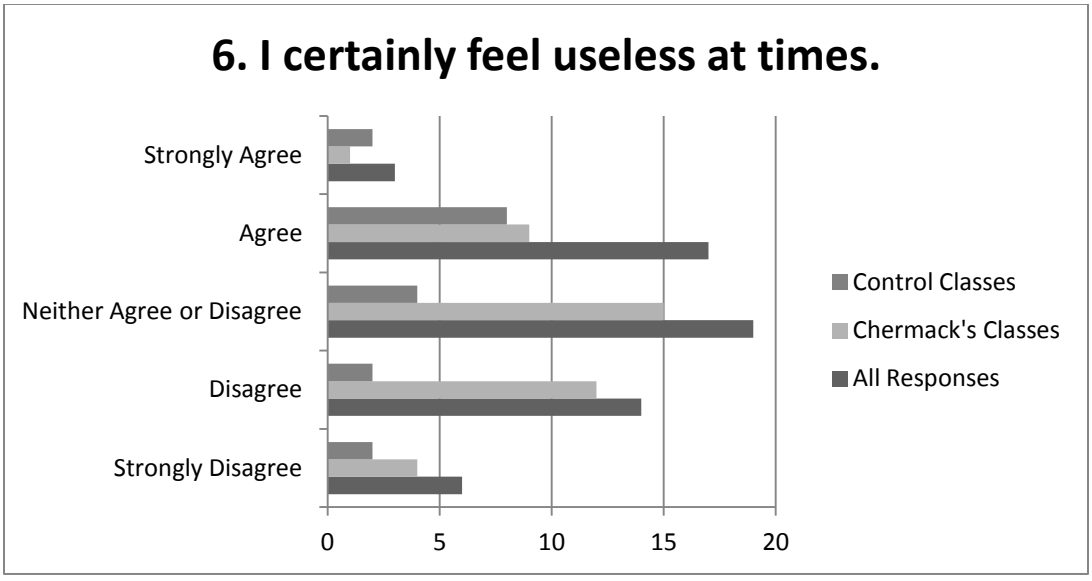
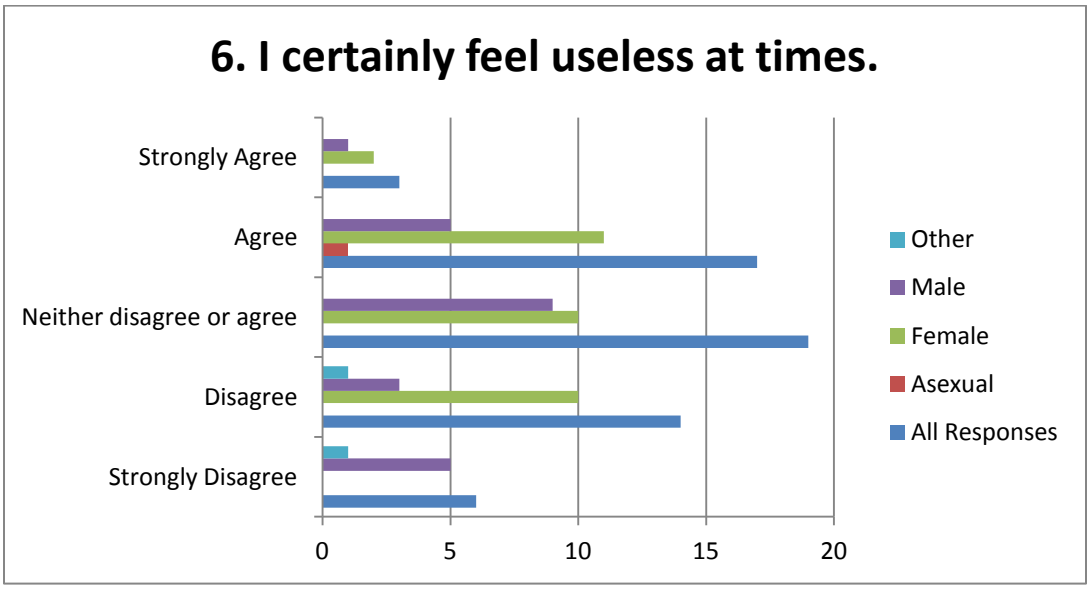


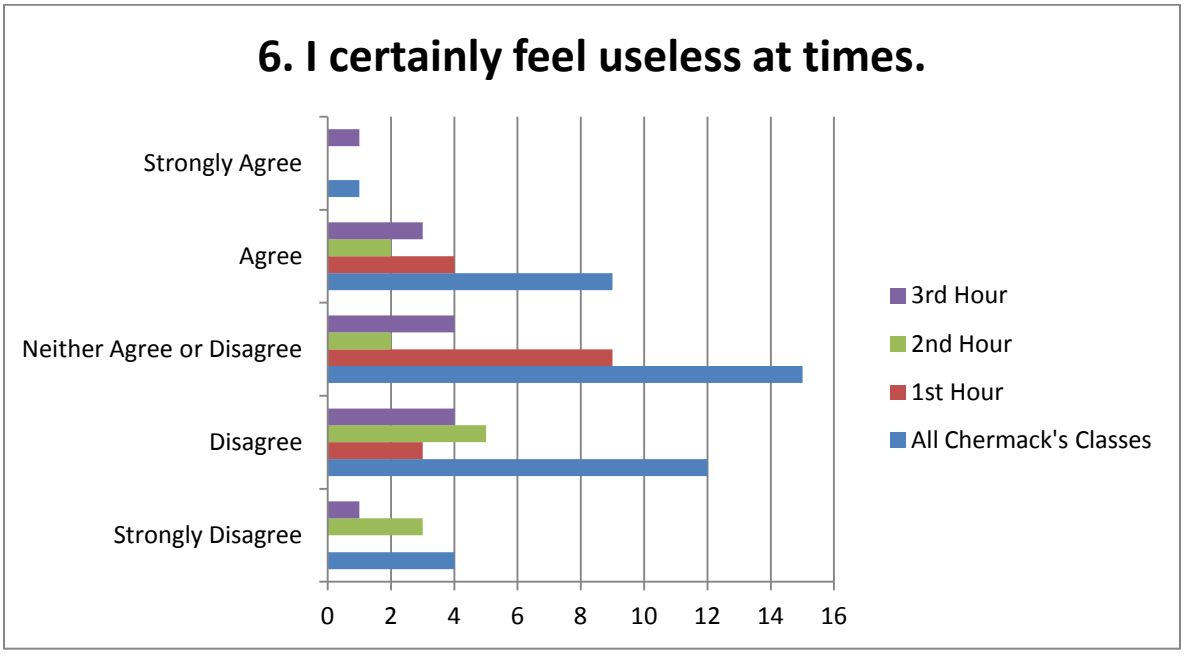
Figure 4.55 shows that there was definitely a discrepancy between my classes and the control classes. My classes were more skewed towards the disagreement side of the graph, while the control classes skewed heavily toward the agreement side showing that those students responded that they felt useless at times.

Figure 4.56



None of the genders showed any pattern on the way they answered this question. The females had a very flat response. The males had a very, very slight spike at the neutral response.

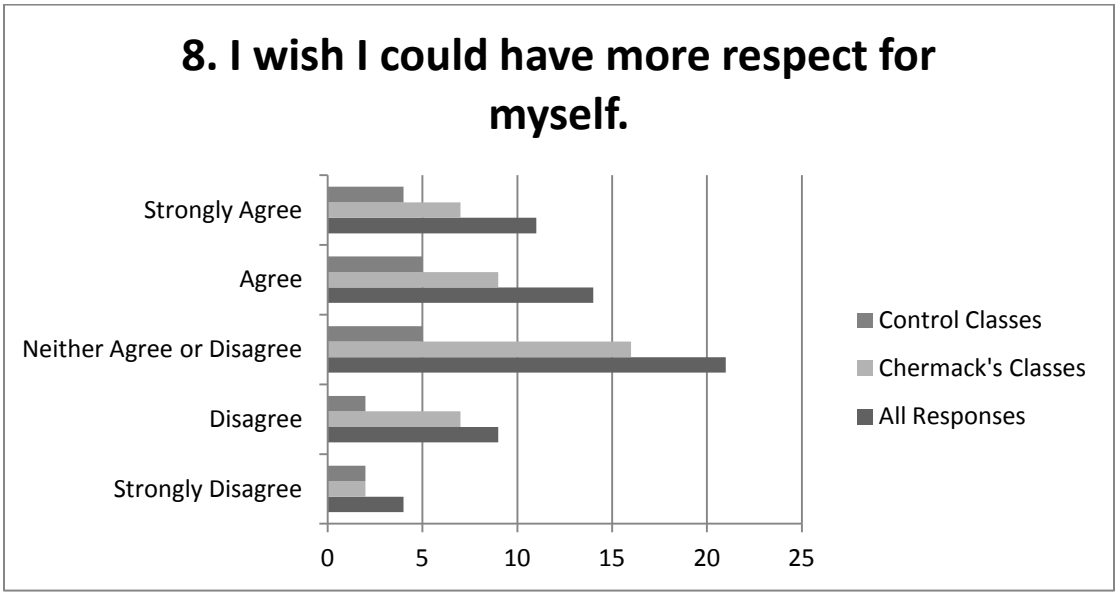
Figure 4.57



While of my classes showed a skew towards the disagreement side of the graph, the gender-segregated grouping class had a very strong tendency towards that side. The mixed-gender grouping class had a much weaker tendency towards the disagreement side of the graph.

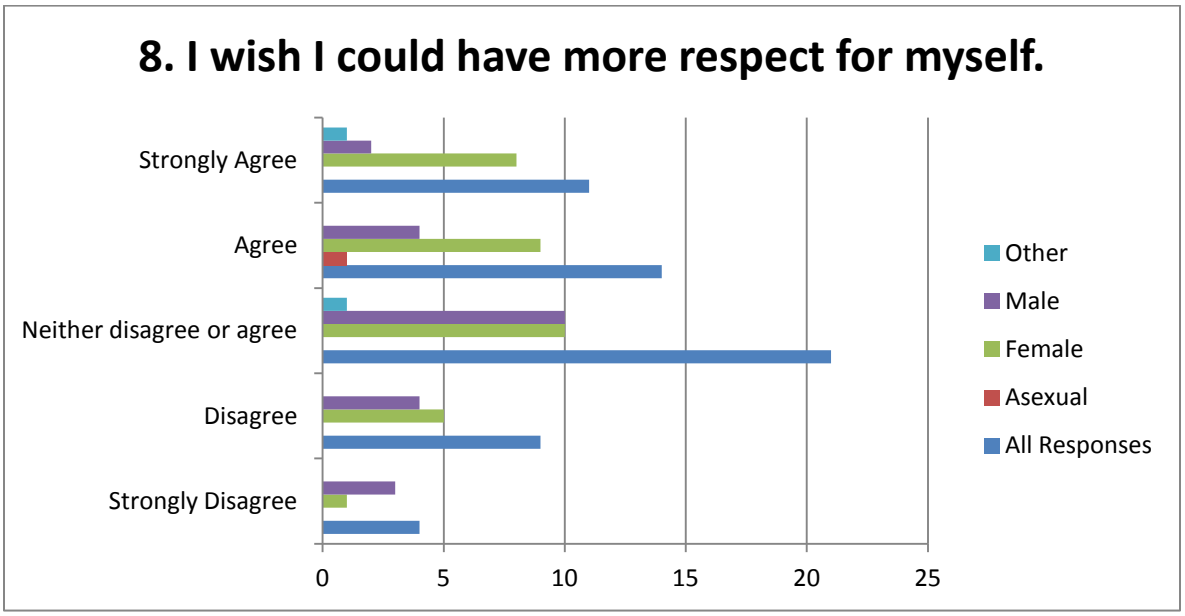
Figures 4.58-4.60 show the results from question #8.

Figure 4.58



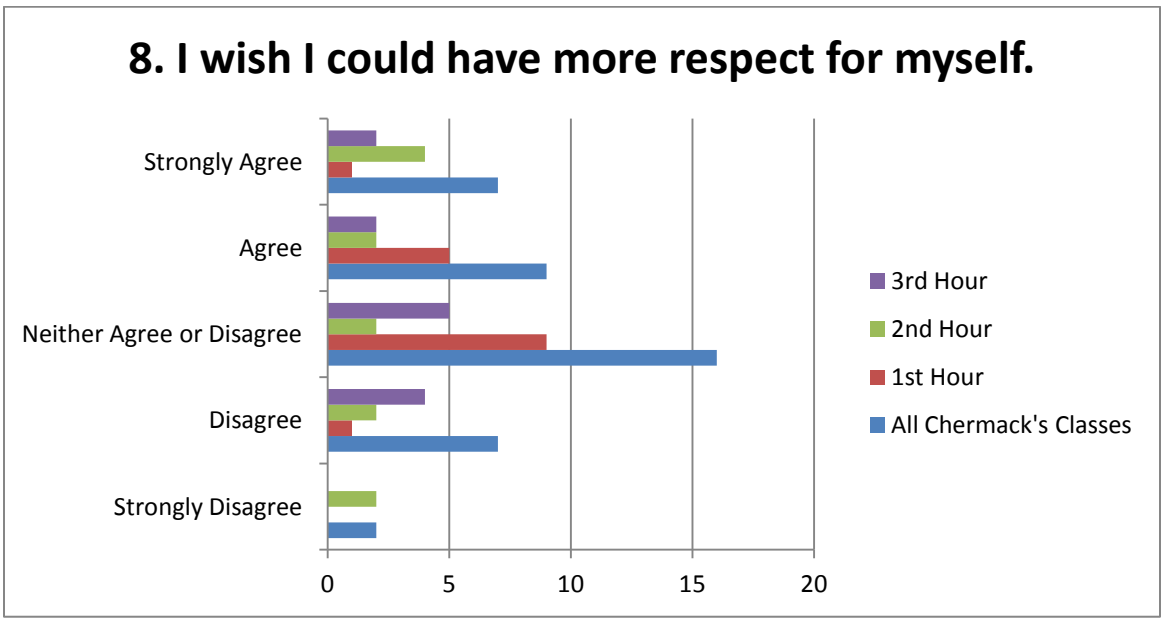
There wasn't a significant difference between the control classes and my classes on how they responded to this question.

Figure 4.59



The males showed a normal curve when responding to this question, but the females skewed more towards the agreement side of the graph showing that they felt like they did wish they could have more respect for themselves.

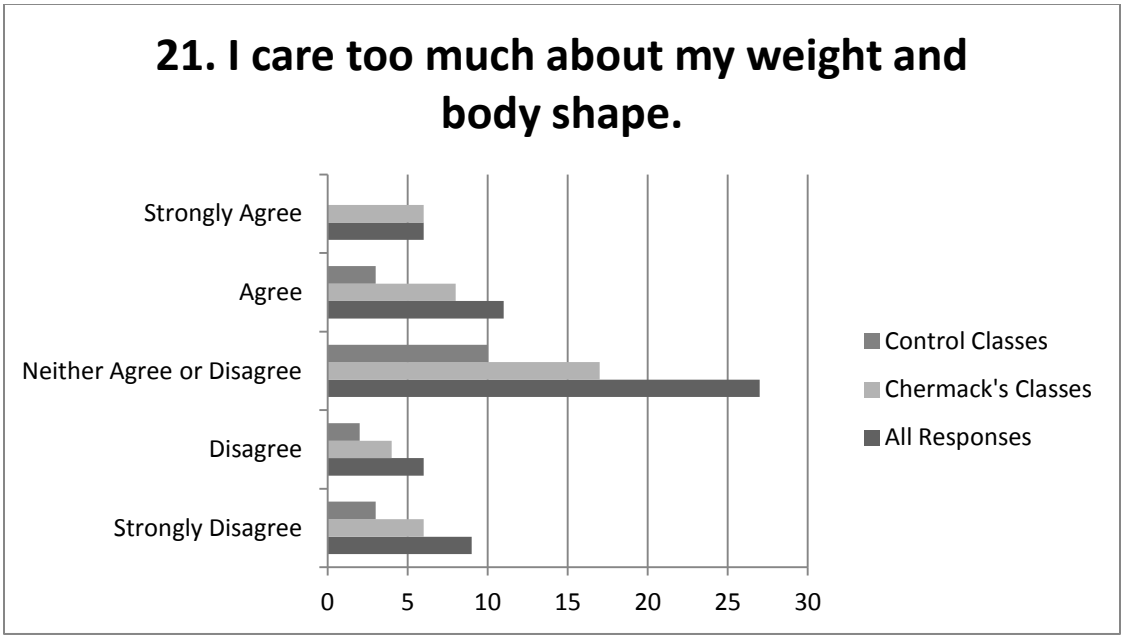
Figure 4.60



Both the mixed-gender grouping and partial gender-segregated grouping classes showed a slight tendency towards the agreement side of the graph on this question. The gender-segregated grouping class showed a flat response to this statement.

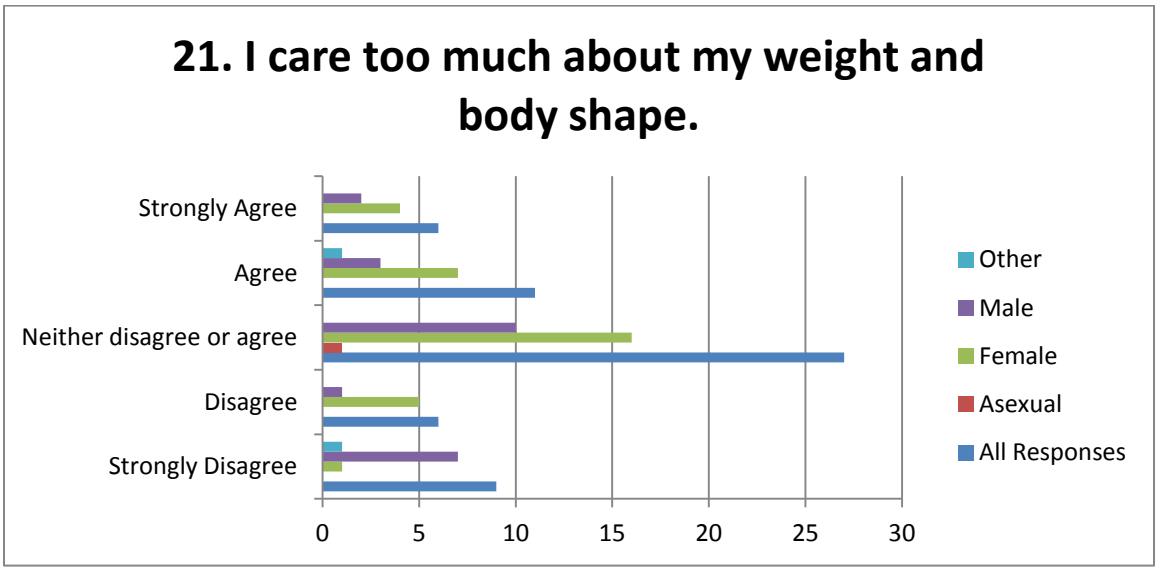
Figures 4.61-4.63 show the results from question #21.

Figure 4.61



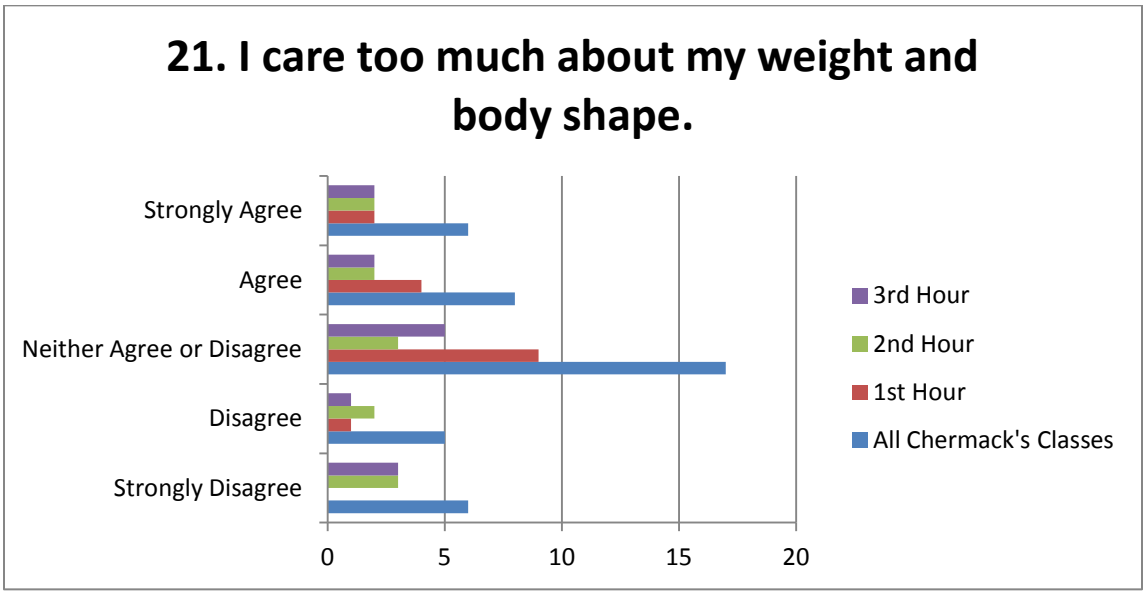
There was not a significant difference between the control classes and my classes on how they responded to this question. Both classes responded with a slight normal curve.

Figure 4.62



There was a definite discrepancy between the female and male responses on this question. The female responses skewed towards the agreement side, while the males skewed towards the disagreement side showing that they did not care too much about their weight and body shape.

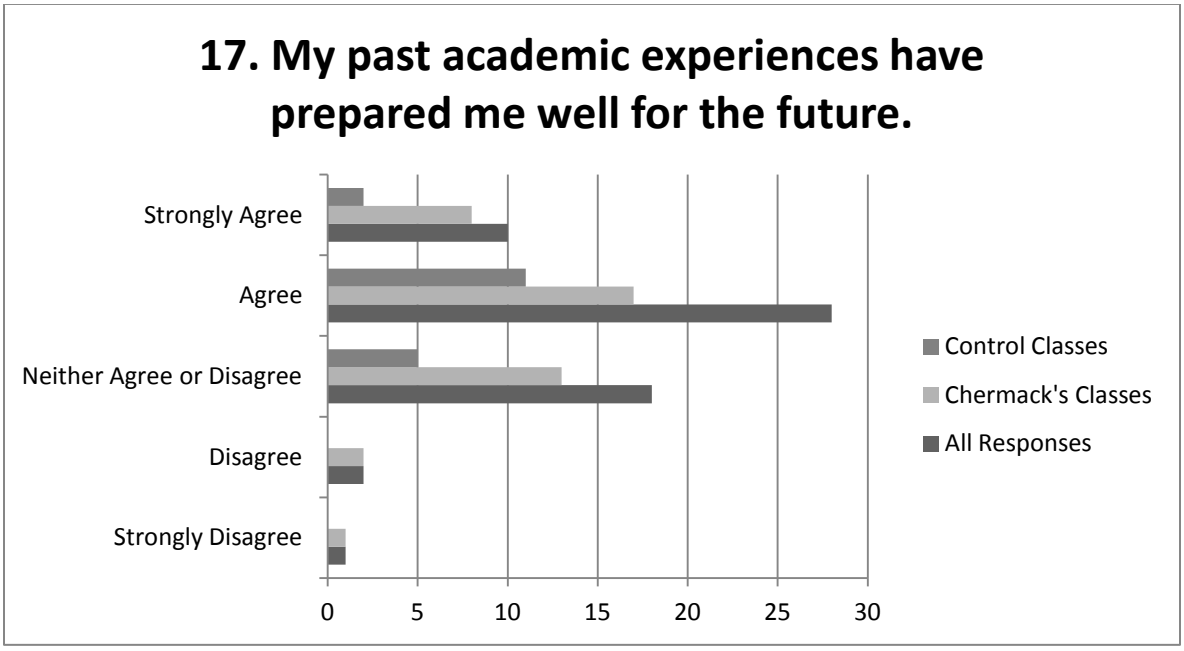
Figure 4.63



Both the gender-segregated grouping and mixed-gender grouping classes showed no real pattern to their responses. The partial gender-segregated grouping class had a slight tendency towards the agreement side of the graph.

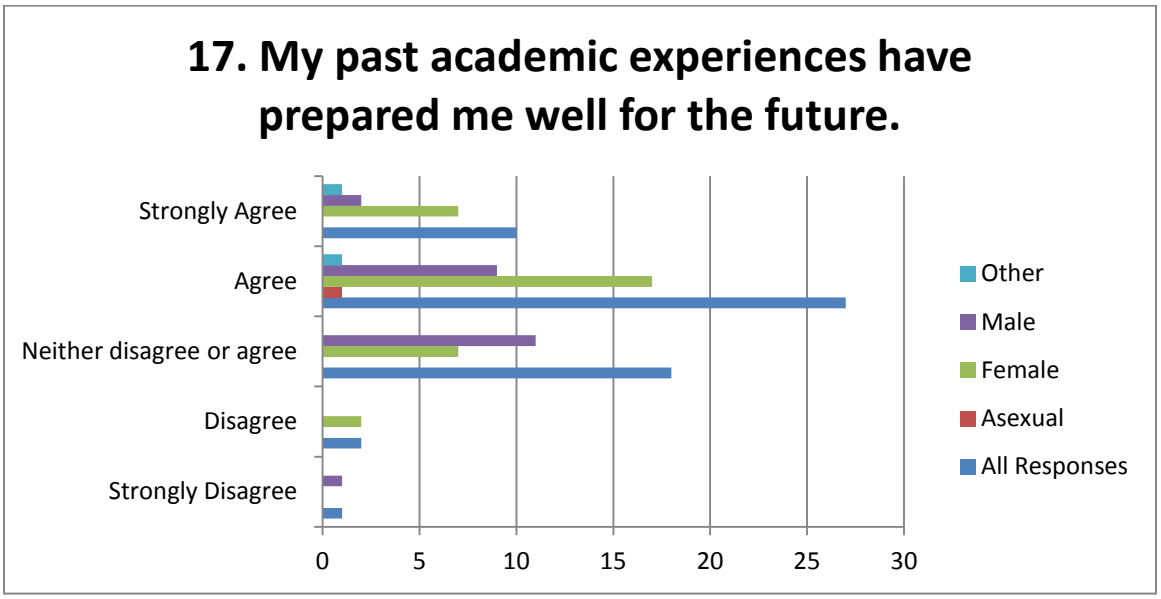
Figures 4.64-4.66 show the results from question #17.

Figure 4.64



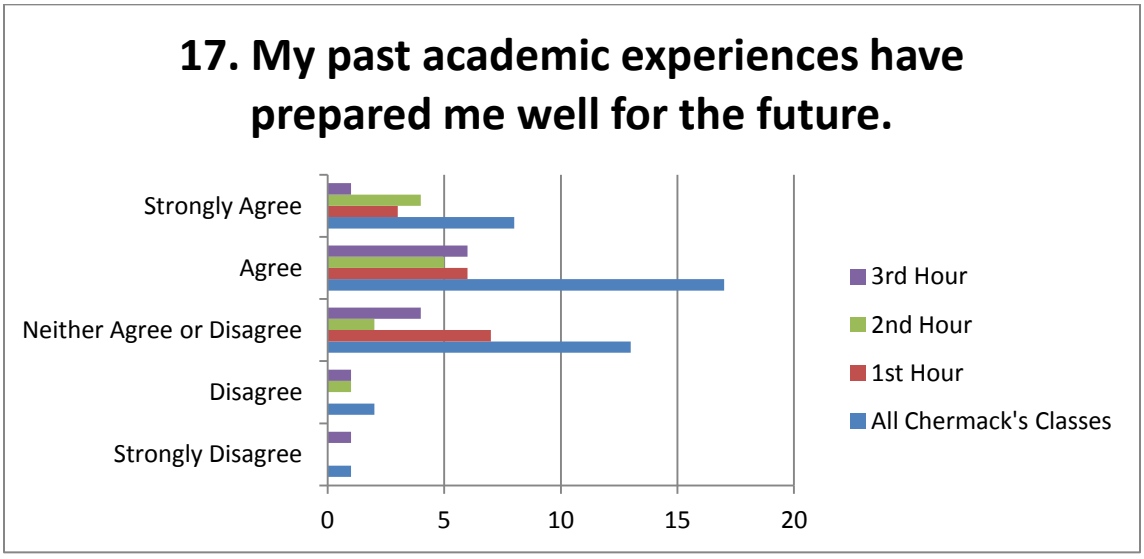
There really was no discrepancy between my classes and the control classes on how the students responded to this question.

Figure 4.65



Both the female and male respondents to this question showed a graph skewing towards the agreement side, but the females' skew was a little stronger than the males' graph, showing more of a tendency to agree that they felt their past academic experiences were preparing them for the future.

Figure 4.66



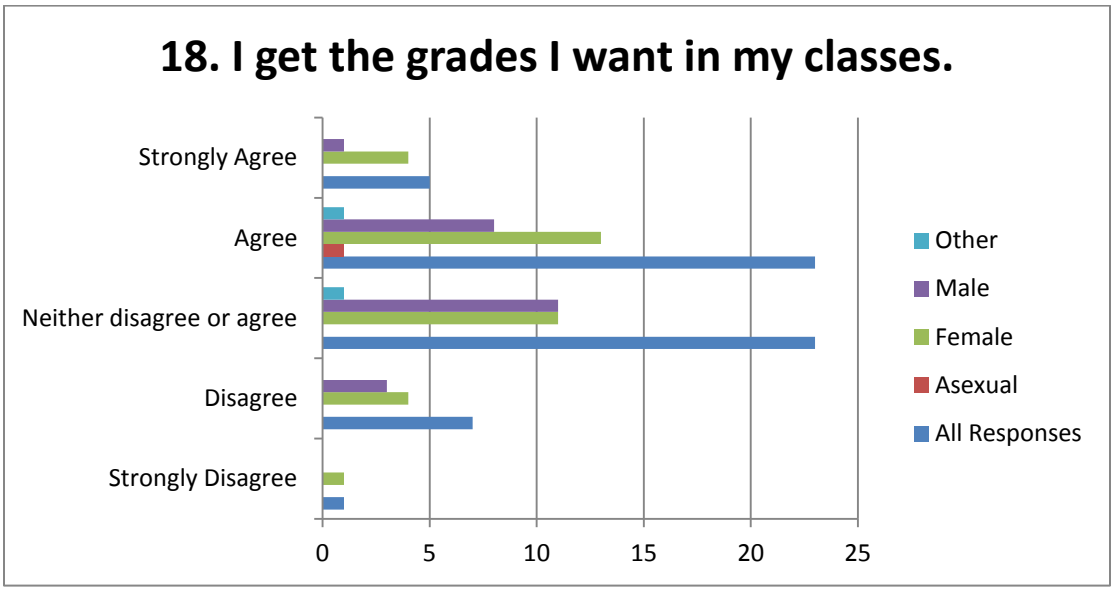
All of my classes showed a trend towards the agreement side of the graph, but the mixed-gender grouping class had the weakest tendency towards that side of the graph.

Figures 4.67-4.69 show the results from question #18.

Figure 4.67

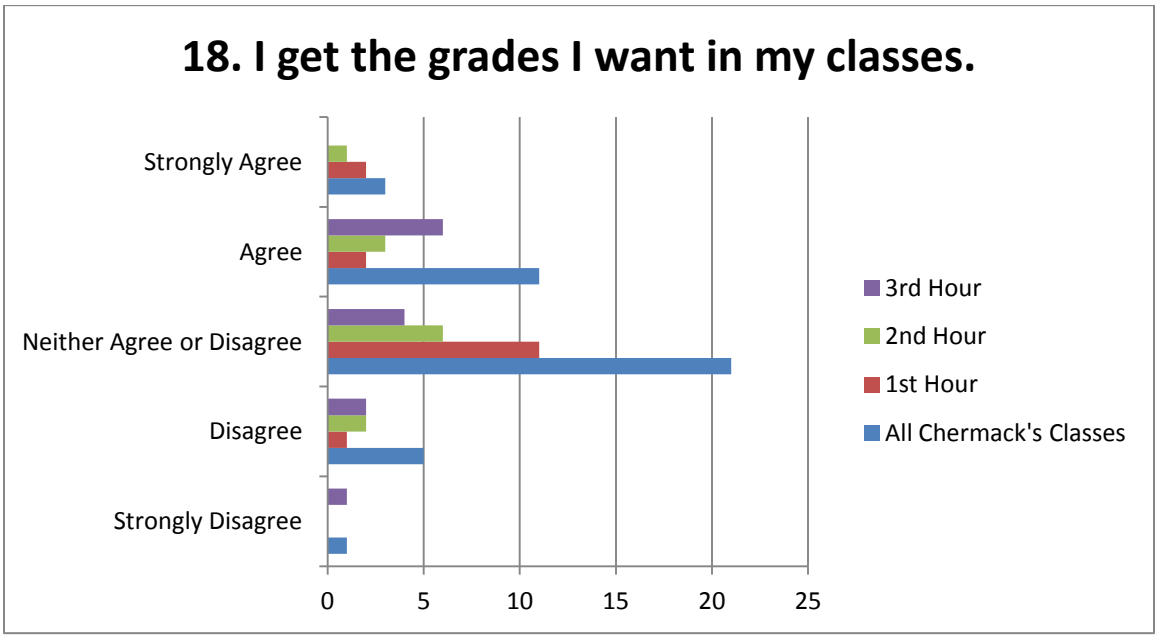
There was some discrepancy between my classes and the control classes in this question. My classes slightly agreed with this, but the control classes had a stronger skew towards the agreement side of the graph showing a response agreeing that they felt they get the grades they want in their classes.

Figure 4.68



Both genders showed very similar responses to this question, but the female responses were slightly closer to the agreement side of the graph.

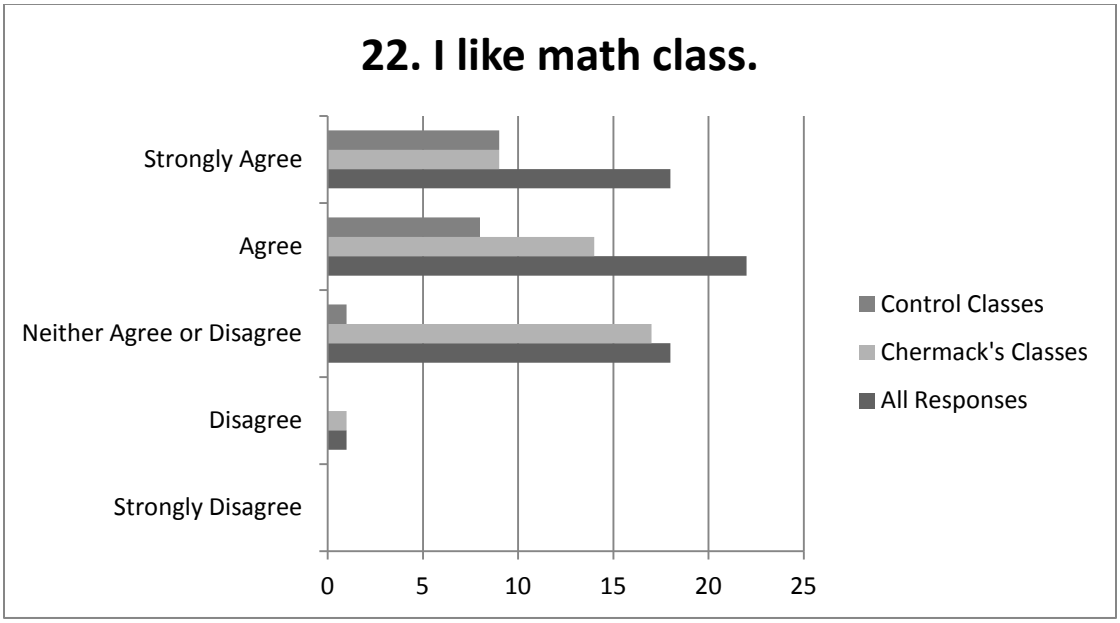
Figure 4.69



My classes showed a slight skew towards the agreement side of the graph for this question, except for the mixed-gender grouping class. They showed more of a skew toward the disagreement side of the graph.

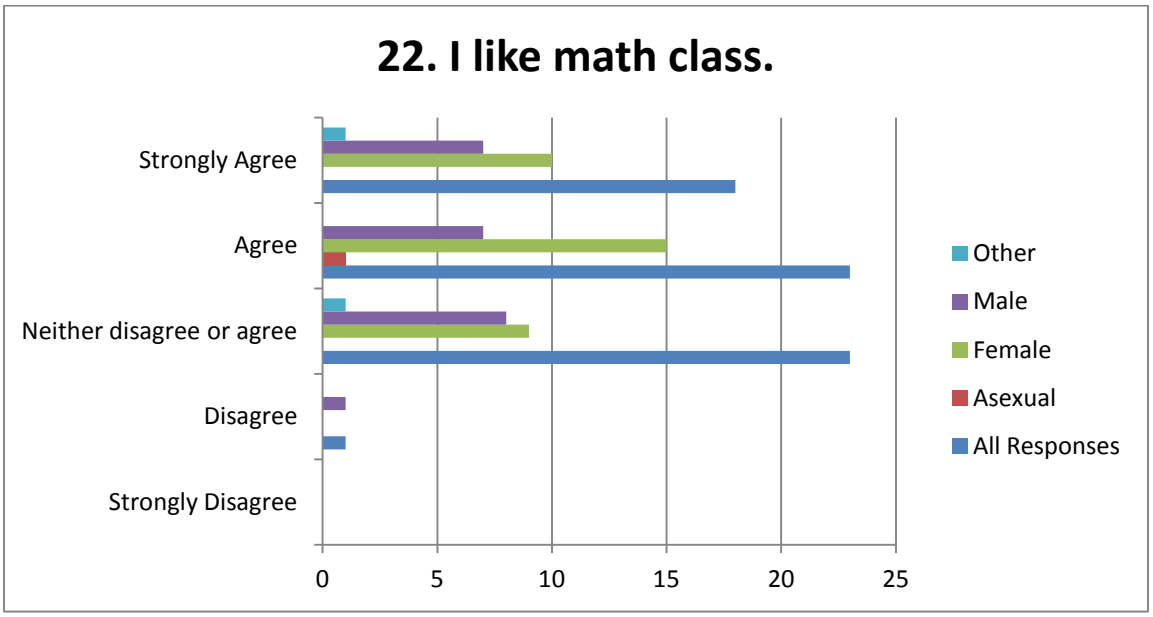
Figures 4.70-4.72 show the results from question #22.

Figure 4.70



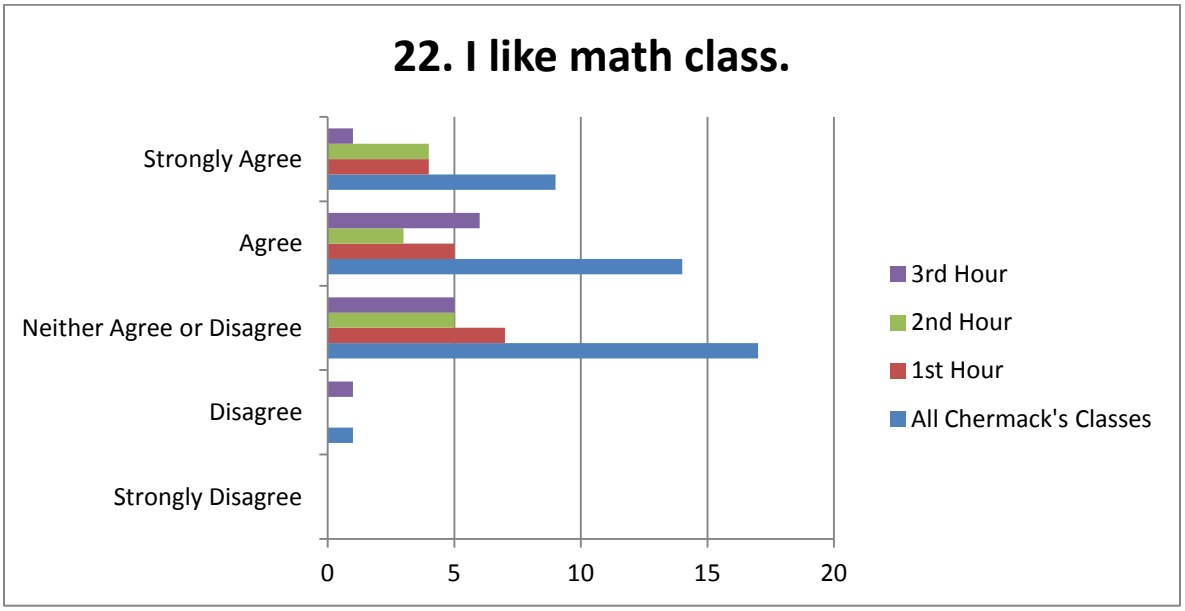
There was a little discrepancy in the results on this question. My classes were less skewed than the control classes toward the agreement side of the graph while responding on how they like math class.

Figure 4.71



There really was no difference between the females and males on how they responded to this question. Most of the respondents were on the agreement side that they liked math class.

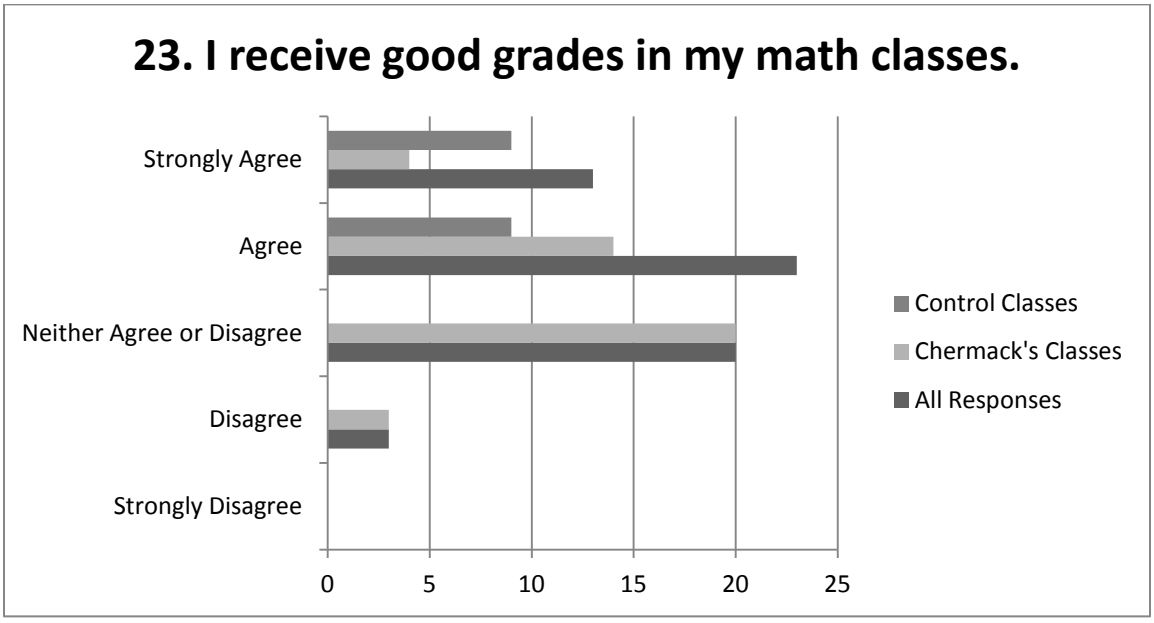
Figure 4.72



All of my classes showed a tendency towards the agreement side of the graph on this question. Any discrepancy was really negligible.

Figures 4.73-4.75 show the results from question #23.

Figure 4.73



There was a difference in how the students responded to this question when looking at my classes compared to the control classes. My classes skewed towards the agreement side, but the control classes skewed heavily towards the agreement side of the graph, showing only positive responses that the students all felt they received good grades in their math classes.

Figure 4.74

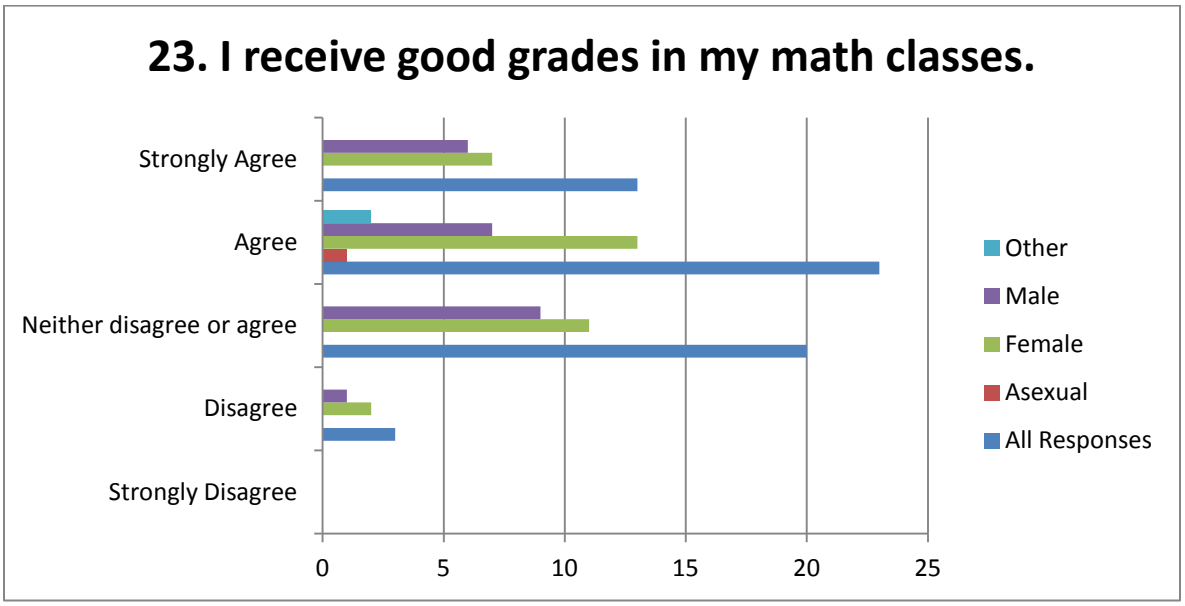
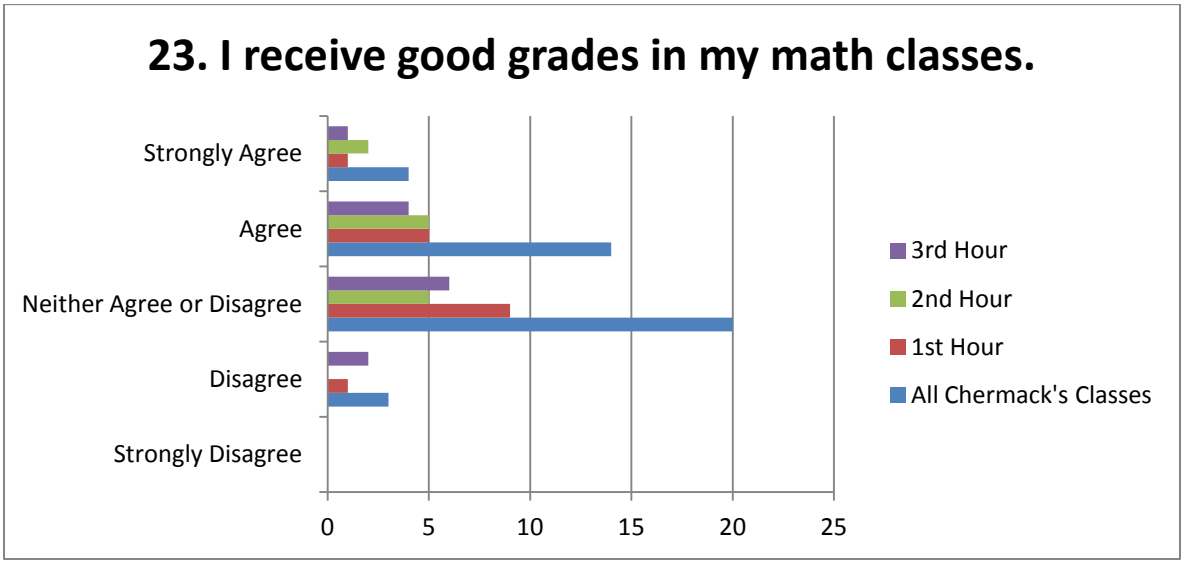


Figure 4.74 showed that there really was no difference between how the males and females responded to this question.

Figure 4.75

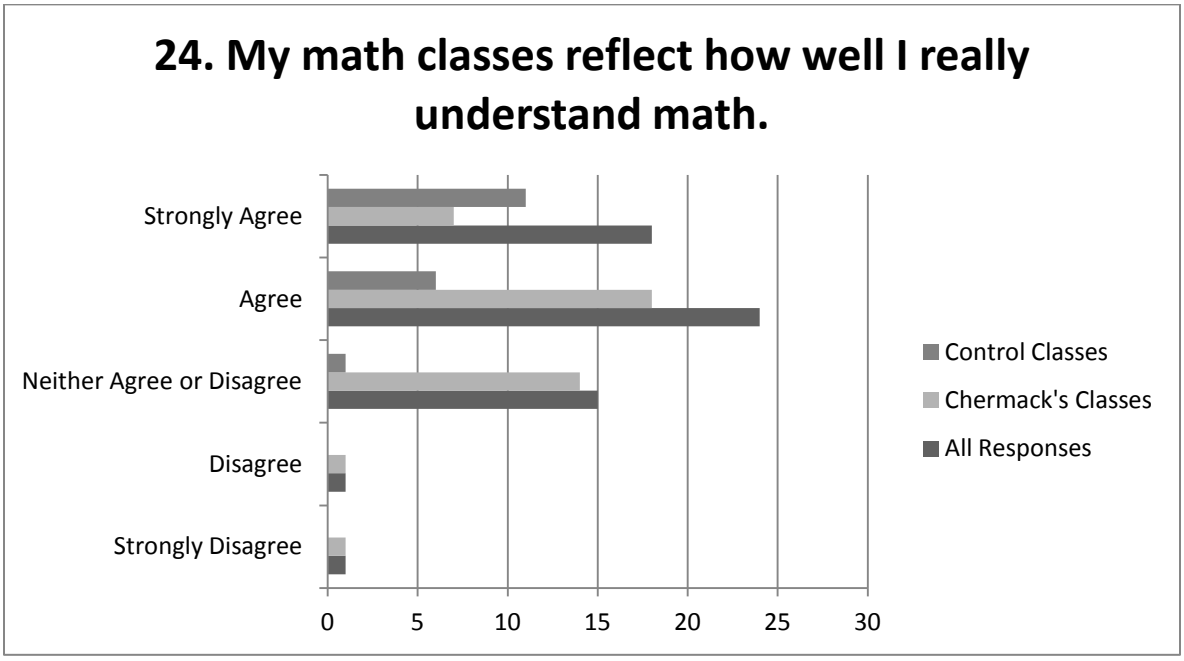


All of my classes showed a tendency toward the agreement side of the graph on this question. There was little discrepancy between the classes, but the mixed-gender grouping

class had less of a skew towards the agreement side of the graph than the gender-segregated grouping class.

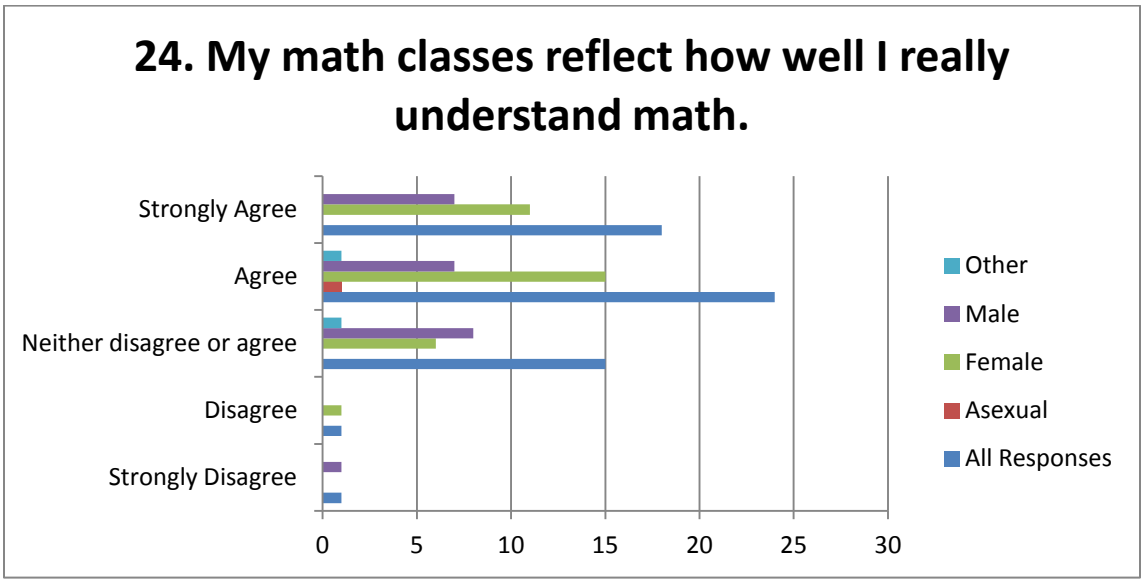
Figures 4.76-4.78 show the results from question #24.

Figure 4.76



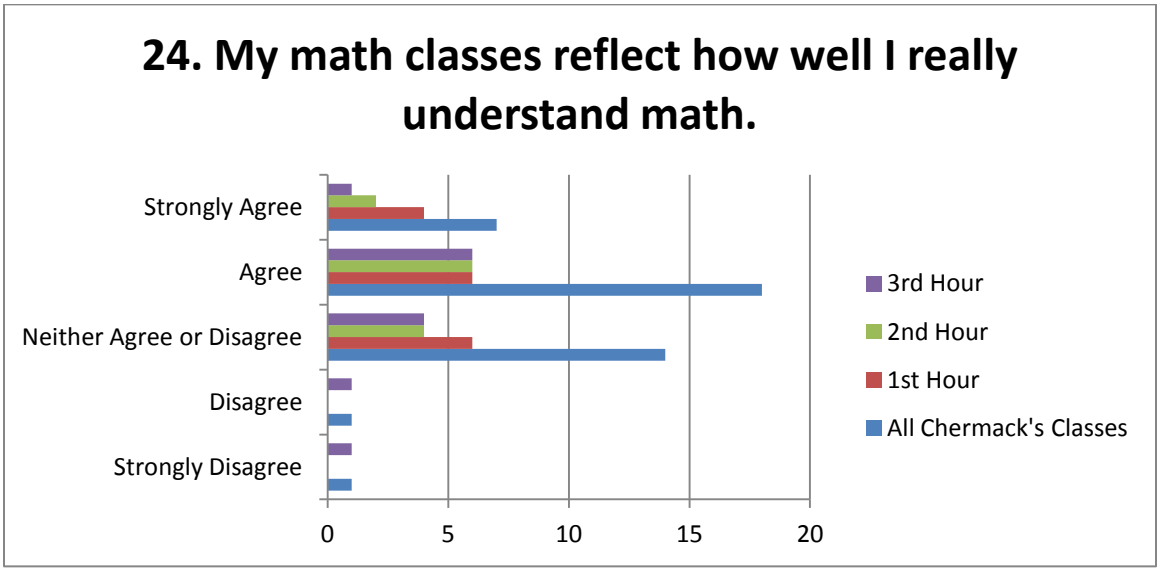
There was a discrepancy between my classes and the control classes on this question. My classes skewed towards the agreement side of the graph, but the control classes skewed much more heavily towards the agreement side of the graph showing that those students agreed with the statement that they felt their math classes reflected how well they really understood math.

Figure 4.77



The female responses show a little stronger of a tendency towards the agreement side of the graph than the males did. Both genders were mostly skewed toward the agreement side of the graph showing that they felt their math classes reflected how well they really understood math.

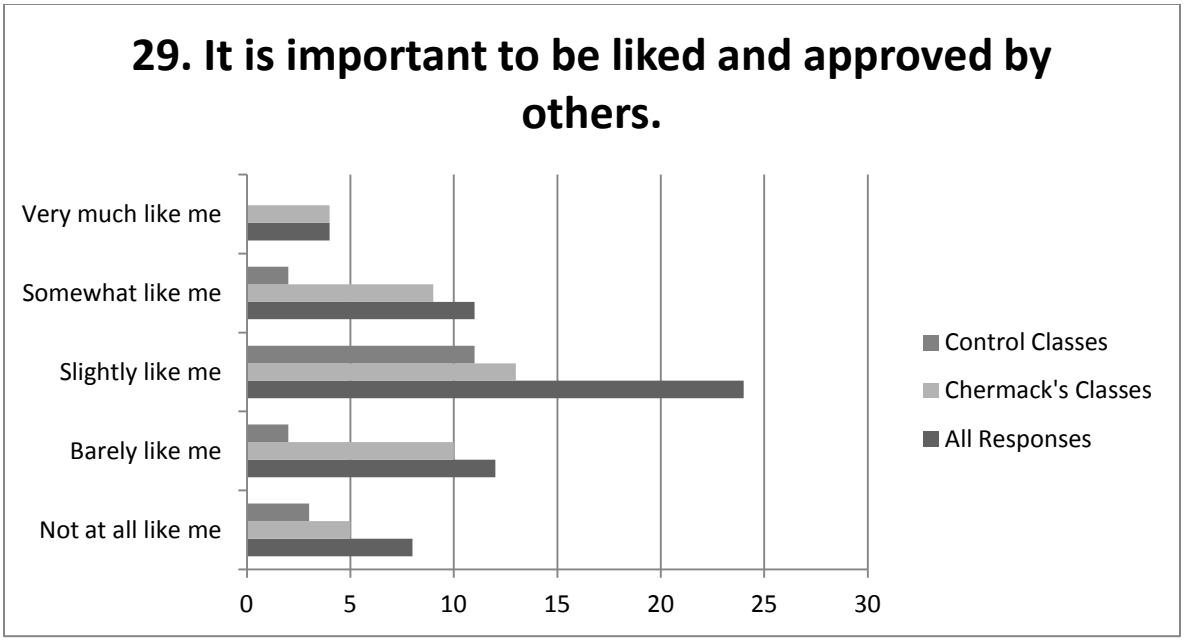
Figure 4.78



All of my classes showed a trend towards the agreement side of the graph on this question. The mixed-gender grouping class had the weakest tendency towards the agreement side of the graph of the three classes.

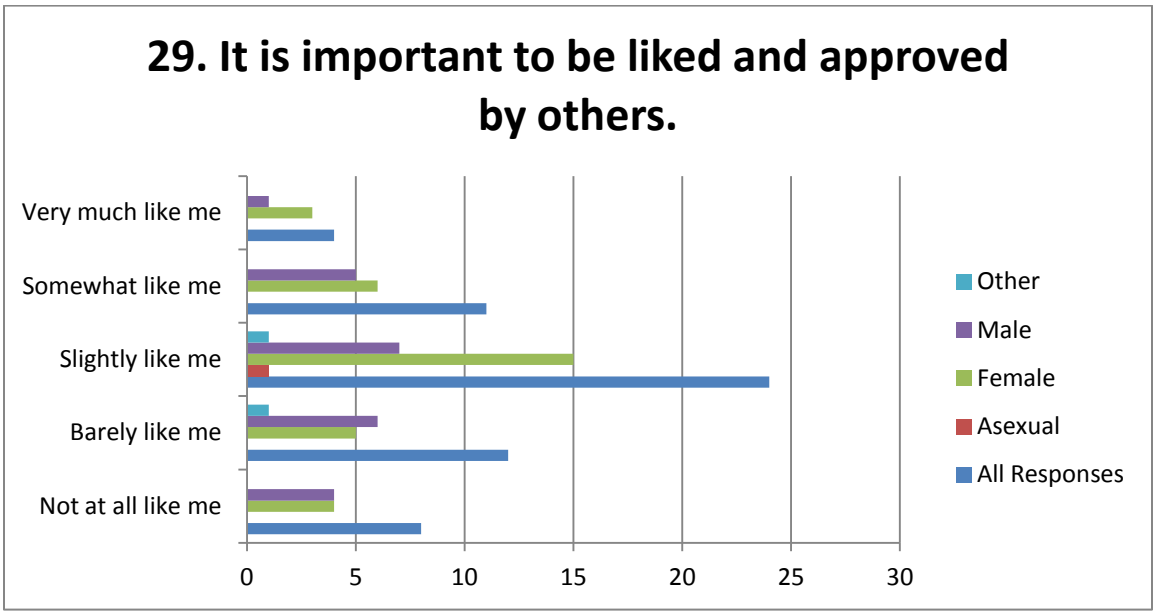
Figures 4.79-4.81 show the results from question #29.

Figure 4.79



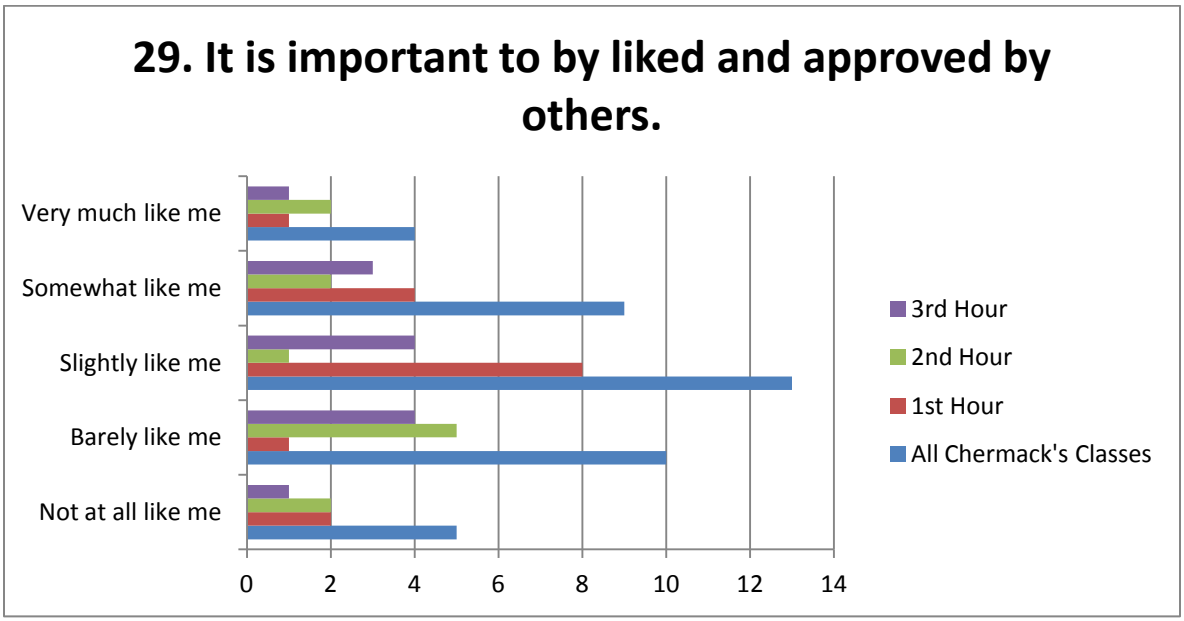
There was not a noticeable difference between my classes and the control classes on how they responded to this question. Both classes seemed to answer in a normal curve to the statement.

Figure 4.80



Looking at this question, the females responded slightly more towards the agreement side of the graph than a normal curve, while the males were closer to a normal curve.

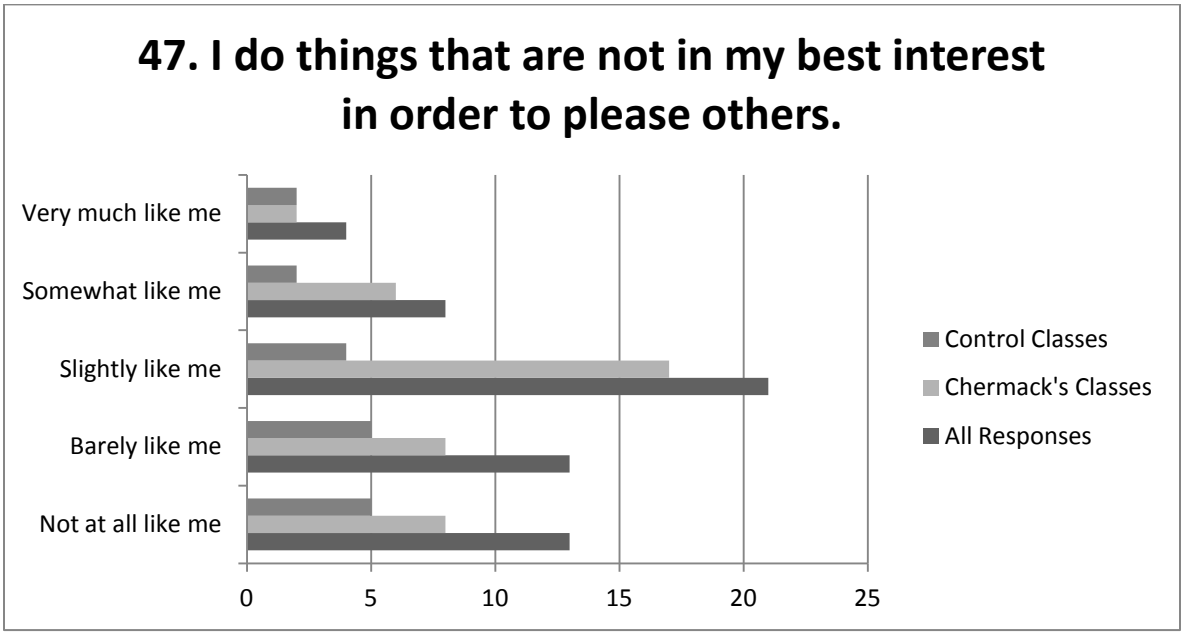
Figure 4.81



My classes did not show a discernible pattern on this question when looking at the individual classes.

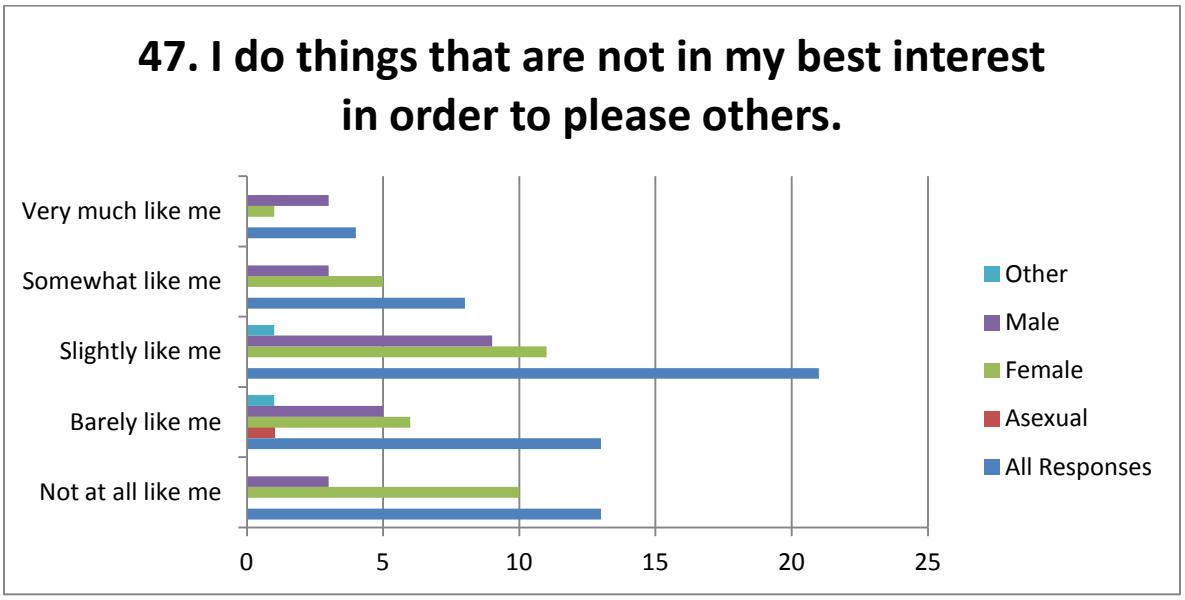
Figures 4.82-4.84 show the results from question #47.

Figure 4.82



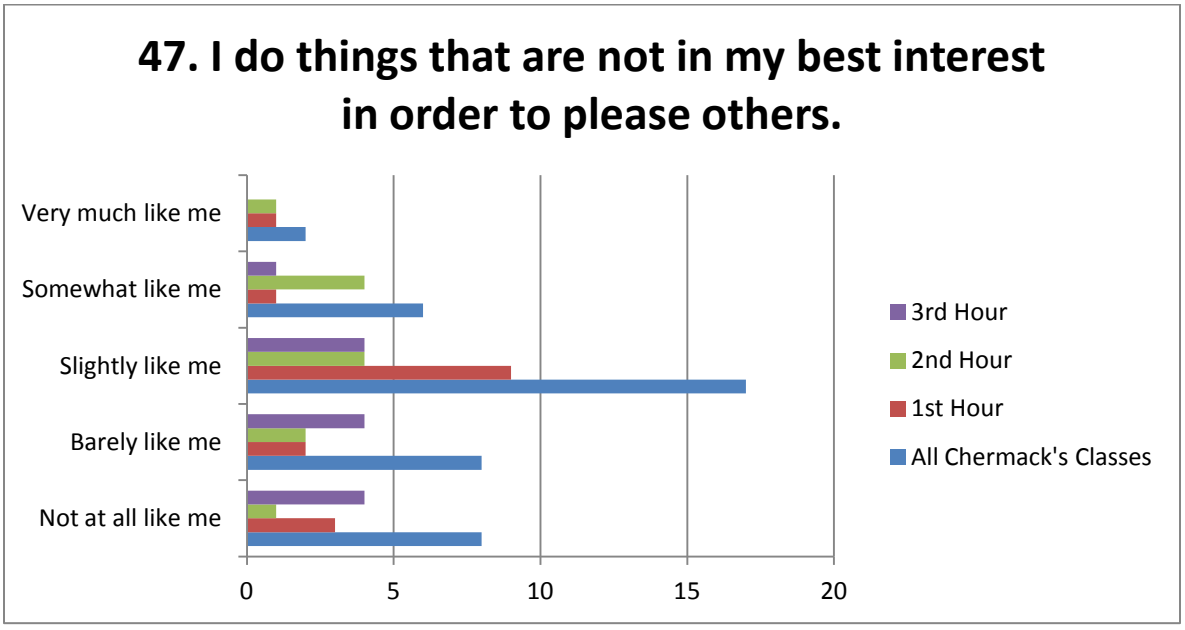
There was a little difference in how the classes responded to this question. My classes skewed slightly towards the disagreement side, while the control classes skewed harder towards the disagreement side in responding that the students felt they do things that are not in their best interest in order to please others.

Figure 4.83



The males showed a definite normal curve when responding to this question. The female responses skewed towards the disagreement side of the graph, showing that they did not feel they did things that were not in their best interest to please others.

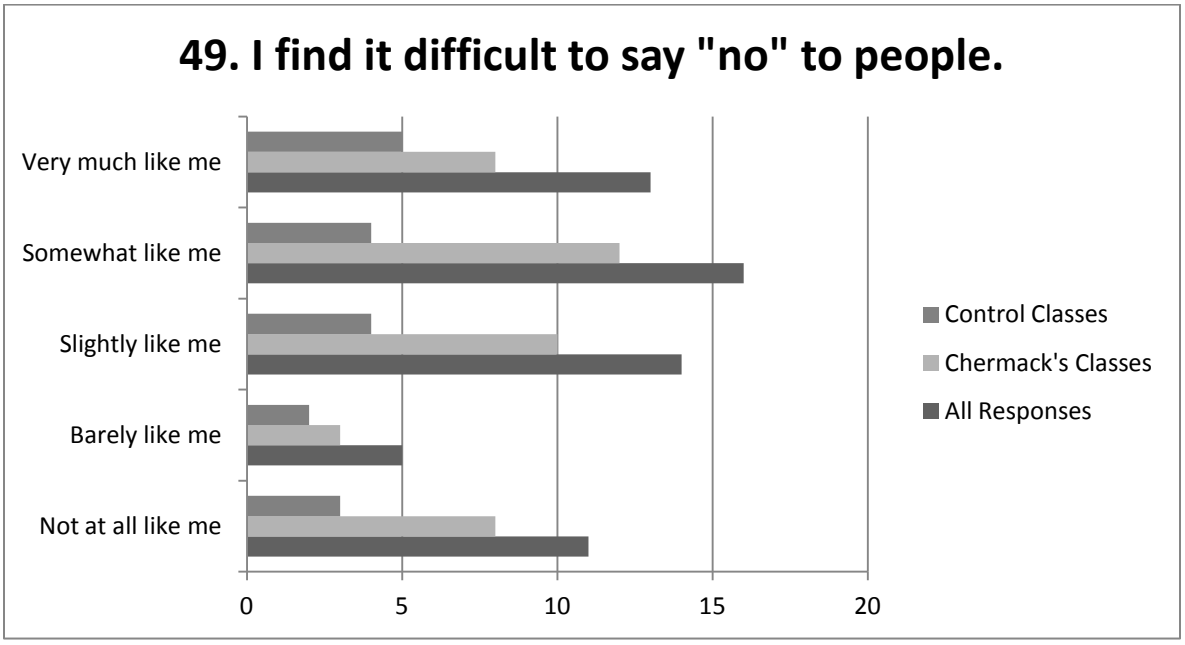
Figure 4.84



My mixed-gender grouping class showed a slight trend toward the disagreement side of the graph on this question. The partial gender-segregated grouping class showed an even slighter trend towards the disagreement end of the graph. The gender-segregated grouping class showed a normal curve in response to this question.

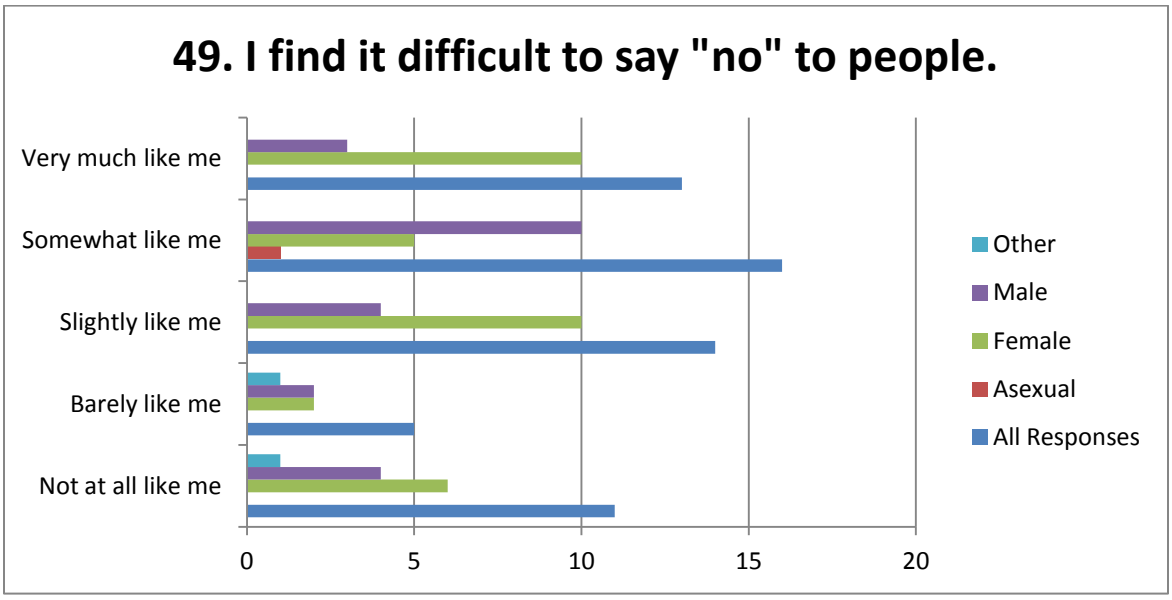
Figures 4.85-4.87 show the results from question #49.

Figure 4.85



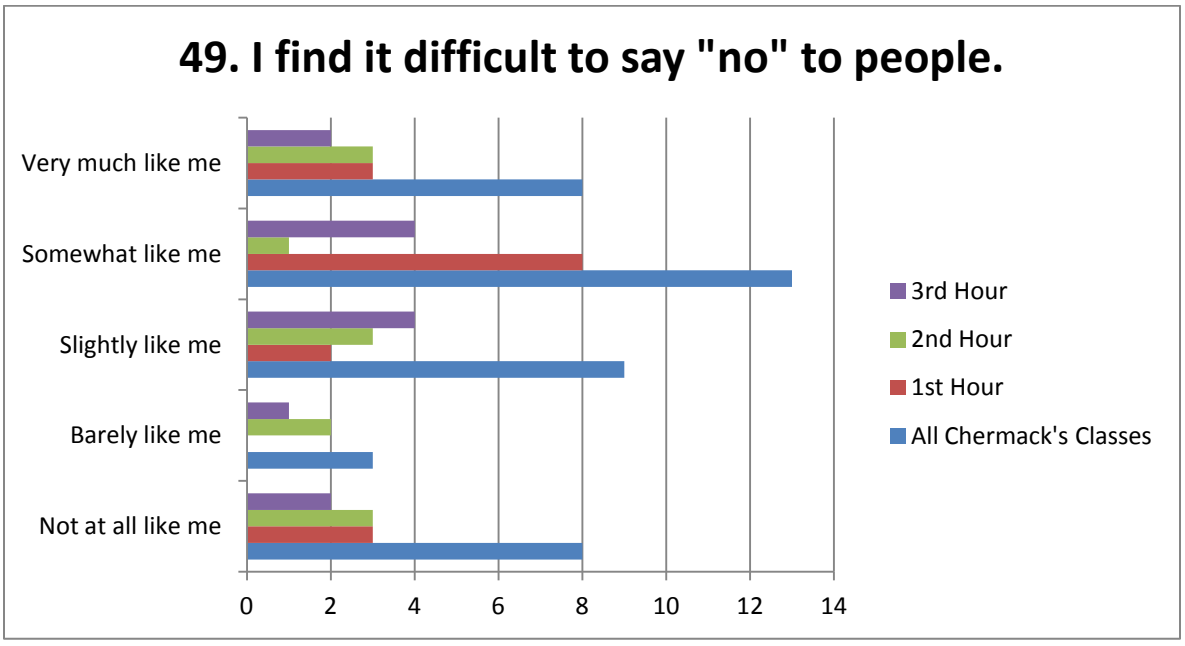
There really was no discrepancy between the control classes and my classes on how they responded to this question. Both classes showed a flat response to the question with no discernible pattern.

Figure 4.86



Both the male and female responses to this question really did not show a discernible pattern. There may had been a slight skew to the agreement side of the graph, but otherwise they were both very flat.

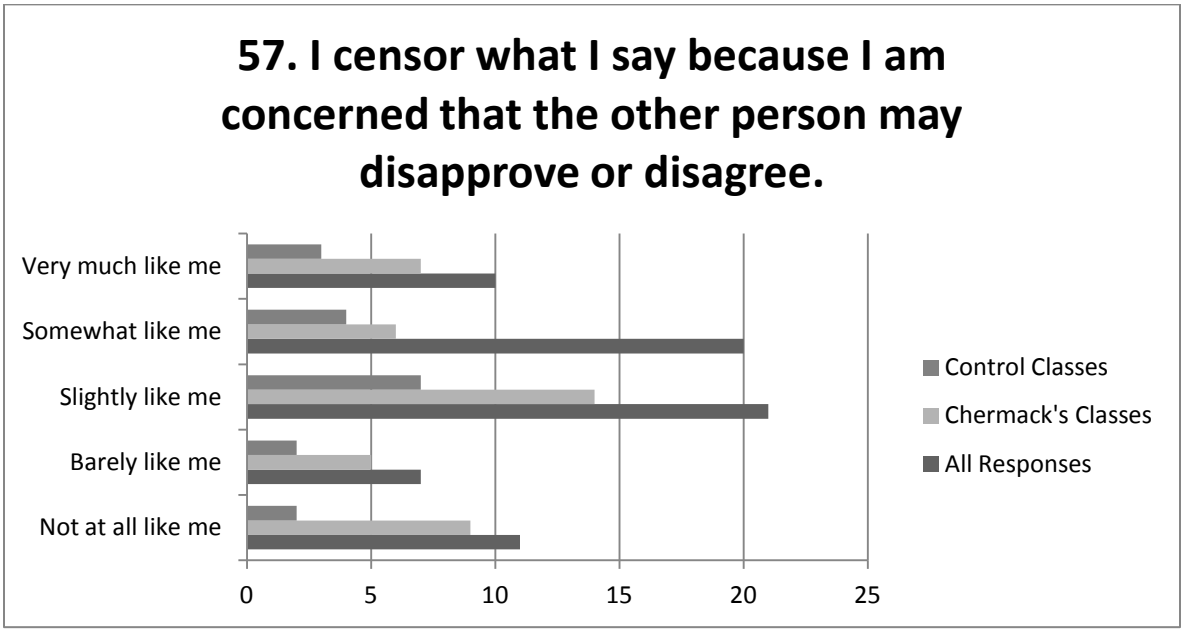
Figure 4.87



None of my classes showed any real pattern when responding to this question. All of my classes had a flat graph across their responses.

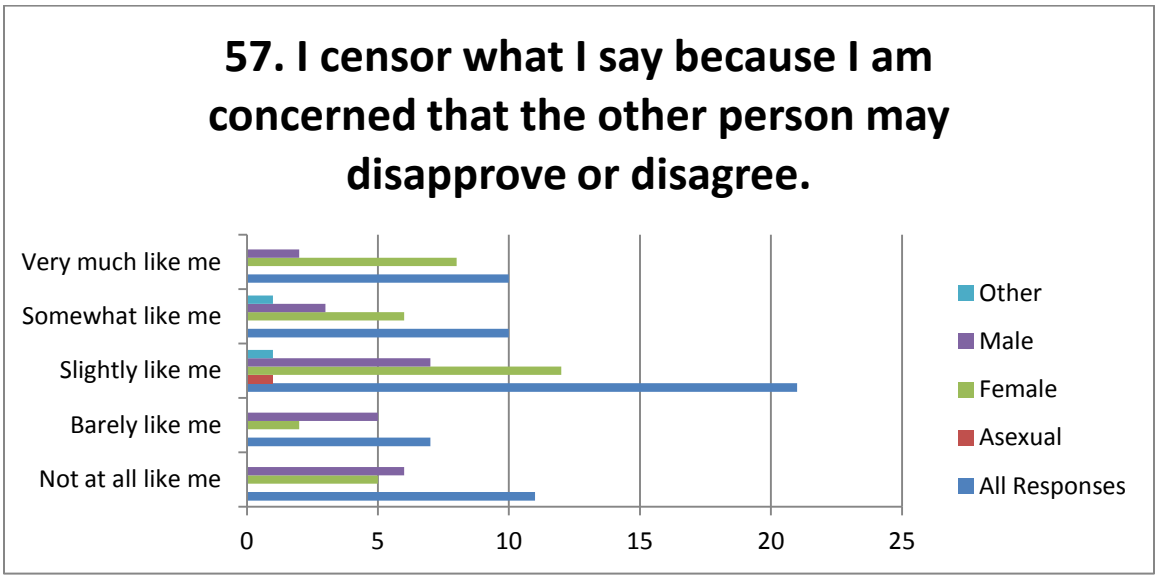
Figures 4.88-4.90 show the results from question #57.

Figure 4.88



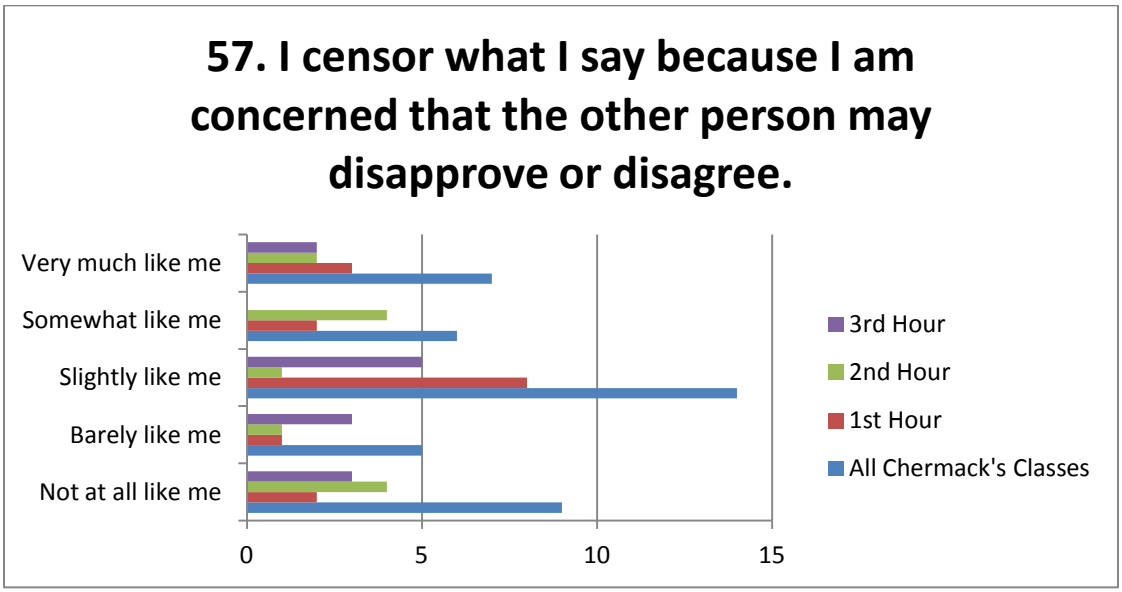
There was a slight discrepancy between the classes on this question. My classes showed the beginning of a normal curve, but the control classes showed a more pronounced normal curve in response to this question.

Figure 4.89



There was a definite discrepancy between the male and female responses on this question. The females' responses skewed more towards the agreement side of the graph, while the males' responses skewed more towards the disagreement side of the graph. Both skews were very subtle, but noticeable.

Figure 4.90



My individual classes showed no discernible pattern when responding to this question.

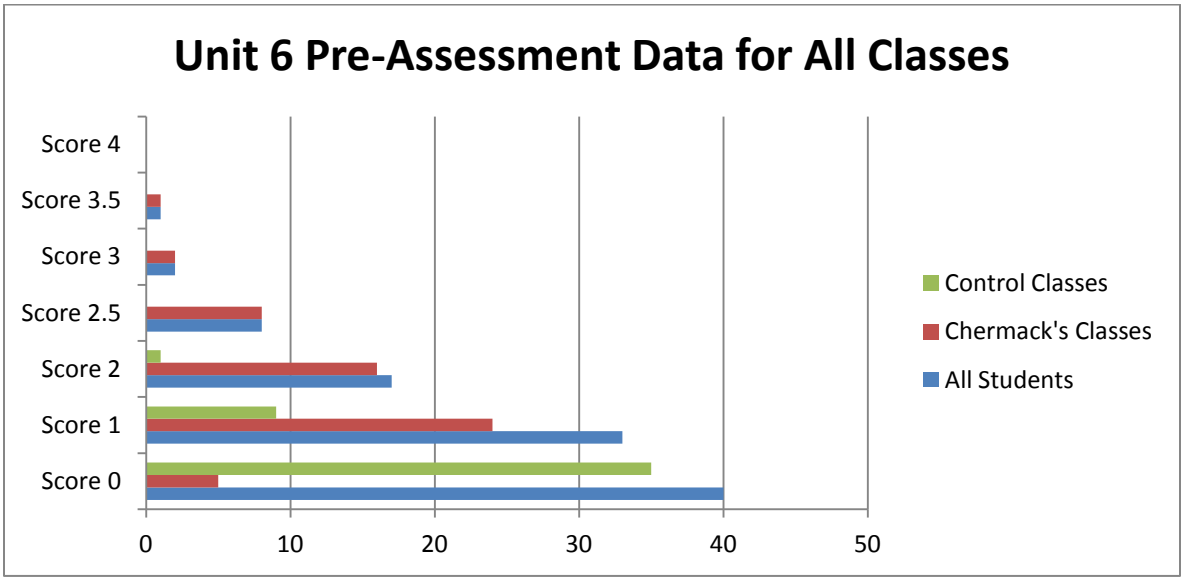
Unit 6 Assessments

Results from Pre-Assessments

I was able to obtain 101 students' pre- and post-assessment (Appendix B) data for Unit 6 which was on proving similarity of polygons. Unit 6 was a long one for our students and it was broken down into two sections because of its length. Students are scored on a content mastery system. They receive scores of 0 through 4 with a 0 being nothing learned and a 4 being beyond mastery.

Figures 4.91-4.93, show the results from the pre-assessments.

Figure 4.91



Looking at the pre-assessment scores, my students started with some higher scores than the control class. I also had an unfortunately large number of students that did not take the pre-assessment in my classes (around 20).

Figure 4.92

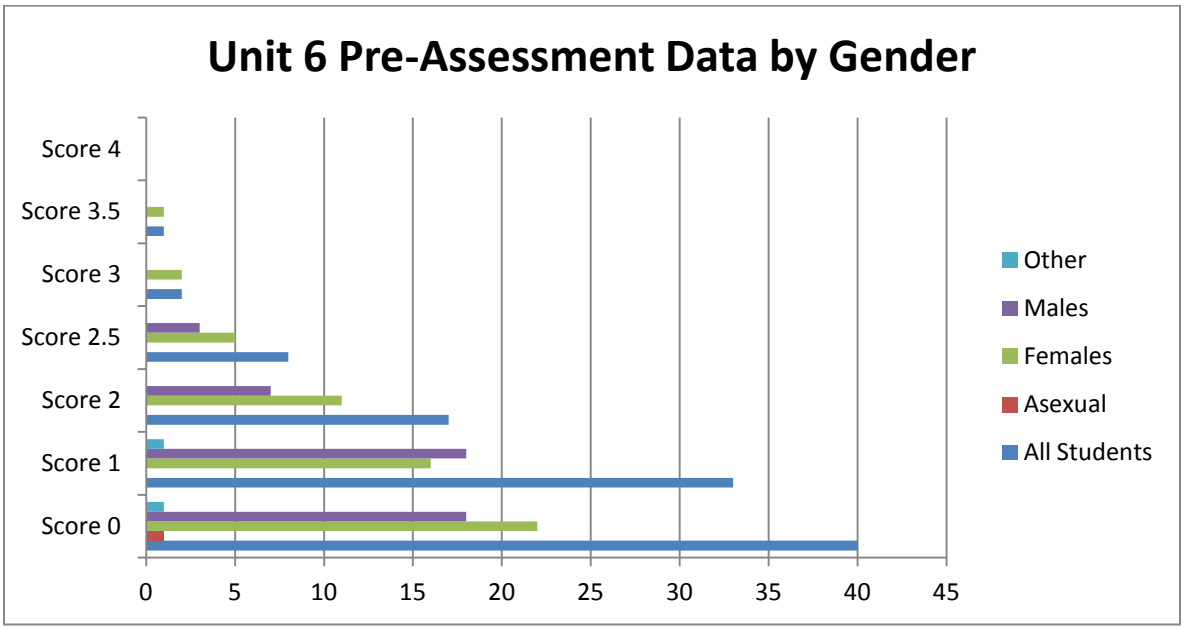
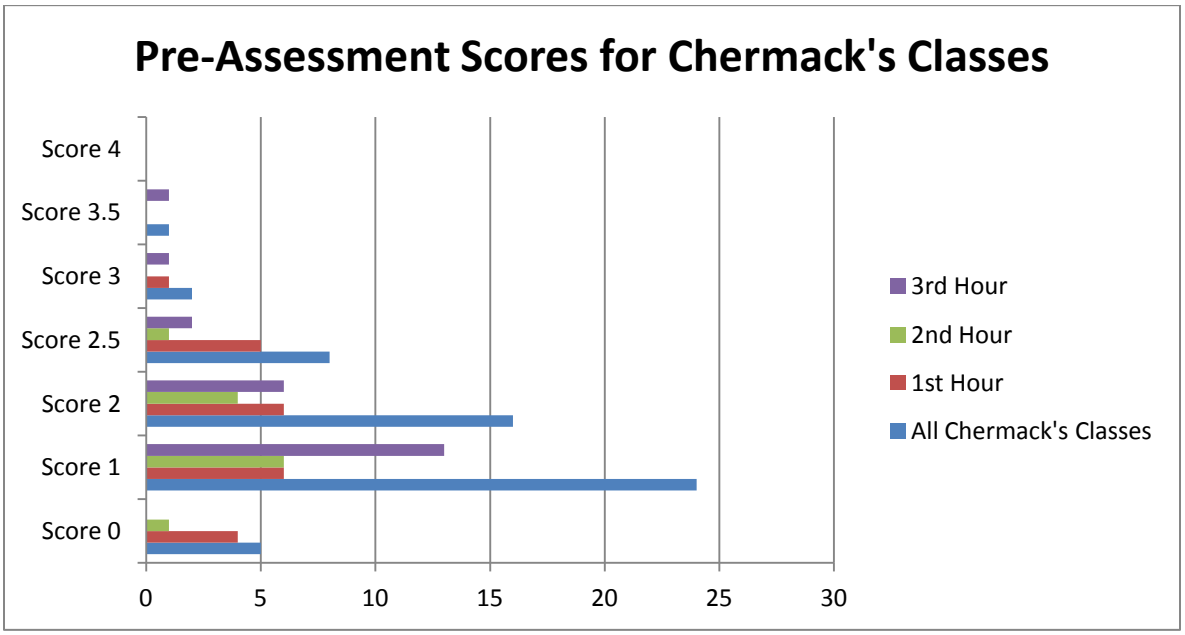


Figure 4.92 shows that there really was no discrepancy in the pre-assessment scores by gender.

Figure 4.93

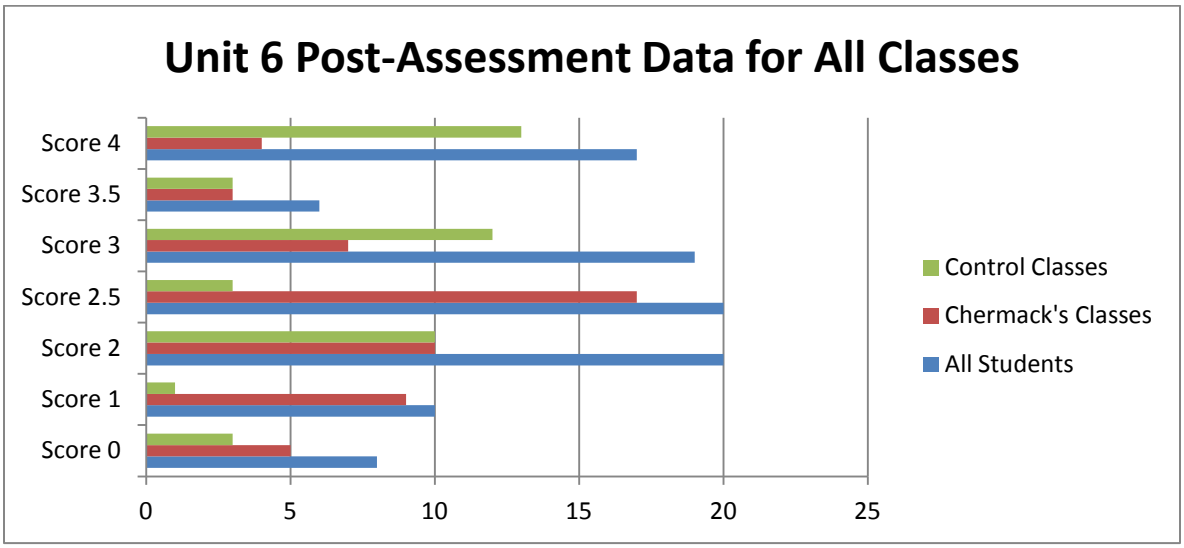


Looking at the pre-assessment data by my classes alone, I saw that there was only a slight discrepancy between the classes. The mixed-gender grouping class showed a slightly higher average on their pre-assessment data than the other two classes, but all classes showed a slight normal curve and not many students in the zero range.

Results from Post-Assessments

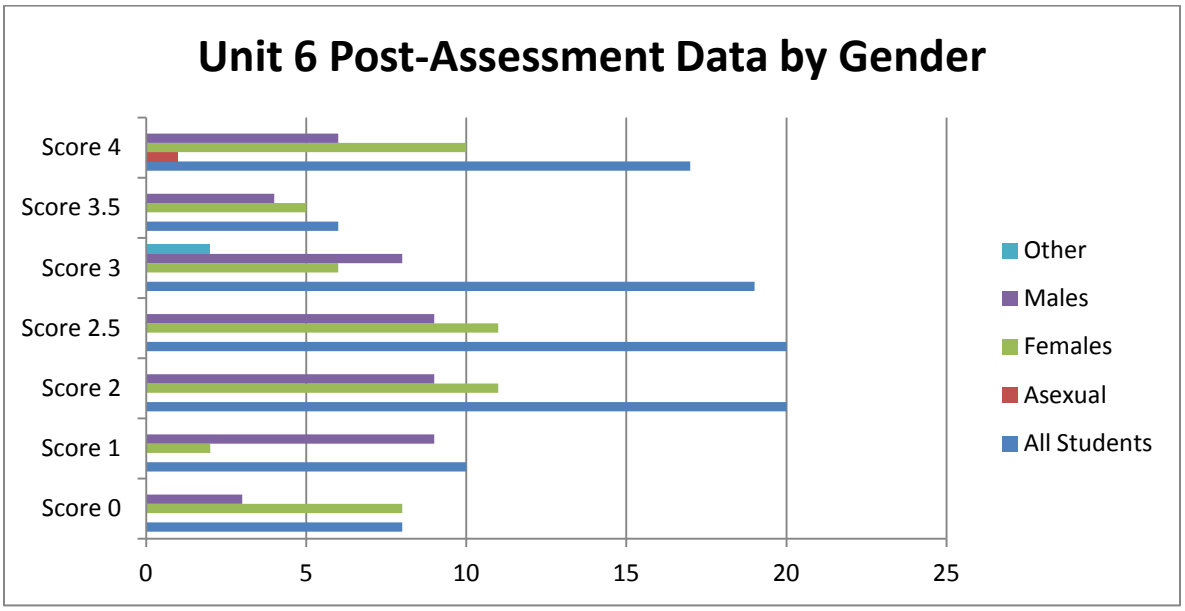
After finally getting through the post-assessments I found the following results, which are depicted in *Figures 4.94-4.96*:

Figure 4.94



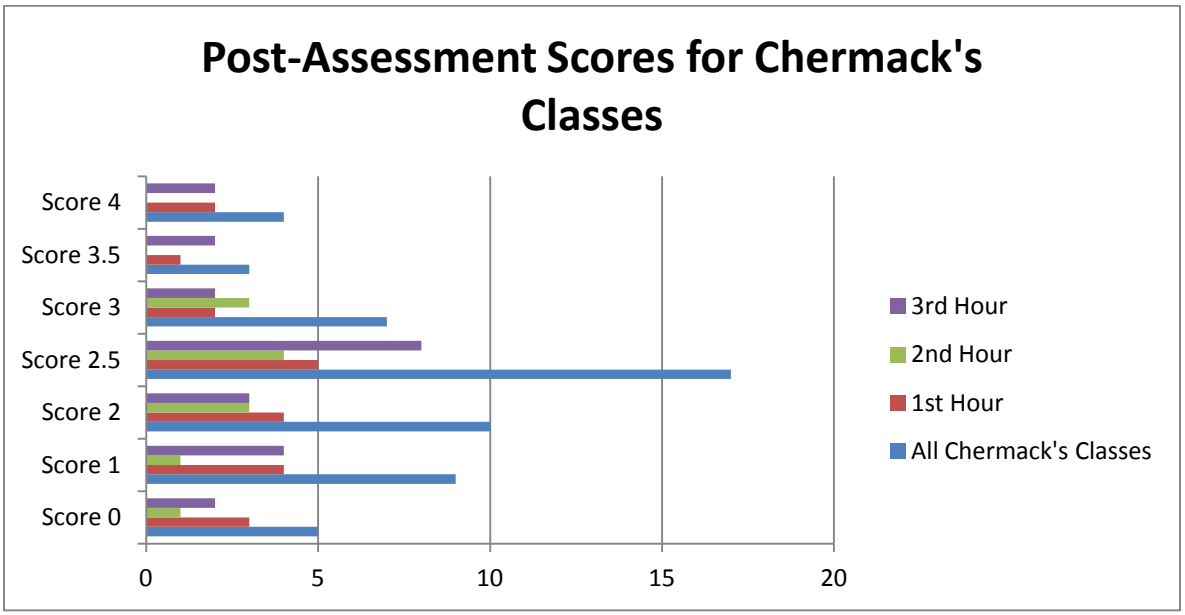
Looking at the data from the post-assessment, my class showed a normal curve with their scores. The control classes really had no discernible pattern in its data.

Figure 4.95



Looking at Figure 4.95, there really seemed to be no discrepancy in the results of the scores between the different genders. All students came across with very flat data and no noticeable patterns.

Figure 4.96

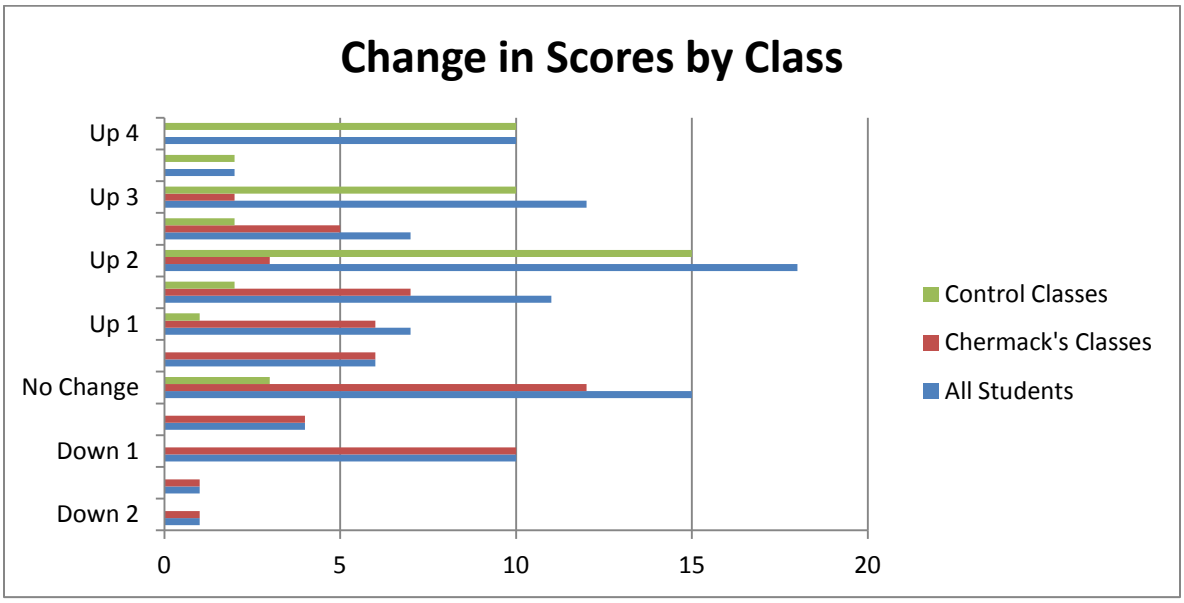


Looking at *Figure 4.96*, there seemed to be no discrepancy between my different classes and how it had an effect on their learning. All three classes showed a normal curve with a slightly improved score from the pre-assessment data, but there was no significant difference between my three classes.

Data from Pre- to Post-Assessments

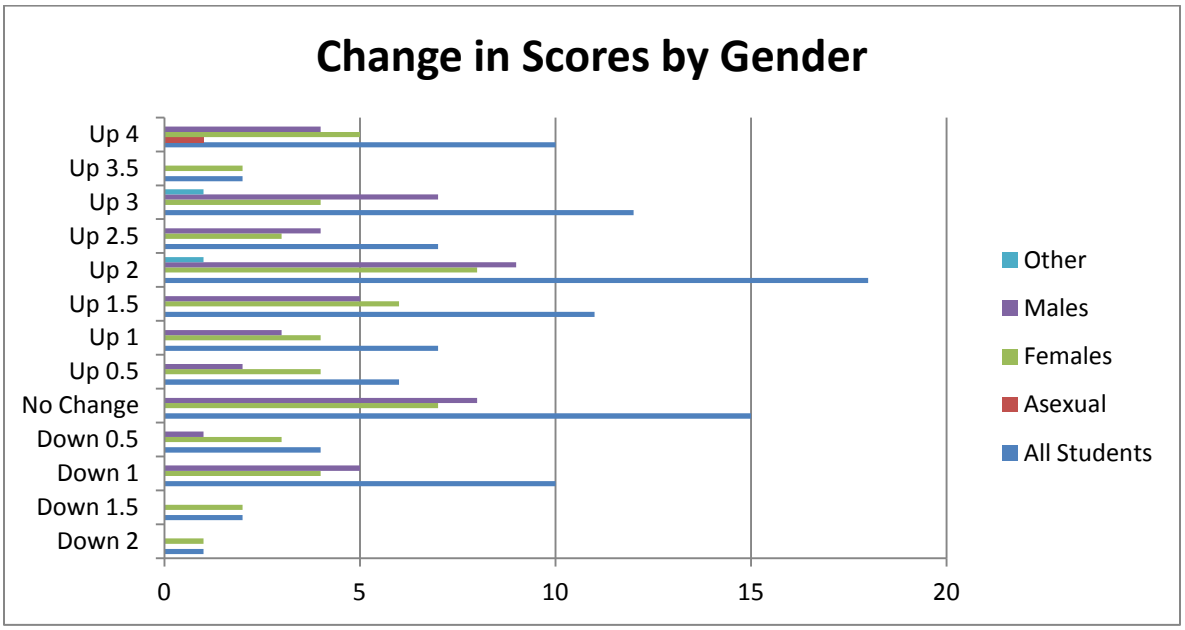
In Figures 4.97-4.99 I show the data for how the students' scores improved from the pre- to post-assessments for Unit 6.

Figure 4.97



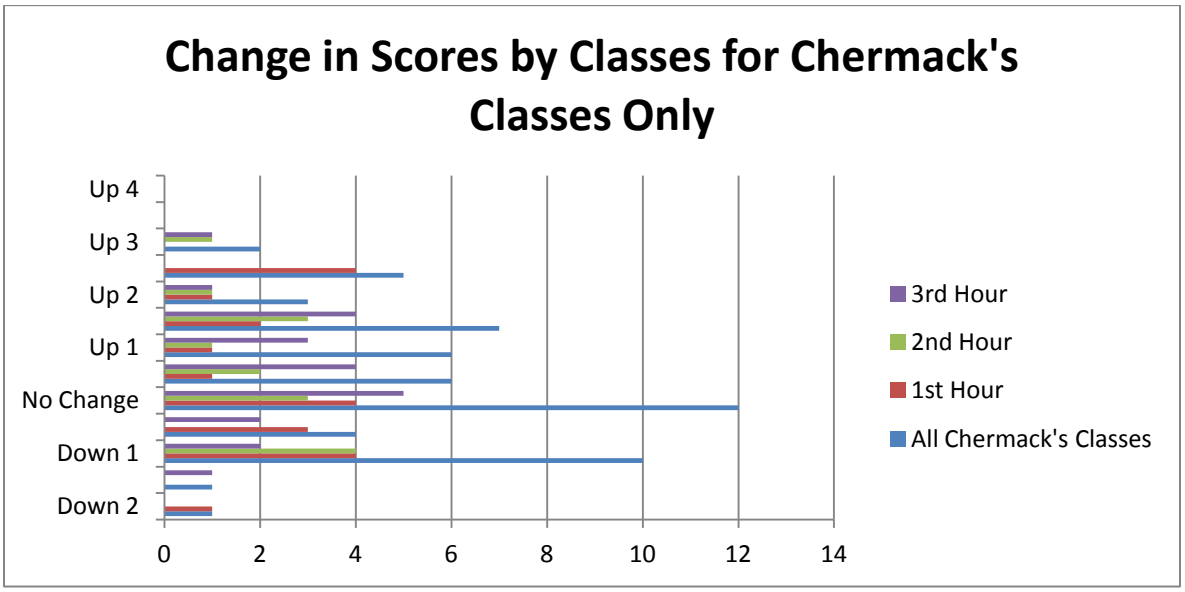
The control classes showed more of an increase in their assessment scores overall. This data alone would make it seem to look like the self-esteem curriculum did not help my students in their math ability.

Figure 4.98



The males and females were pretty evenly split on how they improved on the assessment over Unit 6.

Figure 4.99

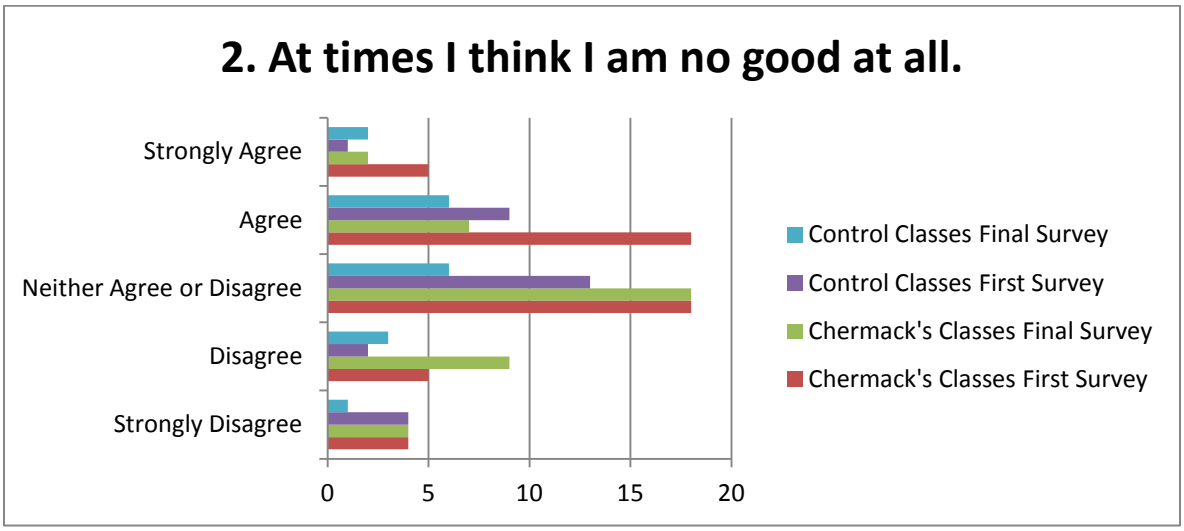


All of my classes seemed to have the same improvement on their scores in the assessment in Unit 6. There may have been a slightly larger increase in the gender-segregated grouping class than the other two classes.

Changes in First to Final Survey

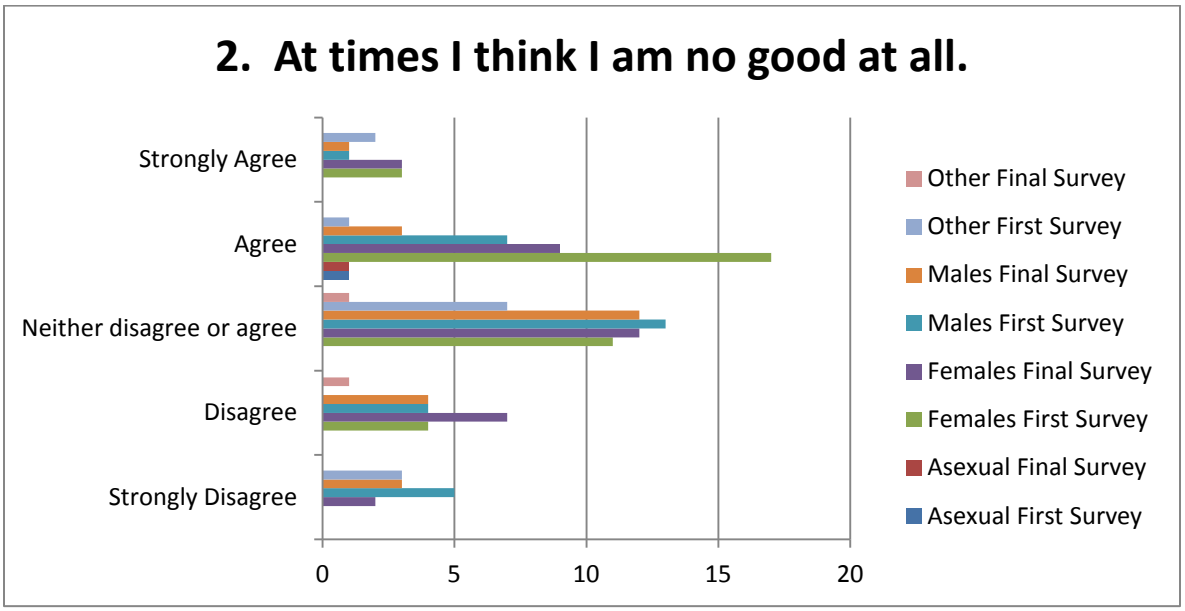
Now I am going to delve further and look at how the students' responses changed between the first and final survey on the questions that I reviewed earlier from the survey. Figures 4.100-4.102 show the changes in question #2.

Figure 4.100



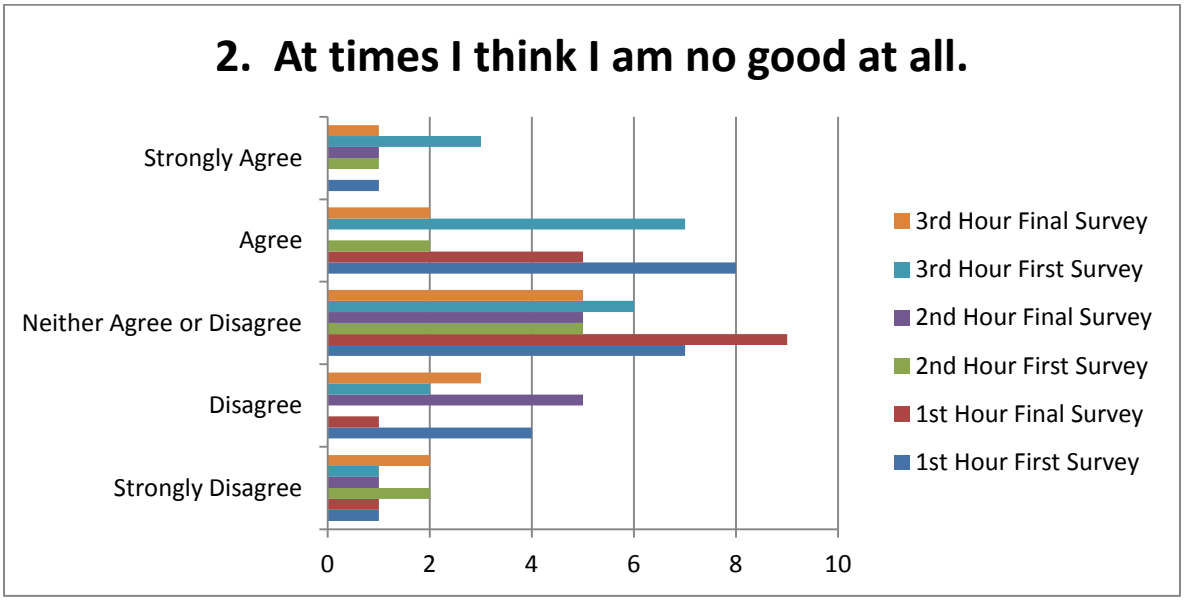
Looking at Figure 5.4, there is some improvement in my students' responses to this statement. They may have been affected by the self-esteem curriculum in the classroom. Of course they also may have been increasing their self-esteem in any number of ways as well.

Figure 4.101



There was a definite improvement on how the females responded to this question between the first and final survey. The males stayed pretty steady in their responses.

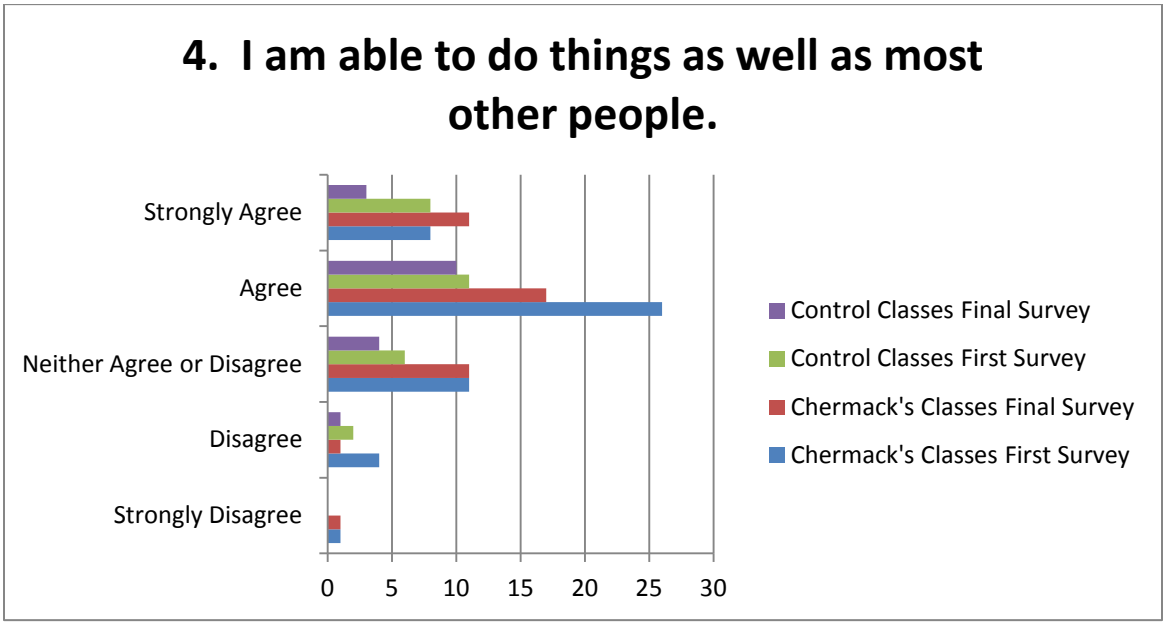
Figure 4.102



All of my classes showed an improvement on how they responded to this question. My gender-segregated grouping class may have a slightly larger improvement than the others, but all three classes showed improvement. This shows an agreement with Brown & Ronau (Feb. 2012), which girls in single-sex grouping show a higher level of self-confidence.

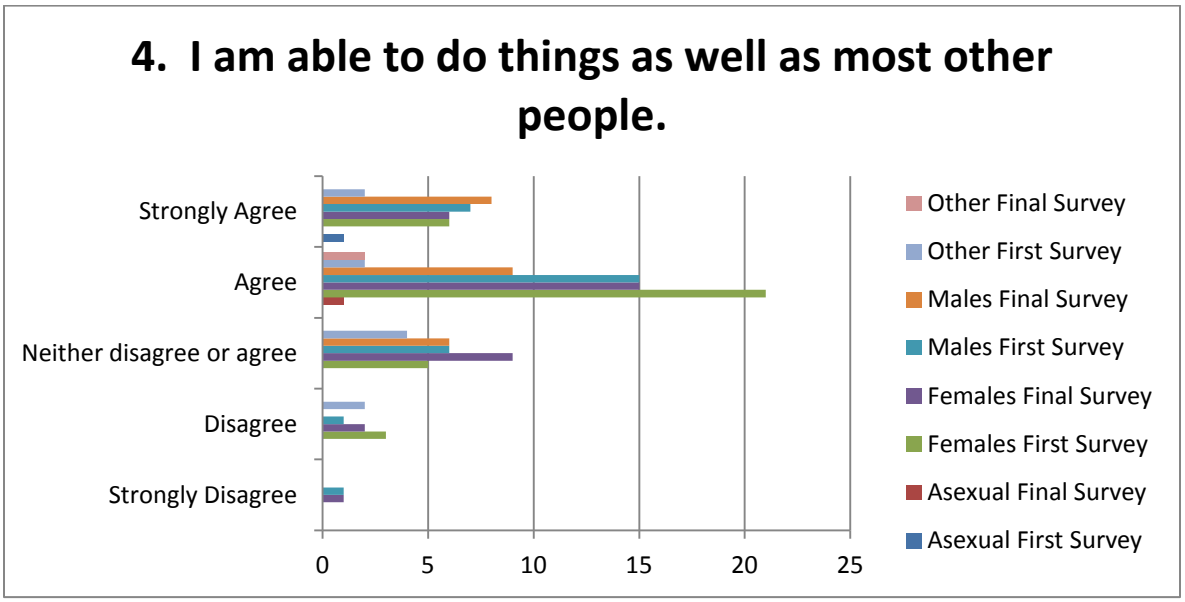
Figures 4.103-4.105 show the results from the changes to question #4.

Figure 4.103



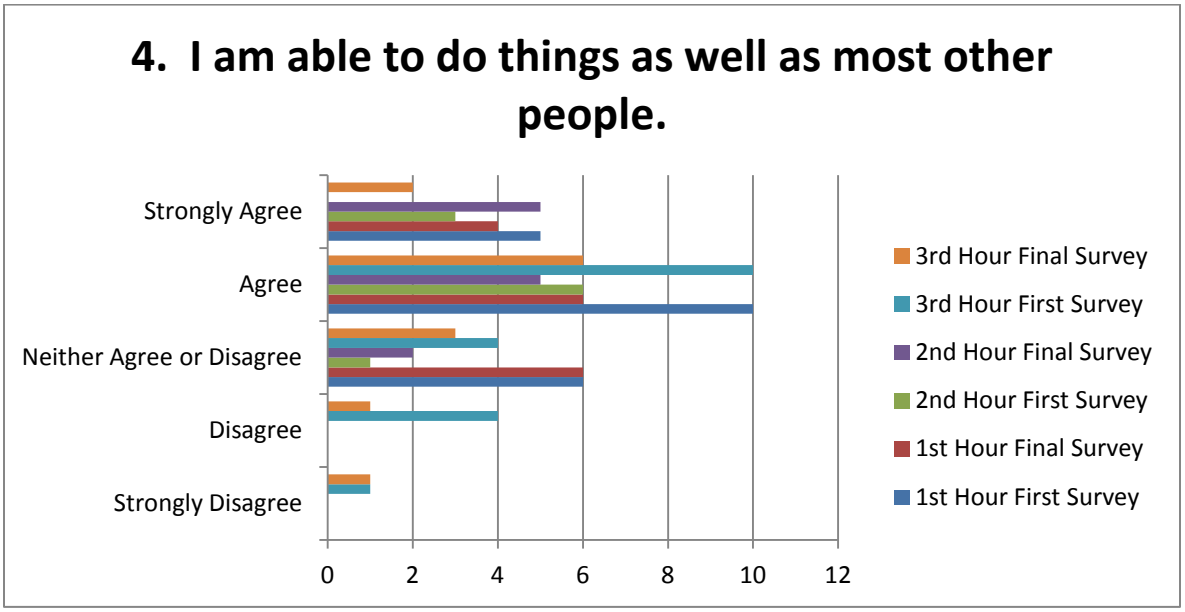
Comparing my classes to the control classes, my classes improved more on this question than the control classes did.

Figure 4.104



The males' responses improved more than the females' on this question.

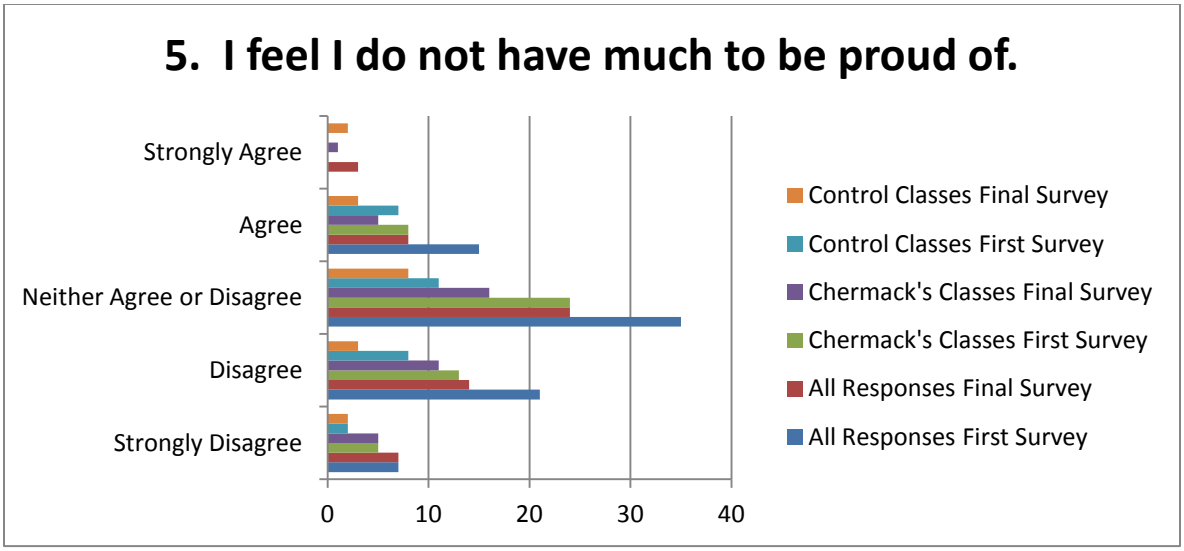
Figure 4.105



Looking at my classes individually, all of my students' responses improved, with the gender-segregated grouping and mixed-gender grouping classes having the biggest improvements.

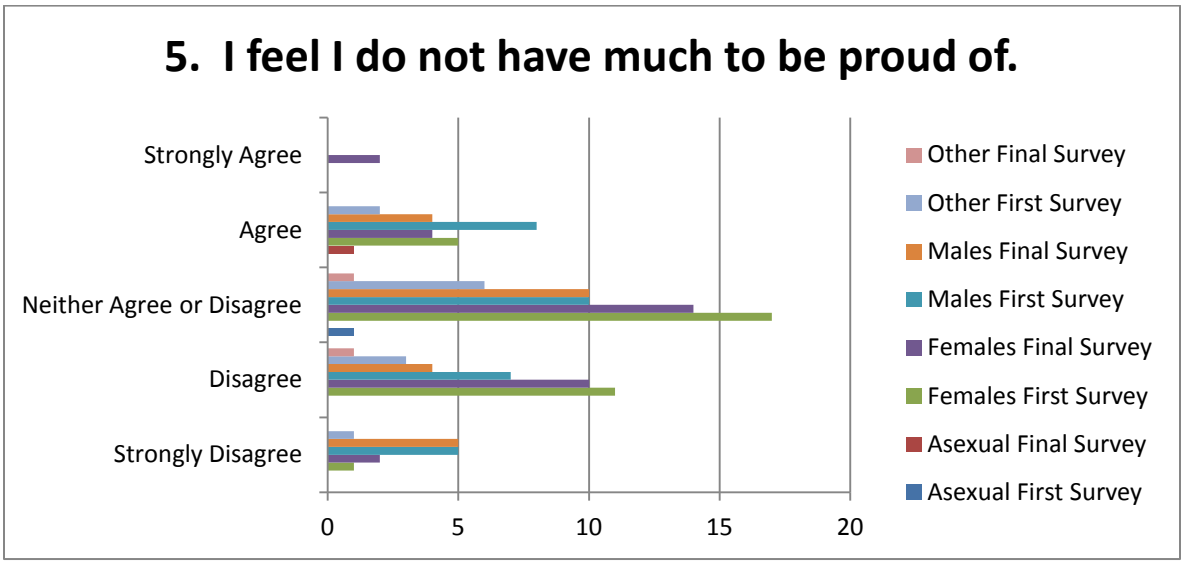
Figures 4.106-4.108 show the changes in the responses to question #5.

Figure 4.106



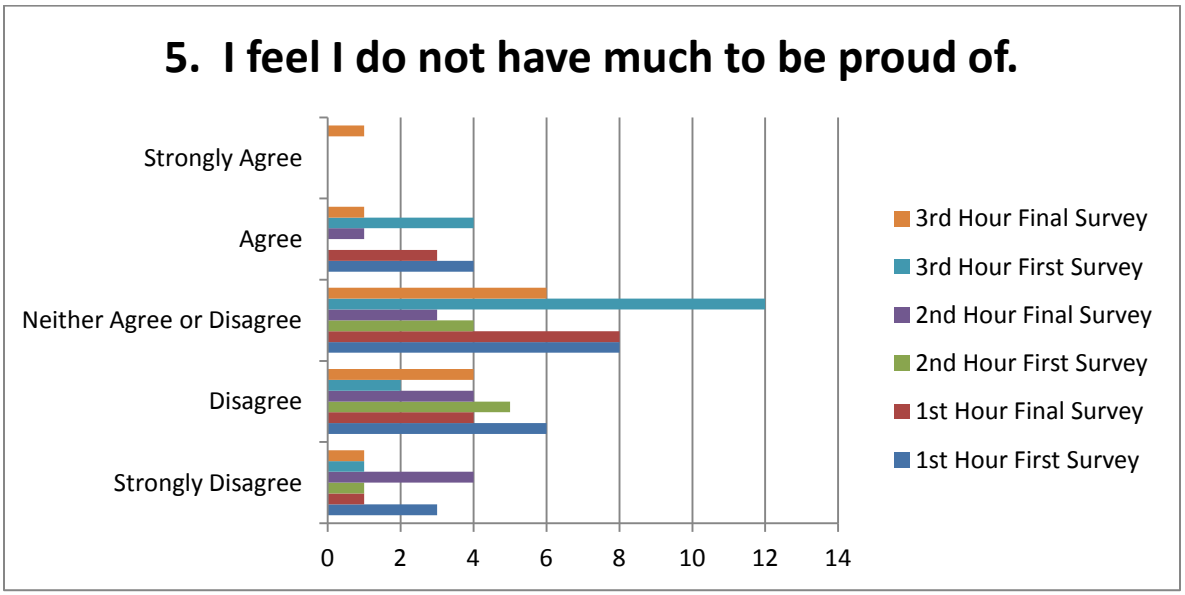
All the students were pretty constant in their responses to this question when looking at the individual classes according to teacher.

Figure 4.107



The male responses stayed steady between the first and final surveys. The female responses seemed to drop a little between the first and final surveys on this question.

Figure 4.108

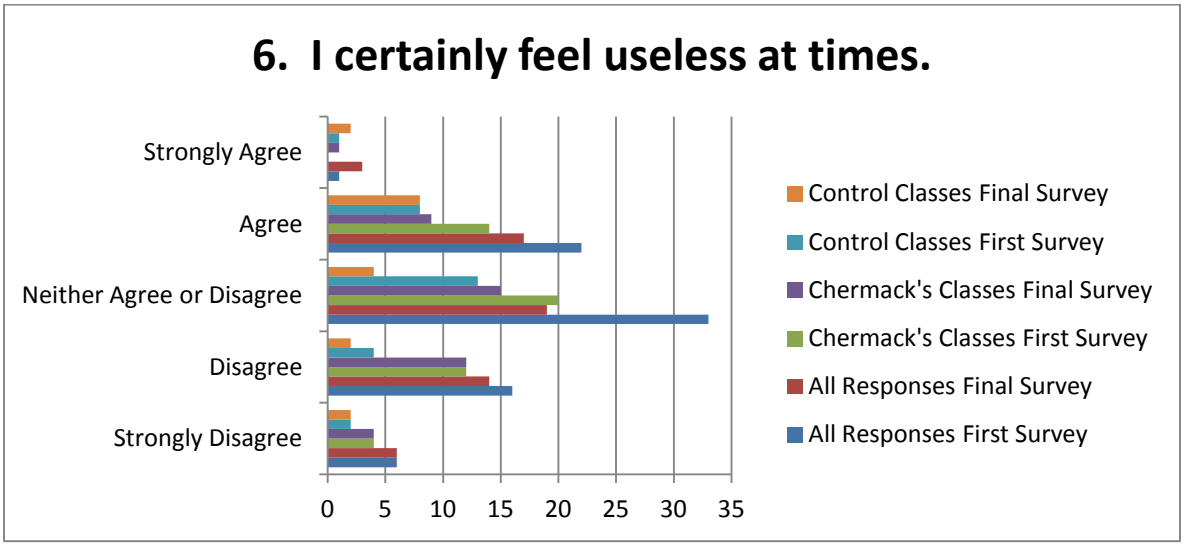


Looking at my classes individually gave a little bit of a different story. My gender-segregated grouping class improved on this question between the first and final survey,

while the mixed-gender grouping class may have dropped a little between the two surveys. The partially segregated grouping class seems to have stayed steady. This question is following what Brown & Ronau (Feb. 2012) wrote. They found that girls that were put in gender-segregated grouping had better self-confidence.

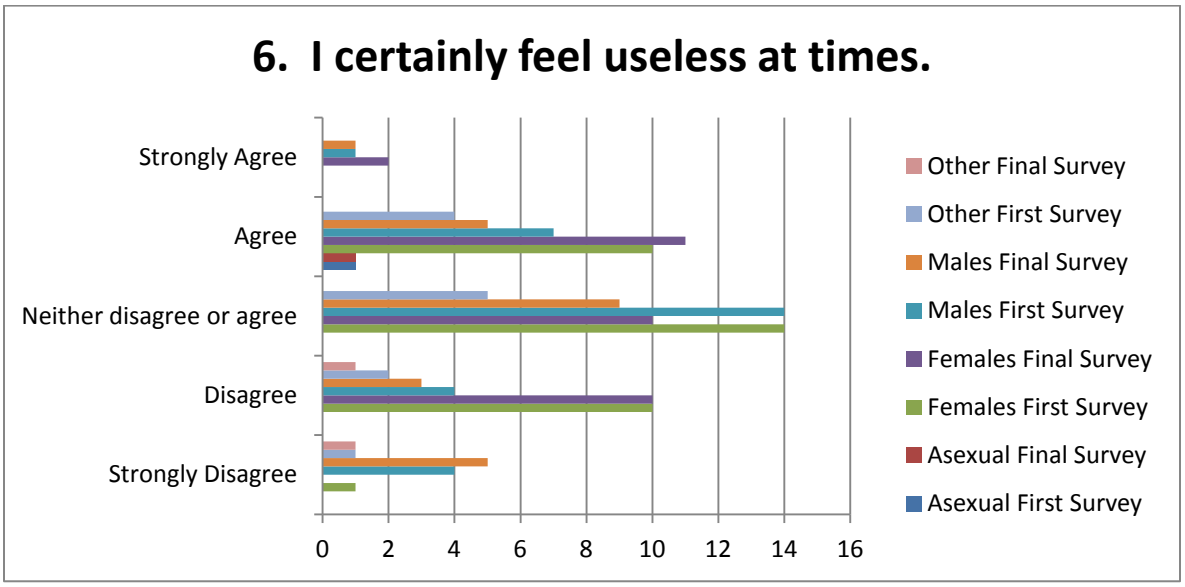
Figures 4.109-4.111 show the results from the change to question #6.

Figure 4.109



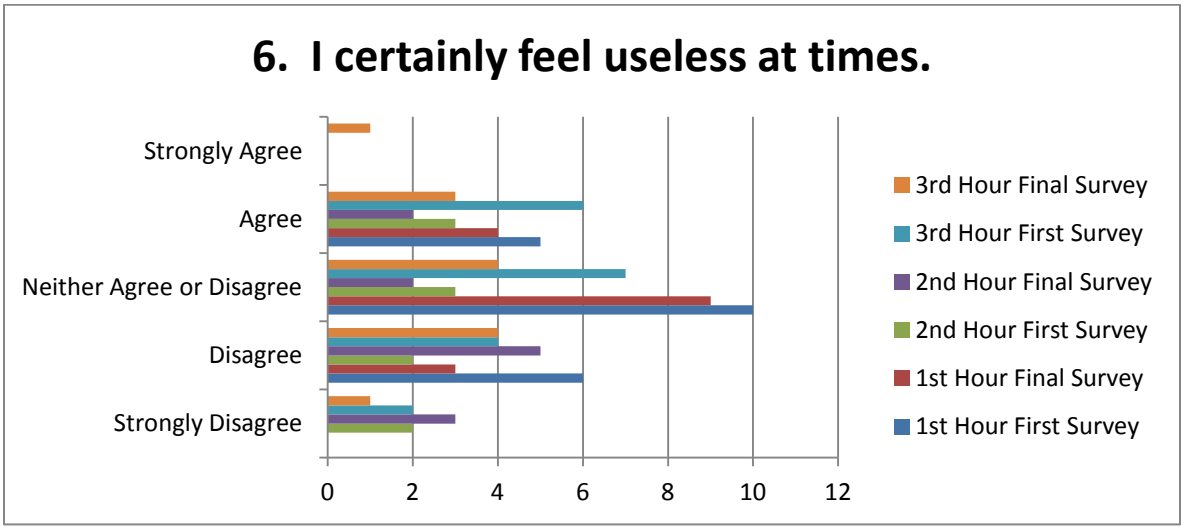
All of the classes looked pretty stable on this question between the first and final survey when comparing my classes to the control classes.

Figure 4.110



The males seemed to stay pretty steady on how they responded to this question, but the females looked like they started to answer more disapprovingly to this question between the first and final survey.

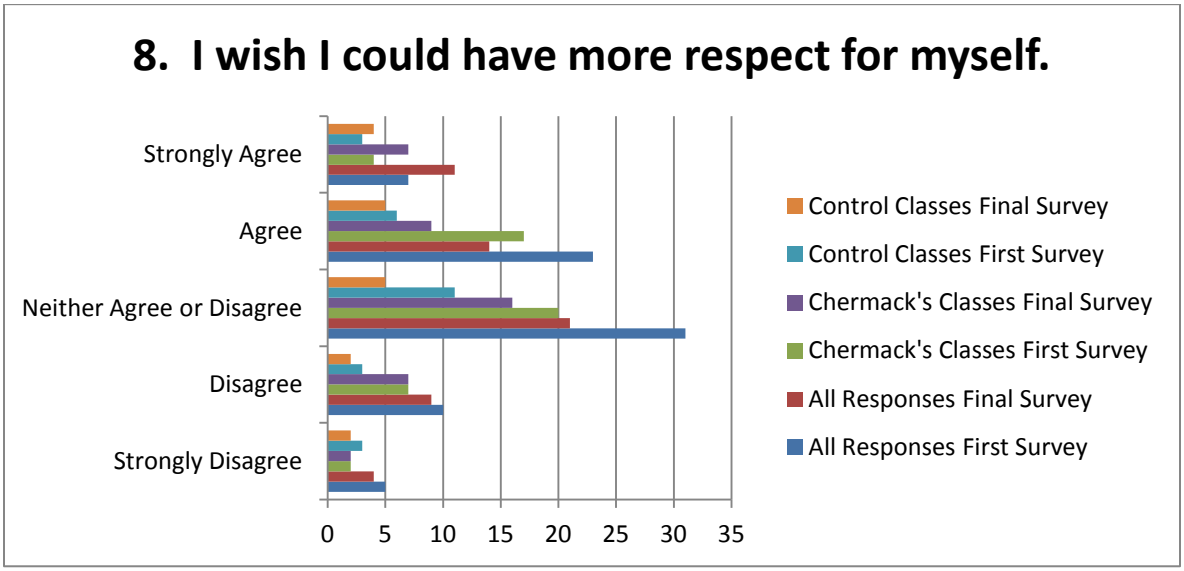
Figure 4.111



My gender-segregated grouping class improved on this question between the first and the final survey. My partial gender-segregated grouping class stayed steady on this question. My mixed-gender grouping class lost ground on this question between the first and final survey. This question shows a correlation with what Brown & Ronau (Feb. 2012) found; that girls in gender-segregated grouping had higher levels of self-confidence.

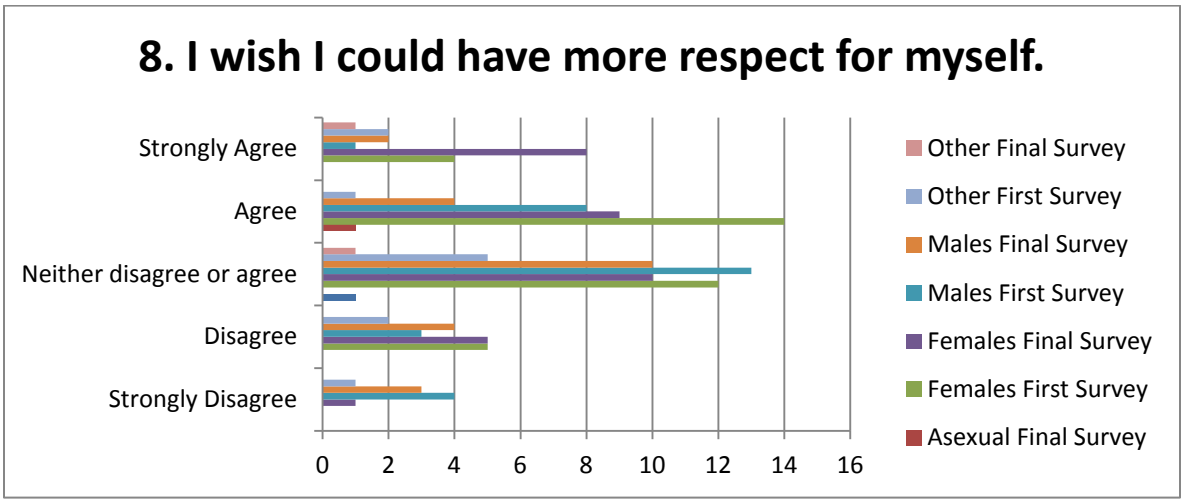
Figures 4.112-4.114 show the results from the changes in question #8.

Figure 4.12



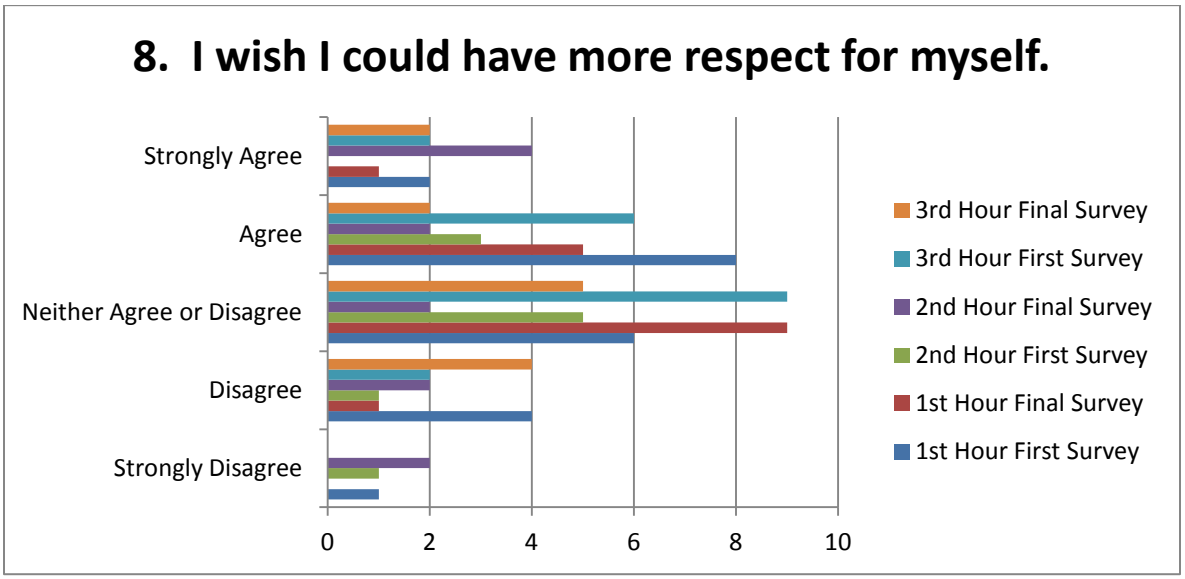
Looking at this question by the individual classes, the responses stayed pretty consistent between the first and final surveys.

Figure 4.113



Both the females and males pretty much stayed steady on this question between the first and final surveys.

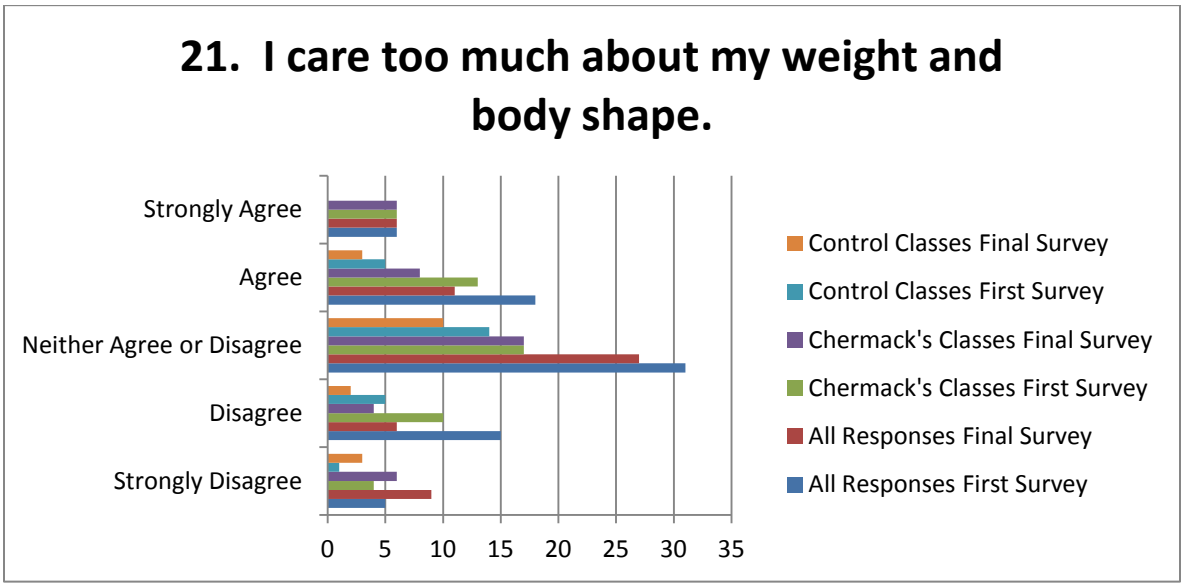
Figure 4.114



My gender-segregated grouping class and my mixed-gender grouping class both showed worse results on this question between the first and final surveys. My partial gender-segregated grouping class did not show much of a change either way.

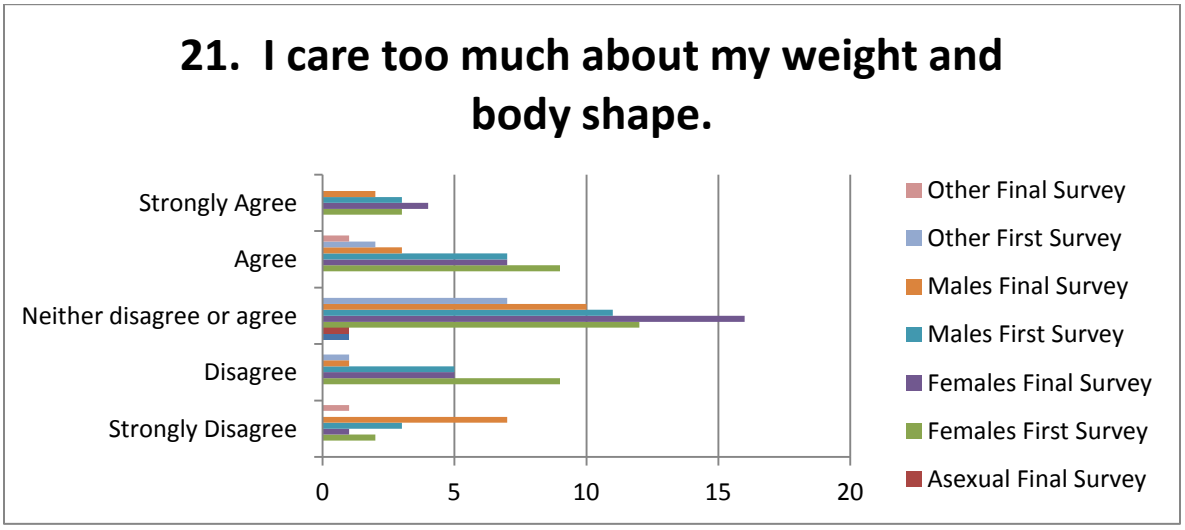
Figures 4.115-4.117 show the results from the changes for question #21.

Figure 4.115



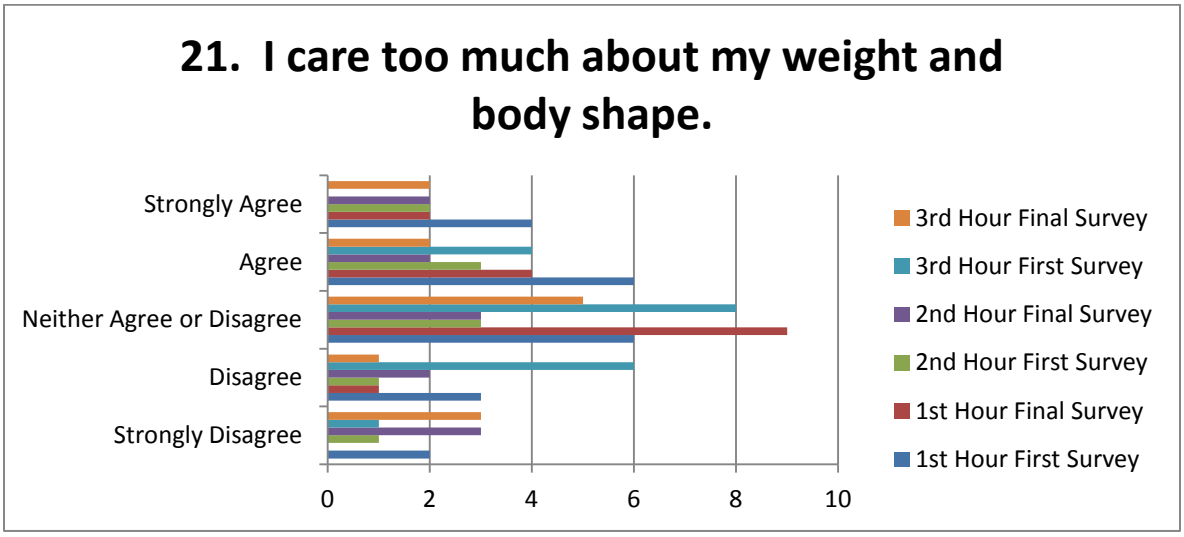
Both my classes and the control classes seemed to have improved slightly on this question between the first and final survey.

Figure 4.116



The male students showed improvement on this question, but the female students stayed basically steady with their responses from the first to the final survey.

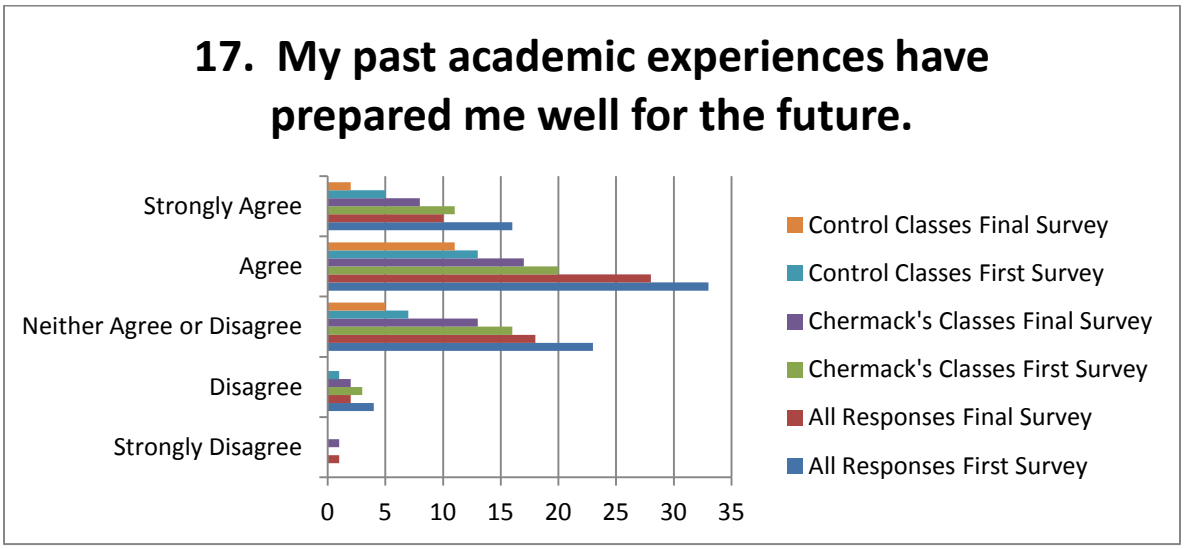
Figure 4.117



Looking at my individual classes, the only class that shows any possible change in this question is the partial gender-segregated grouping class. They seem to have lost ground on how they answered this question between the first and final survey.

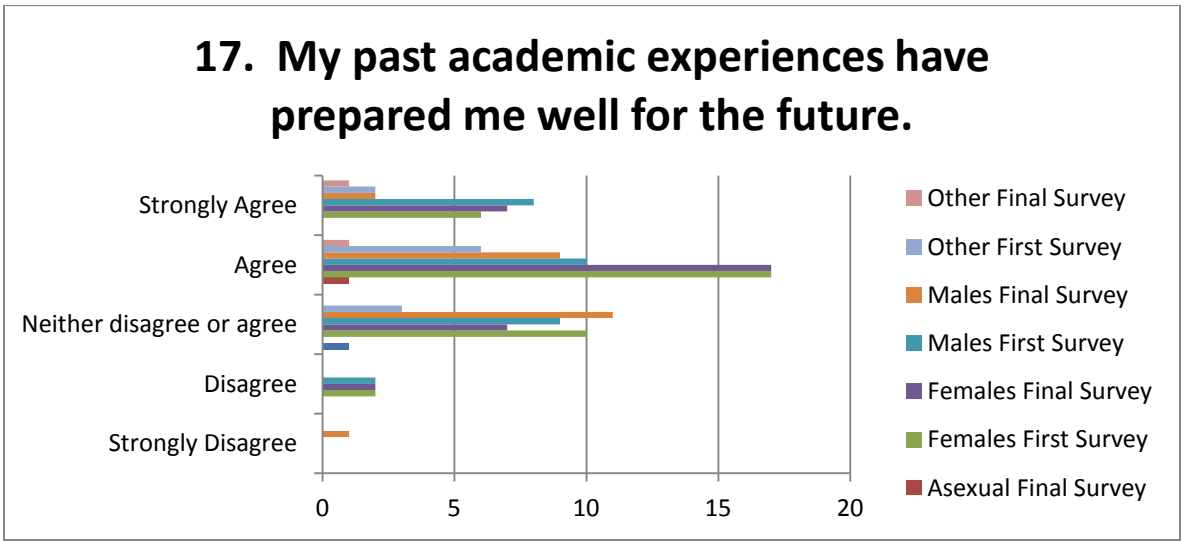
Figures 4.118-4.120 show the results from the changes to question #17.

Figure 4.118



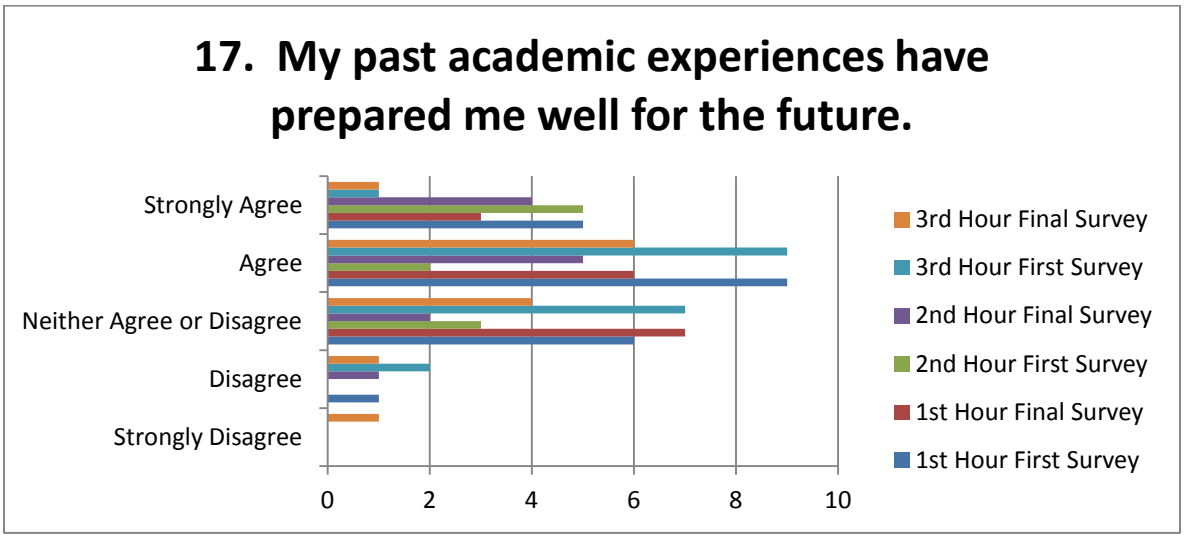
The control classes showed a slight improvement on this question and my classes showed a slight decrease on this question between the first and final surveys.

Figure 4.119



When looking at this question by gender, the females seemed to keep steady between the first and final surveys, but the males lost a little ground.

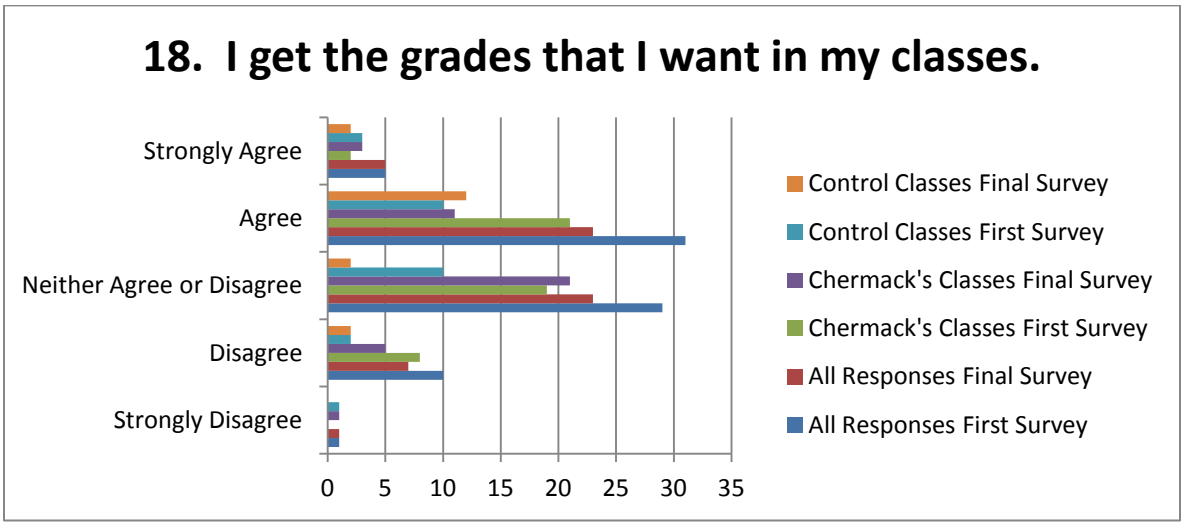
Figure 4.120



My mixed-gender grouping class showed worse numbers on the final survey for this question compared to the first survey. The other two classes did not seem to change between the two surveys.

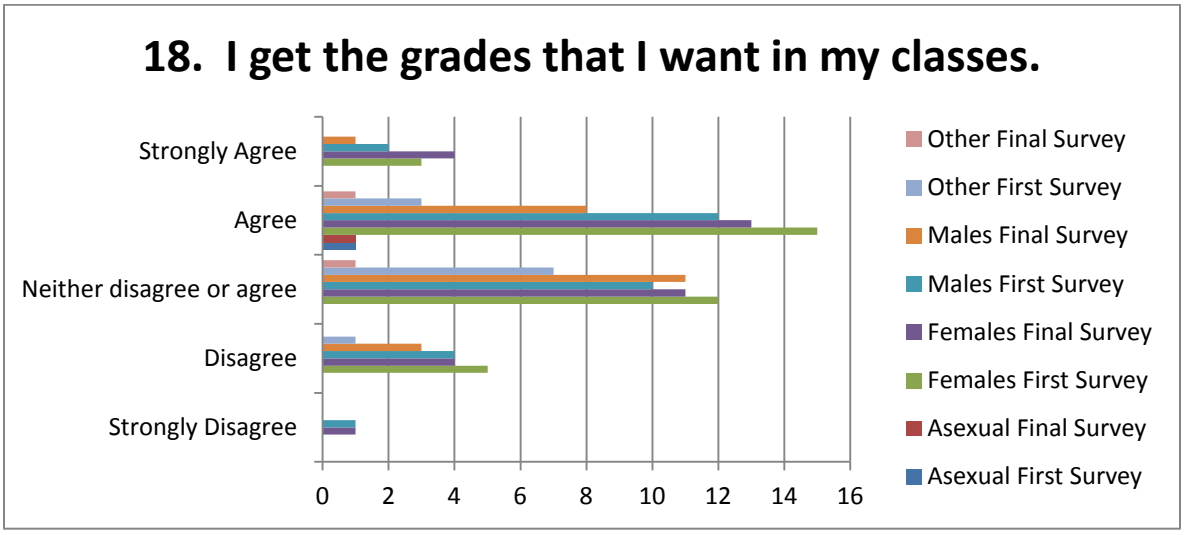
Figures 4.121-4.123 show the results from the change of question #18.

Figure 4.121



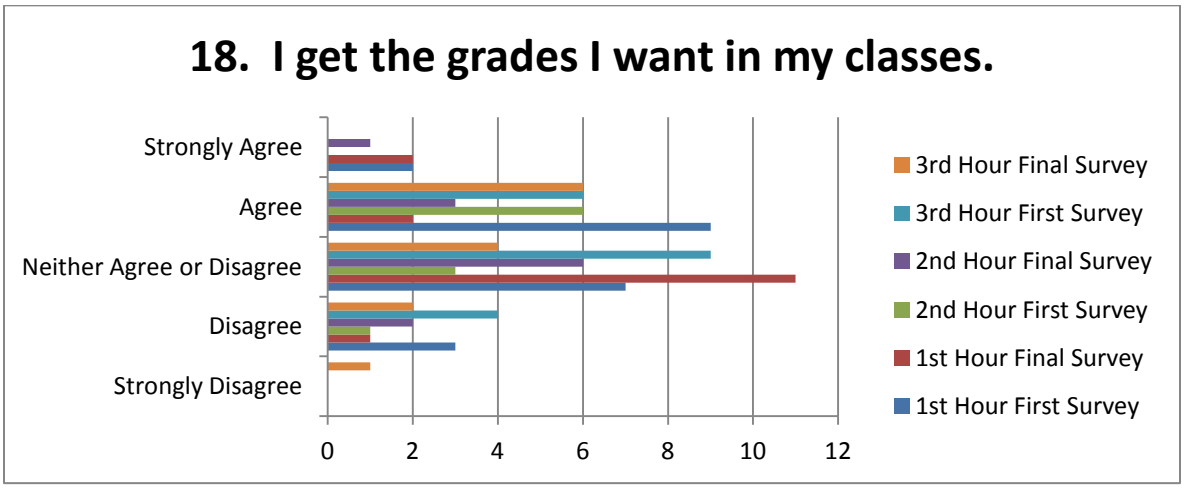
All the classes looked pretty stable between the first and final surveys on this question.

Figure 4.122



Looking at gender, the females lost ground on this question, but the males improved between the first and final survey.

Figure 4.123

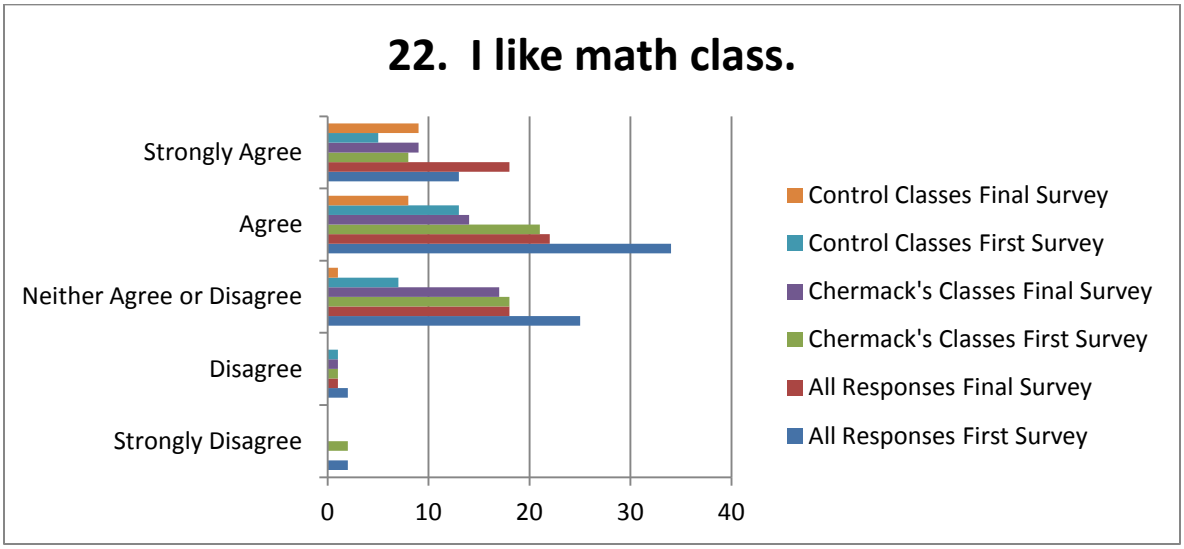


When examining this question further by each of my classes, I saw that my partial gender-segregated grouping class stayed steady on this question. My gender-segregated

grouping class improved on this question. And my mixed-gender grouping class lost ground on this question between the first and final survey.

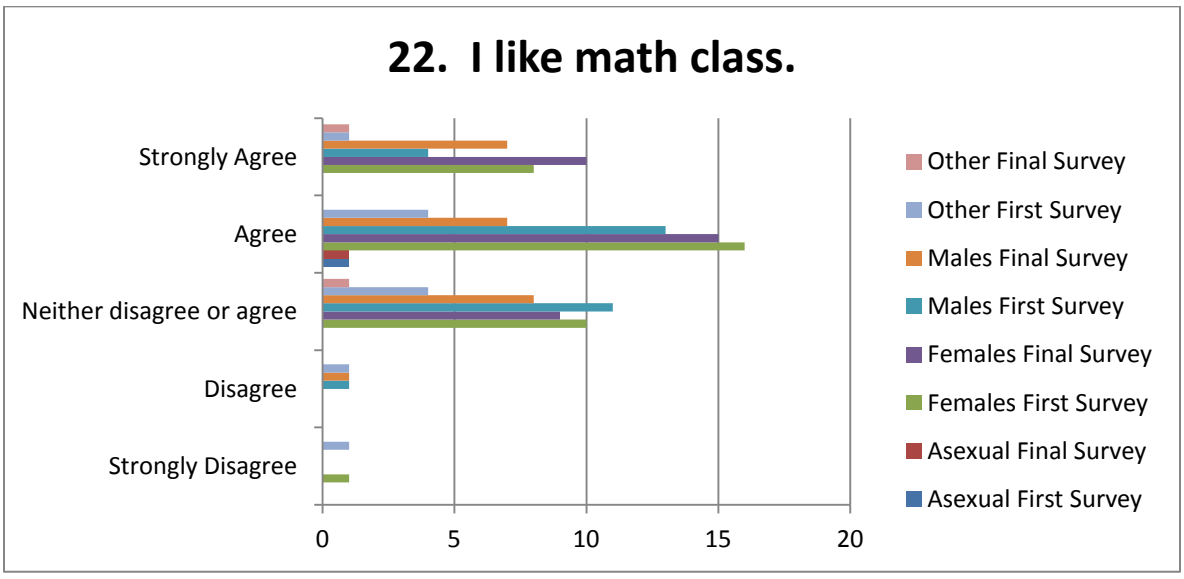
Figure 4.124-4.126 show the results of the changes from question #22.

Figure 4.124



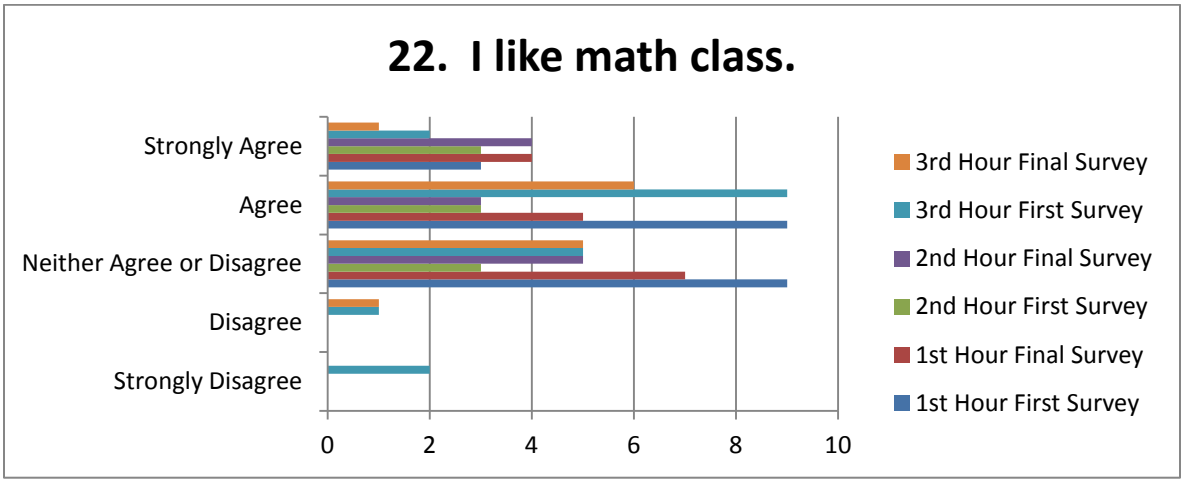
All of the classes improved on this question between the first and final survey.

Figure 4.125



When looking at this question by gender, the females improved between the first and final survey, but the males stayed steady.

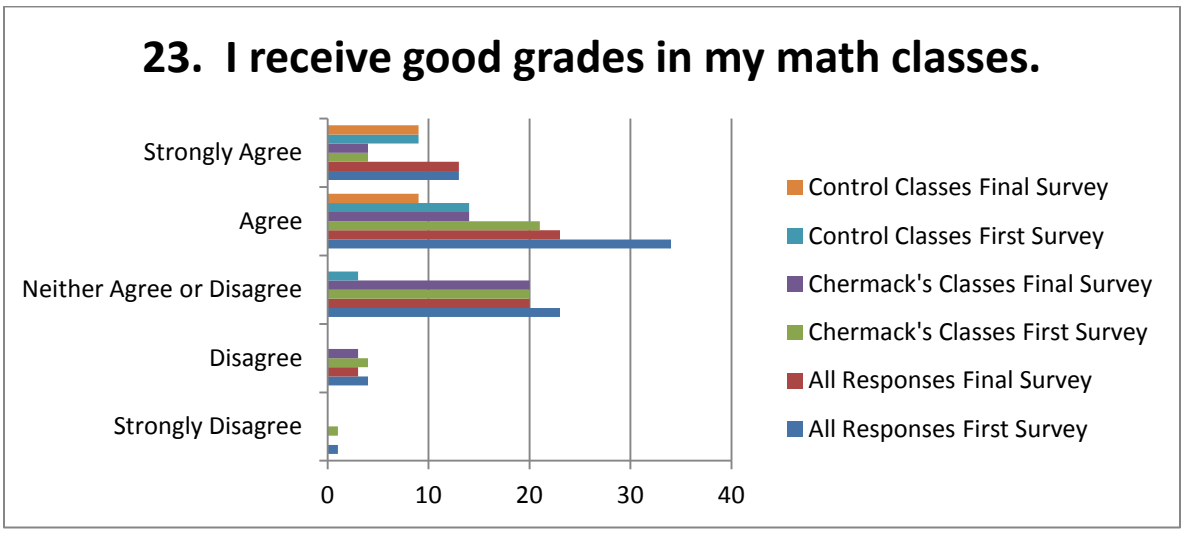
Figure 4.126



Examining this question further by my classes, only my mixed-gender grouping class really had room to improve on this question and they did between the first and final surveys. The other two classes stayed steady with very positive responses.

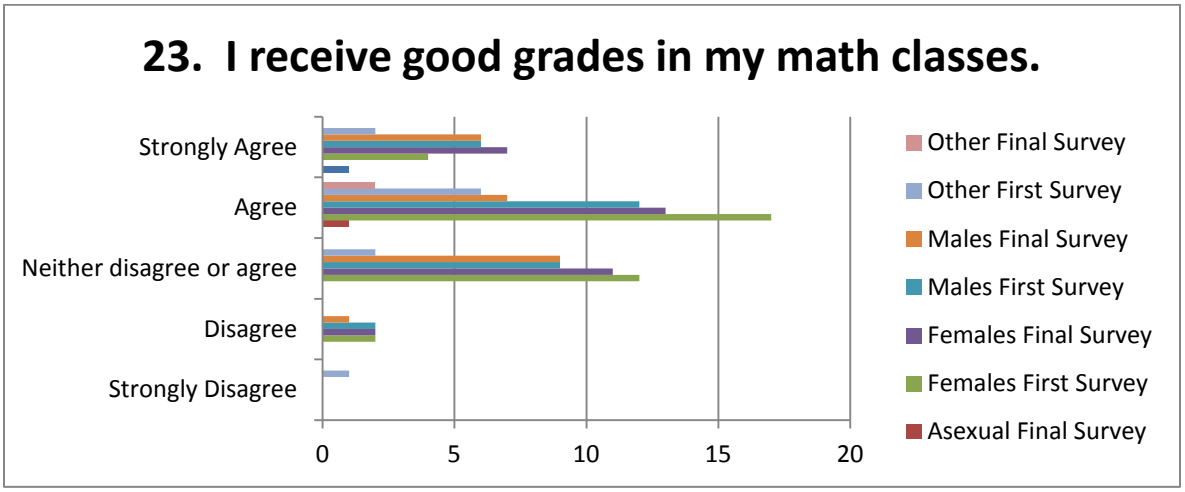
Figures 4.127-4.129 show the results of the changes to question #23.

Figure 4.127



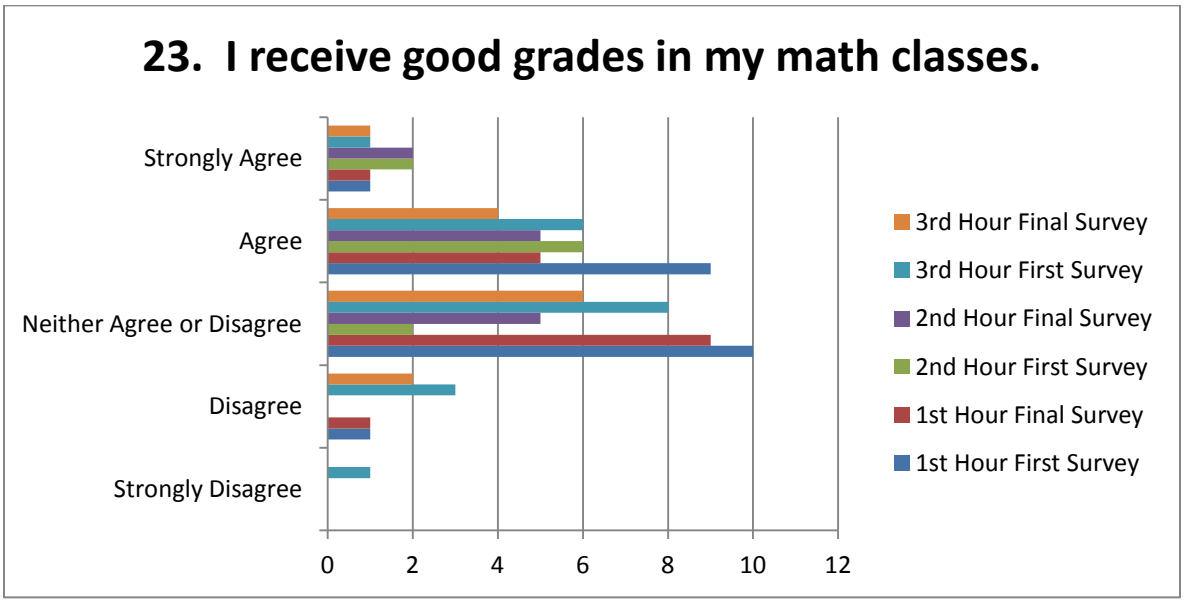
Looking at my classes and the control classes, the responses improved on this question from the first to the final survey.

Figure 4.128



Both the females and males responses were steady on this question between the first and final survey.

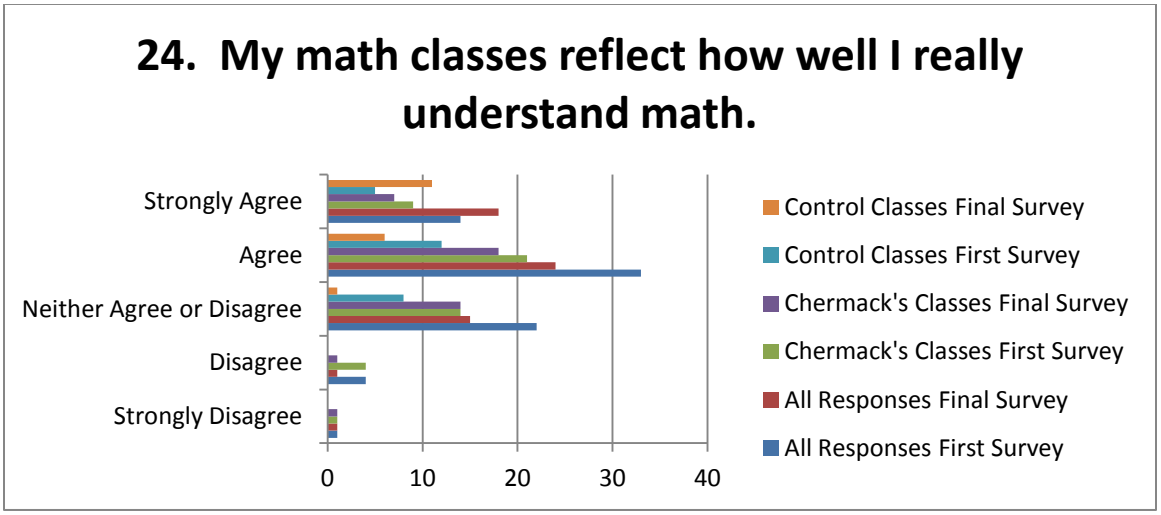
Figure 4.129



My partial gender-segregated grouping class and my gender-segregated grouping classes both stayed steady on this question between the first and final surveys. The mixed-gender grouping class improved between the two surveys.

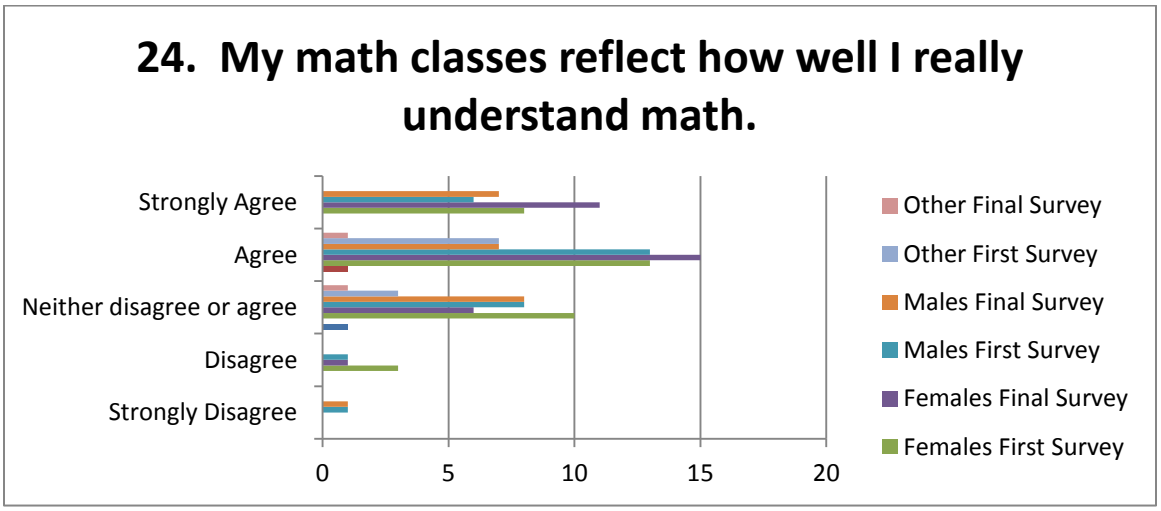
Figures 4.130-4.132 show the results from the change to question #24.

Figure 4.130



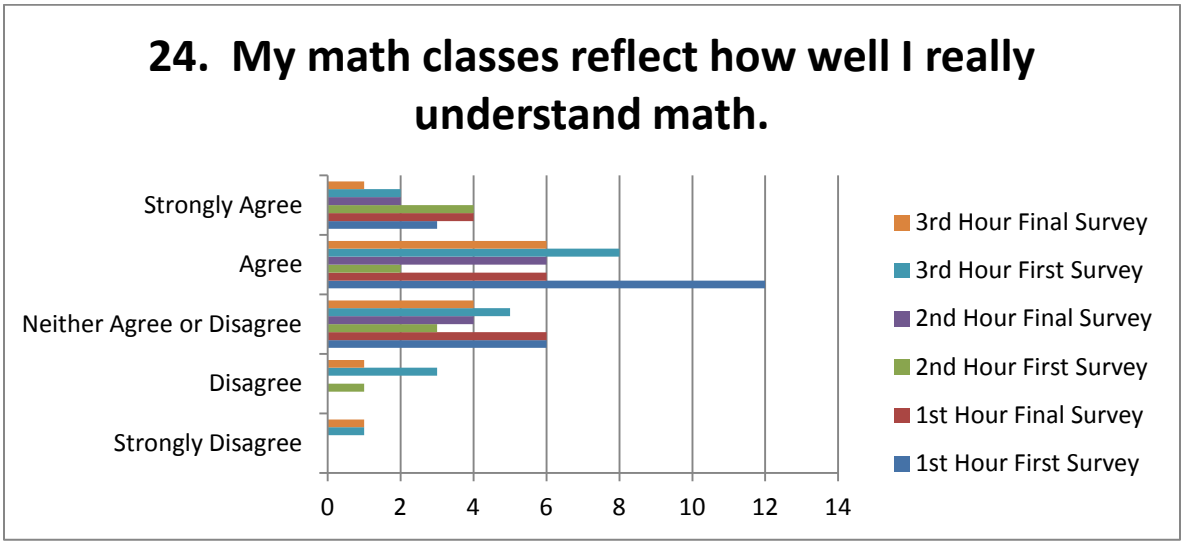
The control classes showed a little improvement on this question, but my classes stayed stable between the first and final surveys.

Figure 4.131



When looking by gender, females improved on this question between the first and final survey. Males seemed to stay pretty steady between the two surveys.

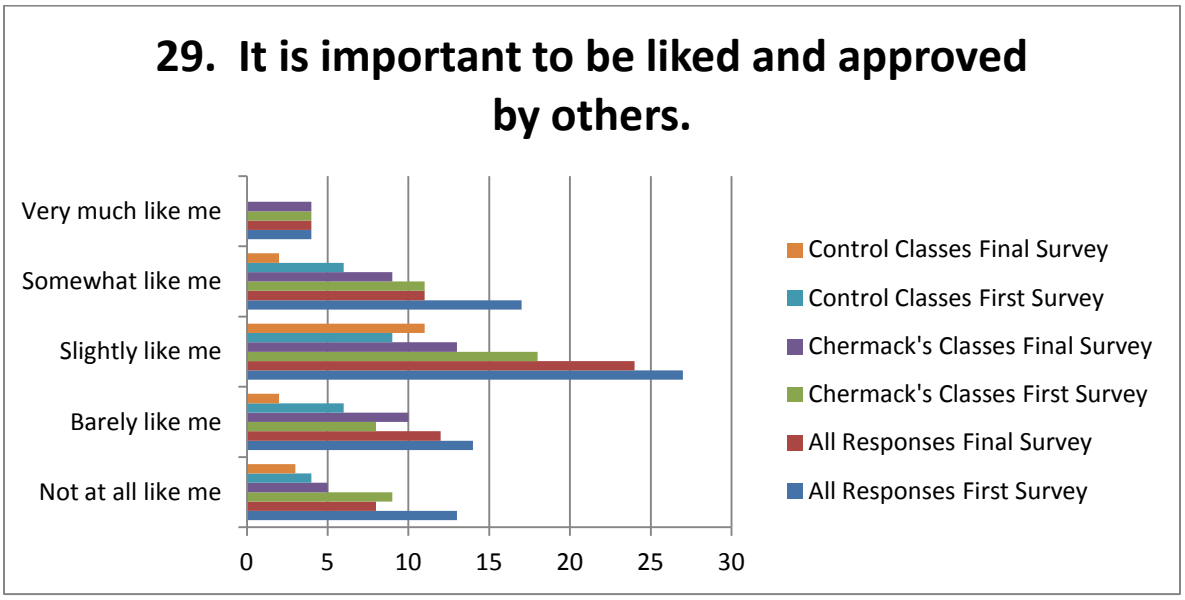
Figure 4.132



My mixed-gender grouping and partial gender-segregated grouping classes did not show much of a change in their responses between the first and final surveys on this question. In my gender-segregated grouping class, the responses improved on this question.

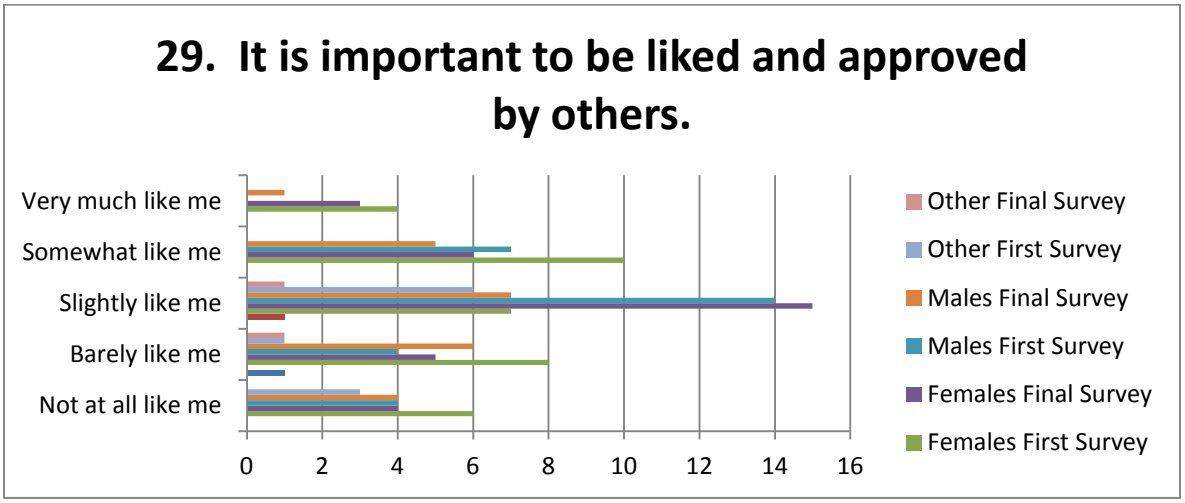
Figures 4.133-4.135 shows the results of the change of question #29.

Figure 4.133



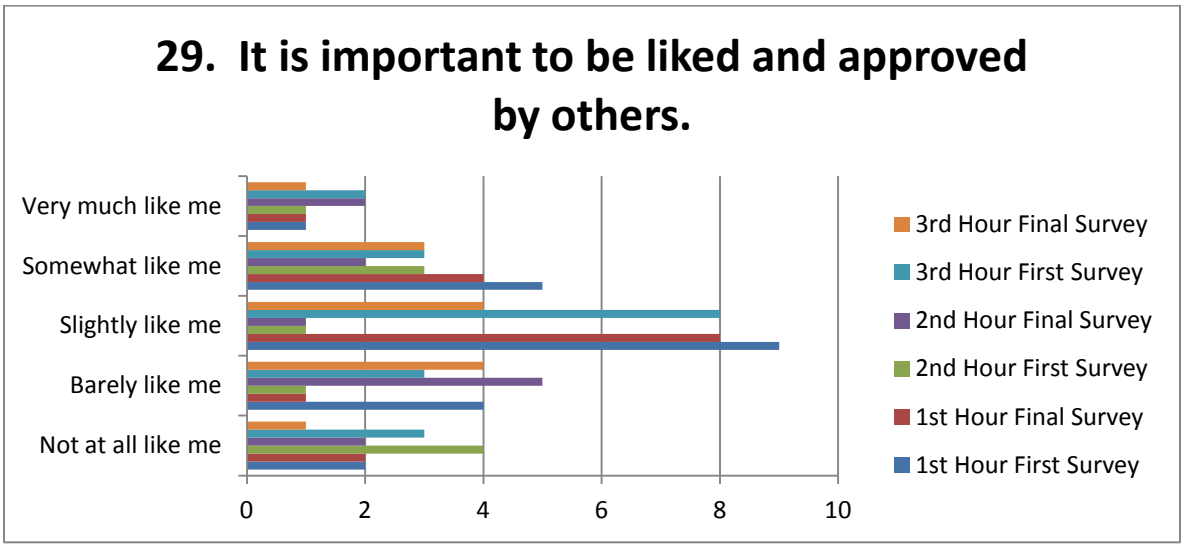
Both my classes and the control classes stayed pretty steady between the first and final surveys with this question.

Figure 4.134



When looking at this question by gender, both females and males lost a little ground between the first and final survey.

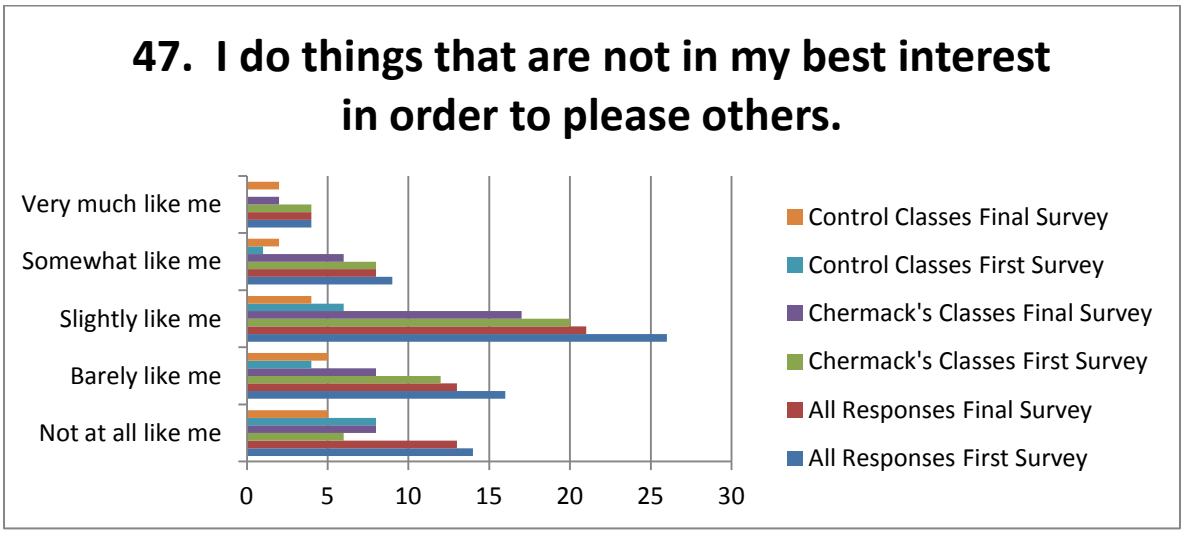
Figure 4.135



There still was no noticeable change between the first and final surveys when looking at my individual classes.

Figures 4.136-4.138 show the results from the change to question #47.

Figure 4.136

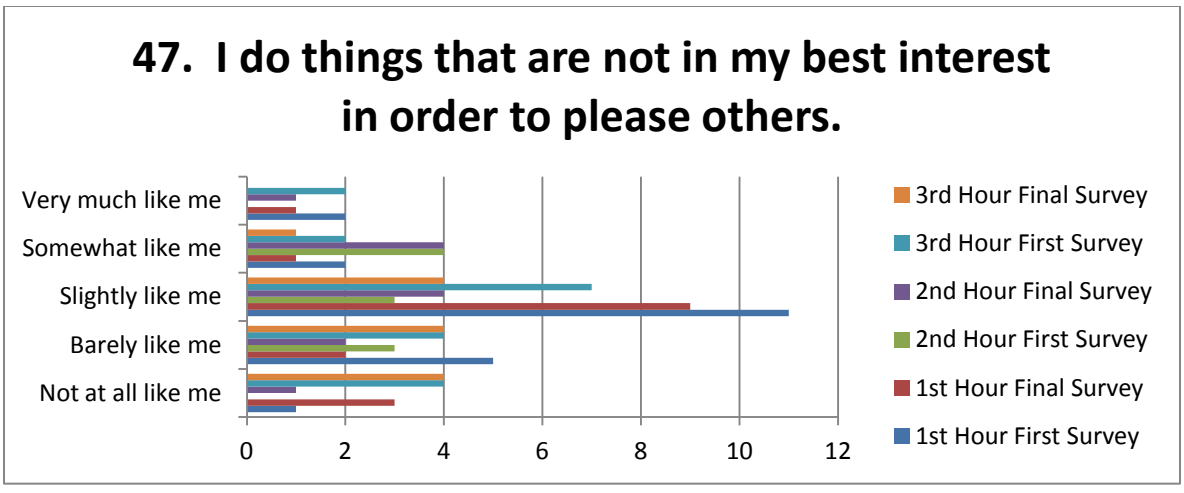


My classes improved a little on this question between the first and final survey. The control classes did not really change, if anything, they may have gotten a little worse in their responses to this question.

Figure 4.137

When examining this question by gender, neither the females or the males changed their responses significantly between the first and final survey.

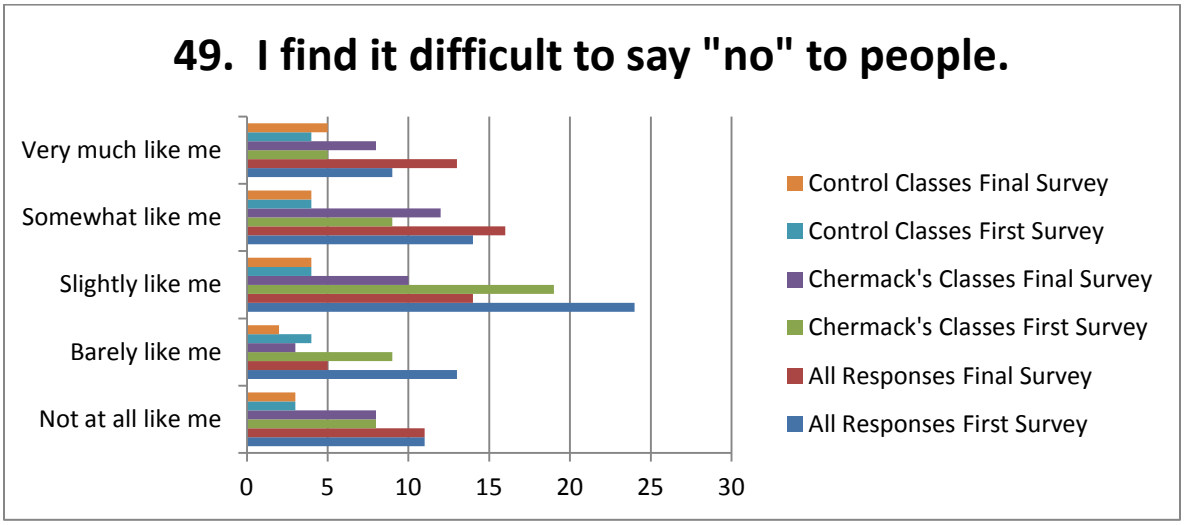
Figure 4.138



Looking more in depth at my classes on this question, my partial gender-segregated grouping class didn't really see a change from the first to the final survey. The gender-segregated grouping class improved on this question and the mixed-gender grouping class had a slight drop in how they answered this question between the two surveys.

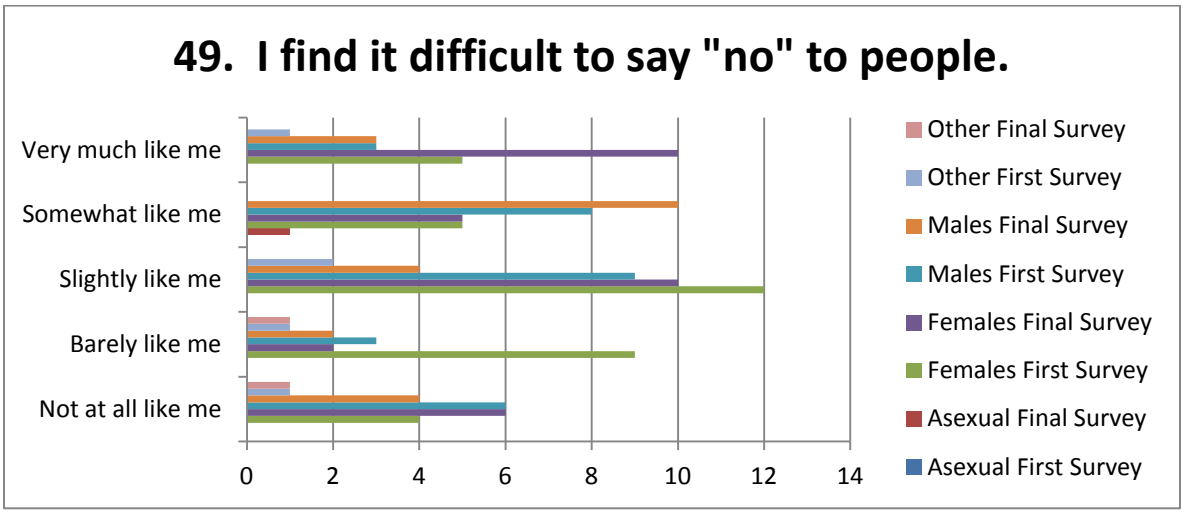
Figures 4.139-4.141 show the results from the change to question #49.

Figure 4.139



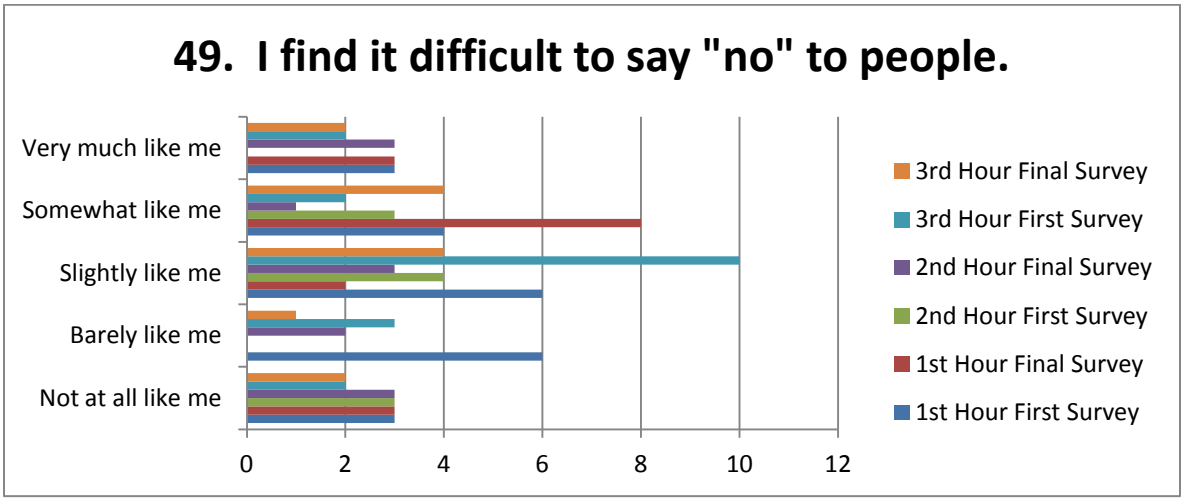
The control classes showed no significant change between the first and final surveys on this question. My classes showed a slight drop in the positivity to their responses to this question between the two surveys.

Figure 4.140



When this question is broken down by gender, I saw that both females and males had a drop in their responses to this question between the first and final survey. The females had a more drastic drop than the males.

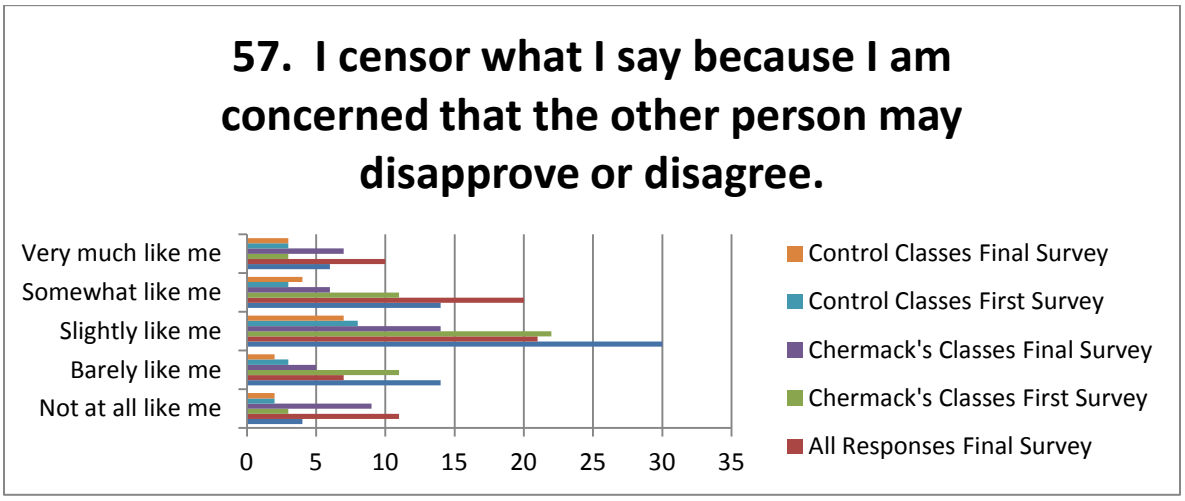
Figure 4.141



Looking at this question in more depth by just my classes, I can see that my gender-segregated grouping class seemed to have the drop in numbers in their responses between the two surveys, not the other two classes.

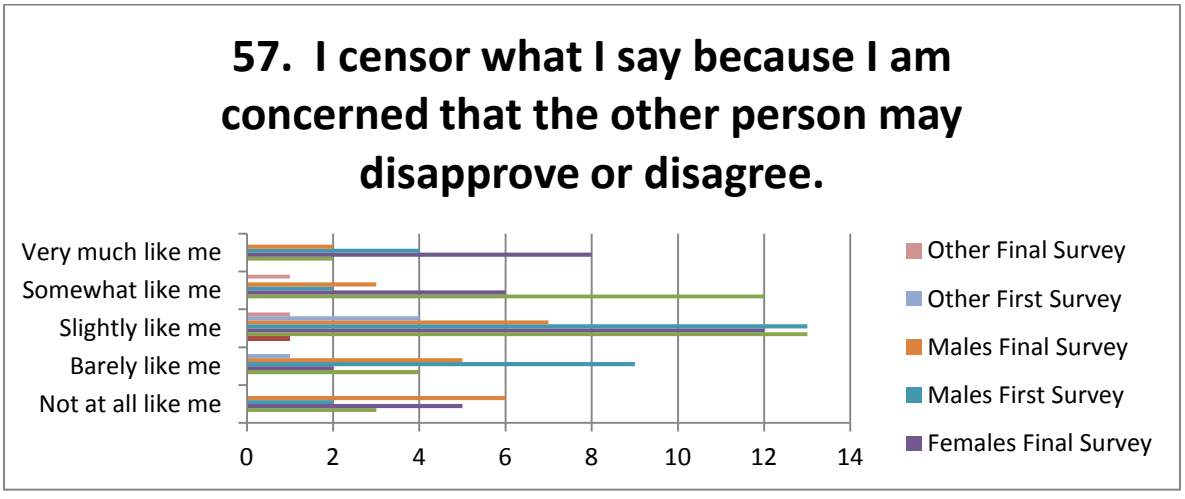
Figures 4.142-4.144 show the results from the change to question #57.

Figure 4.142



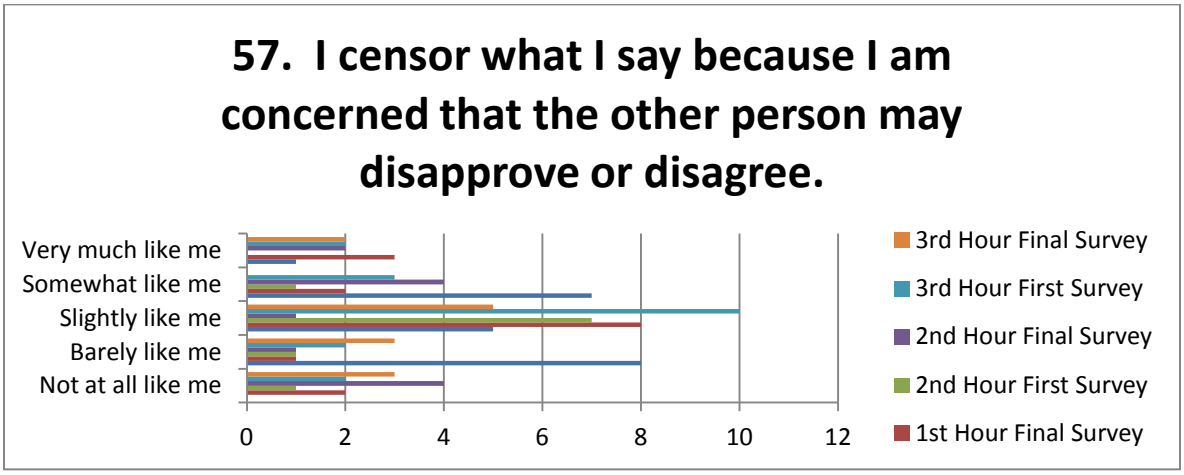
This question showed an interesting result in its change in my classes from the first to the final survey. My students didn't necessarily show an improvement or a loss in their numbers, but they went from having a normal curve to having a less definable graph in their responses. The control classes stayed stable between the two surveys on this question.

Figure 4.143



Looking at this question by gender, the females lowered their numbers in their positivity on their responses between the first and final survey. The males improved on this question between the two surveys.

Figure 4.144



When I examine this question further looking just at my classes, my gender-segregated grouping class looks like its numbers lowered a little in how positive they responded between the first and final surveys. My other two classes stayed pretty stable between the two surveys.

Data Summary

In the following chapter I will examine this data further to come attempt to come to some conclusions to how my self-esteem curriculum and gender grouping impacted the students in my classroom and in my school.

CHAPTER FIVE

Conclusions

Introduction

In the last chapter I highlighted some of the data I received from my students while doing this research. While writing that chapter I realized that I could have written the chapter four times as long and still found more information to include that could be found pertinent to this research. I had to draw the line somewhere and go back to my original question. How can a self-esteem curriculum in a mathematics classroom increase the confidence and ability of female students?

Limitations of the Study

My first thoughts to this, when looking at my data, are that the numbers are much too small to make any reliable conclusions. I would have preferred to have done this research on a much larger scale, but unfortunately that is not the case. This definitely turned out to be one of the major limitations in my study. When looking at the assessments, the students' scores improved, but did the self-esteem curriculum make a difference on their scores? It really is too hard to tell. Did the gender grouping make a

difference on their scores? There may be something there, but more work definitely needs to be done.

Like I previously said, it seems the self-esteem curriculum may not have made that much of a difference on the grades of my students. So does that mean it wouldn't help increase the grades and/or mathematical ability of students? I don't think that's the case. I think there were a few limitations in my research that caused me to not see results in this area. One, this was just too short of a study in terms of length of time. If we go back to the literature, there is a lot riding on girls in terms of self-esteem in their middle school and high school years. This self-esteem may very likely be affecting their grades in school. If we can improve students' self-esteem, we should be able to, in turn, improve their grades. Since Klein et al. (2010) found that students struggling with self-confidence were quieter in class and attended less, if a self-esteem curriculum is improving self-confidence over a few months or even a year's worth of time, do we think we'll see an increase in test scores two years down the line? I feel that looking at the self-esteem surveys I could see some improvement in not only the girls' self-esteem, but all of my classes that received the self-esteem curriculum. If we were able to see how this improved self-esteem could impact their grades after a year, or maybe five years, then I feel like there would be some significant improvement in grades compared to students that did not have improved self-esteem.

Another issue occurred with my professional learning community and how we pre-assess versus post-assess our students is the assessments themselves. For this unit, as well as many others, we chose to use multiple choice questions. I feel that many of my students

decided to guess at those questions, which the students got some questions right by chance, and showed a higher pre-assessment score than they really would have done if they were given a pre-assessment with open-ended questions. I have felt like our pre-assessments do not fit with our post-assessments very well so they do not do a good job of showing actual improvement because of the large disparity between the two assessments. I think looking back we need to reevaluate how we are assessing and pre-assessing our students. I think this is another major implication that we need to look at as a professional learning community.

Effects of Self-Esteem Curriculum

Looking more in depth at the survey results, I think I definitely saw a difference on students' self-esteem. I felt like they improved in all of my classes, but even more so in my gender-segregated grouping class. In some of the questions, you are even able to see the difference between all three classes when one class just had the genders segregated during the self-esteem curriculum.

Again, I feel that if I was able to do this longer and look at the results a year or five years from now, I might be able to see even better numbers. Just like the literature shows, gender-segregated grouping may or may not be beneficial to girls. I think with a longer study I may have seen more improvement, but I would have no way of knowing that without doing the actual research.

Thoughts on Future Research and Future Practice

The benefit with my school is that we have a strong professional community where we learn from each other and I can present my findings and my colleagues may be willing

to further pursue the idea of gender-grouping for increased academic ability. So it is nice to see that the implications of my study can be used to try to possibly further the research at my school level if I can get my colleagues to agree to the idea.

After all this work, I found many takeaways that I am going to use in my continued practice and what I'd like to try as future research in my classroom or possibly in my professional learning committee with the aid of my colleagues.

First of all, through my many years analyzing the literature, I feel that there is benefit to working with gender-segregated education when the student prefers that type of learning. I also feel that it needs to be truly gender-segregated and not biological sex-segregated. This alone will cause issues at the most important time for children; their middle school years. Many children are not comfortable being open about their sexual identity at a young age, so to be segregated by gender identity to help with their learning would be intimidating and hurting in its own right.

I think another possible way around this is to start looking at choosing how we educate children as a psychological endeavor. We should test our children to see how they best learn and be teaching them that way. We cannot possibly teach all children each way they want to learn in the same classroom, so we need to look at putting children with the educators that work with them. So, in the long run this just means one more complication to the differentiation weave that we as educators maneuver everyday in our classrooms, as well as one more complication for counselors and other administration involved in student scheduling.

Second, I definitely want to continue the self-esteem curriculum in my classroom. I would like to find new resources and hopefully share those with my colleagues. Thankfully, at my school we are working on restorative practices and with that I believe we will be improving self-esteem as well. I think that this is one more way to incorporate that into what we are doing.

Conclusion

Like all research, I don't feel like this is done. I haven't cured anything and I feel like I could write for another 200 pages and read literature for another 5 years, but as Dr. Laura Haldin, Ms. Suzie Myhre and many others of my very intelligent colleagues have told me, I have to stop somewhere. I have shown how my research showed some results, but I definitely feel like with more time, patience, and students, more could have been learned.

REFERENCES

Adams, T. L. (1998). Pulling the plug on gender-related differences in mathematics. *Preventing School Failure: Alternative Education for Children and Youth, 42*(4), 176-180.

Berube, C., & Glanz, J. (2008). Equal Opportunity: Reframing gender differences in science and math. *Principal Leadership, 8*(9), 28.

Brown, S. L., & Ronau, R. R. (2012). Students' perceptions of single-gender science and mathematics classroom experiences. *School Science and Mathematics, 112*(2), 66-87.

Burkam, D.T., Lee, V. E., & Smerdon, B.A. (1997). Gender and science learning early in high school: Subject matter and laboratory experiences. *American Educational Research Journal, 34*(2), 297-331.

Campbell, P. B. (1986). What's a nice girl like you doing in a math class? *Phi Delta Kappan, 67*(7), 516.

Campbell, P. B. (1992). Nothing can stop us now: Designing effective programs for girls in math, science, and engineering. *Encouraging Girls in Math and Science Series,*

Changing schools that shortchange girls. (1992). *Education Digest, 58*(2), 41.

Chouinard, R., & Roy, N. (2008). Changes in high-school students' competence beliefs,

utility value and achievement goals in mathematics. *The British Journal of Educational Psychology, 78*(Pt 1), 31-50.

Cross-national patterns of gender differences in mathematics: A meta-analysis. (2010). *Psychological Bulletin, 136*(1), 103-127.

Davenport, E.C., Davison, M.L., Kuang, H., Ding, S., Kim, S., & Kwak, N. (1998). High school mathematics course-taking by gender and ethnicity. *American Educational Research Journal, 35*(3), 497-514.

Dentith, A. (2008). Smart girls, hard-working girls but not yet self-assured girls: The limits of gender equity politics. *Canadian Journal of Education / Revue Canadienne De L'Éducation, 31*(1), 145-166.

Dove self-esteem project. Retrieved from http://selfesteem.dove.us/Articles/Written/Dove-Confident-Me-five-session-resources.aspx

Eliot, L. (2010, Nov 1,). The myth of pink & blue brains. *Educational Leadership, 68*, 32.

El-Haj, T.R.A. (2003). Challenging the inevitability of difference: Young women and discourses about gender equity in the classroom. *Curriculum Inquiry, 33*(4), 401-425.

Florida high school high tech discover your future team builders & icebreakers: Techniques for success. Retrieved from http://www.serviceandinclusion.org/conf/HSHT-Team-Building-Ice-Breaker-Manual-2008-09.pdf

Forgasz, H. J., Leder, G. C., & Kloosterman, P. (2004). New perspectives on the gender stereotyping of mathematics. *Mathematical Thinking and Learning, 6*(4), 389-420.

Fredua-Kwarteng, E. (2005). *A perspective on gender disparity in mathematics education*

Gaskell, P. J., Hepburn, G., & Robeck, E. (1998). Re/presenting a gender equity project: Contrasting visions and versions. *Journal of Research in Science Teaching, 35*(8), 859-876.

Gerrity, M. (1994). Math, science and girls. *Momentum, 25*

Girls disengage from high school science. (2010). *Education Digest, 75*(8), 44.

Guzzetti, B. J., & Williams, W.O. (1996). Changing the pattern of gendered discussion: Lessons from science classrooms. *Journal of Adolescent & Adult Literacy, 40*(1), 38-47.

Hazari, Z., Sadler, P. M., & Tai, R. H. (2008). Gender differences in the high school and affective experiences of introductory college physics students. *The Physics Teacher, 46*(7), 423-427.

Heller, K. A., & Ziegler, A. (1996). Gender differences in mathematics and the sciences: Can attributional retraining improve the performance of gifted females? *Gifted Child Quarterly, 40*(4), 200-210.

Ireson, J., & Hallam, S. (2005). Pupils' liking for school: Ability grouping, self-concept and perceptions of teaching. *The British Journal of Educational Psychology, 75*(Pt 2), 297-311.

Karp, K., & Shakeshaft, C. (1997). Restructuring schools to be math friendly to females. *NASSP Bulletin, 81*(586), 84-93.

Kennedy, K., & Schumacher, P. (2005). A collaborative project to increase the

participation of women and minorities in higher level mathematics courses. *Journal of Education for Business, 80*(4), 189-193.

Kimura, D. (2002). Sex differences in the brain. *Scientific American,*

King, K., Gurian, M., & Stevens, K. (2010, Nov 1,). Gender-friendly schools. *Educational Leadership, 68*, 38.

Klein, S. S., Richardson, B., Grayson, D. A., Fox, L. H., Pollard, D. S., & Dwyer, C. A. (2007). *Handbook for achieving gender equity through education* (2nd ed. Ed.). Mahwah: Routledge Ltd – M.U.A.

Klenke, A. Single sex education best for girls who prefer single sex environment. Retrieved from www.care2.com/causes/single-sex-education-best-for-girls-who-prefer-single-sex-environment.html

Kloosterman, P., Tassell, J. (., Ponniah, A. G., & Essex, N. K. (2008). Perceptions of mathematics and gender. *School Science and Mathematics, 108*(4), 149-162.

Köller, O., Baumert, J., & Schnabel, K. (2001). Does interest matter? The relationship between academic interest and achievement in mathematics. *Journal for Research in Mathematics Education, 32*(5), 448-470.

Koontz, T. (1997). Know thyself: The evolution of an intervention gender-equity program. *National Council of Teachers of Mathematics Yearbook,* , 186.

LaFrance, M. (1985). The school of hard knocks: Nonverbal sexism in the classroom. *Theory into Practice, 24*(1), 40-44.

Lindstrom, H.L., & Tracy, D.M. (2003). *Implementing gender-fair teaching in a*

rural high school science classroom. Norman: National Rural Education Association.

Long, V. M., & Smith, D. Mathematics education: One size does not fit all. *Perspectives on Multiculturalism and Gender Equity: Changing the Faces of Mathematics,*

Malone, J. A., & Cavanagh, R. F. (1997). The influence of students' cognitive preferences on the selection of science and mathematics subjects. *International Journal of Science Education, 19*(4), 481-490.

Mason, C. L., & Kahle, J. B. (1989). Student attitudes toward science and science-related careers: A program designed to promote a stimulating gender-free learning environment. *Journal of Research in Science Teaching, 26*(1), 25.

Math and science motivation: A longitudinal examination of the links between choices and beliefs. (2006). *Developmental Psychology, 42*(1), 70-83.

McCaughtry, N. (2004). Learning to read gender relations in schooling: Implications of personal history and teaching context on identifying disempowerment for girls. *Research Quarterly for Exercise and Sport, 75*(4), 400-412.

McCormick, P. (1995, Feb 1,). Are girls taught to fail? *U.S. Catholic, 60,* 38.

Muller, C. (1998). Gender differences in parental involvement and adolescents' mathematics achievement. *Sociology of Education, 71*(4), 336-356.

Olszewski-Kubilius, P., & Turner, D. (2002). Gender differences among elementary school-aged gifted students in achievement, perceptions of ability, and subject preference. *Journal for the Education of the Gifted, 25*(3), 233-268.

Phillips, K. A., & Barrow, L. H. (2006). Investigating high school students' science

experiences and mechanics understanding. *School Science and Mathematics, 106*(4), 202-208.

Plucker, J. A. (1996). Secondary science and mathematics teachers and gender equity: Attitudes and attempted interventions. *Journal of Research in Science Teaching, 33*(7), 737-751.

Reilly, D. (2012). Gender, culture, and sex-typed cognitive abilities. *PloS One, 7*(7), e39904.

Reis, S. M., & Park, S. (2001). Gender differences in high-achieving students in math and science. *Journal for the Education of the Gifted, 25*(1), 52-73.

Riegle-Crumb, C., Farkas G., & Muller, C. (2006). The role of gender and friendship in advanced course taking. *Sociology of Education, 79*(3), 206-228.

Rodrick, L. M., & Tracy, D. M. (2001). Gender cultures in a science classroom: Teaching that frees girls and boys to learn. *Equity & Excellence in Education, 34*(2), 29-34.

Roeder, P., & Grühn, S. (2000). Gender and course choices. *European Education, 32*(4), 33-54.

Rop, C. (1997, Dec 1,). Breaking the gender barrier in the physical sciences. *Educational Leadership, 55*, 58.

Sadker, D. M., Sadker, M. P., & Zittleman, K. R. (2009). *Still failing at fairness* (Rev. and updated ed. Ed.). New York, NY: Scribner.

Sadker, M. (1994). *Failing at fairness : How america's schools cheat girls*. United States:

Streitmatter, J. (1998). Single-sex classes: Female physics students state their case. *School Science and Mathematics, 98*(7), 369-375.

Team building. Retrieved from https://www.d125.org/assets/1/Documents/TeamBuilding.pdf

Tyler-Wood, T., Ellison, A., Lim, O., & Periathiruvadi, S. (2012). Bringing up girls in science (BUGS): The effectiveness of an afterschool environmental science program for increasing female students' interest in science careers. *Journal of Science Education and Technology, 21*(1), 46-55.

van Langen, A., Rekers-Mombarg, L., & Dekkers, H. (2006). Sex-related differences in the determinants and process of science and mathematics choice in pre-university education. *International Journal of Science Education, 28*(1), 71-94.

Weisglass, J. No compromise on equity in mathematics education. *Changing the Faces of Mathematics: Perspectives on Multiculturalism and Gender Equity,*

Williams, J. E. (1998). Self-concept – performance congruence: An exploration of patterns among high-achieving adolescents. *Journal for the Education of the Gifted, 21*(4), 415-422.

Wolters, C. A., & Pintrich, P.R. (1998). Contextual differences in student motivation and self-regulated learning in mathematics, English, and social studies classrooms. *Instructional Science, 26*(1/2), 27-47.

Appendix A

Saint Paul Public Schools
A World of Opportunities

Washington Technology Magnet
1495 Rice Street, Saint Paul, MN 55117-3864
(651) 293-8830 • Fax (651) 228-4331 • www.washington.spps.org

September 16, 2016
Dear Parent or Guardian;
I am completing my master's degree in education at Hamline University. As a part of my graduate work, I plan to conduct research during the second quarter of school. The purpose of this letter is to ask your permission for your child to take part in my research. This research is public scholarship and the abstract and final product will be cataloged in Hamline's Bush Library Digital Commons, a searchable electronic repository and that it may be published or used in other ways. I may also publish or use my findings in the future.
My research is going to be based on student academic records and surveys. Student survey answers and student grades will be the majority of my data collection.
The idea behind my research and data collection is to look for a connection between an improved self-esteem and improved grades. I also want to look for a connection between students working in single-sex groups and increased math grades. Lastly, I want to see if single-sex groups lead to increased math self concept.
All students participating in my research will have their grades examined. They will also take surveys on self-esteem, self-confidence and their perceptions of school and mathematics.
If your child participates in my research, his or her identity will be protected. No names or identifying characteristics will be used. Student surveys will be done on the iPads to avoid any possibility of handwriting identification. All results will be confidential and anonymous. This eliminates risks for your child and other participants. Also, you or your child may decide not to participate at any time without any negative consequences. Participation in my research is voluntary and you or your child may choose to withdraw from the project at any time without negative consequences.
I have already received permission to do this research from principal Dr. Mike McCollor, the district St. Paul Public Schools, and Hamline University Graduate School of Education.
Please return the signature page of this permission form. If you have any questions, please contact me.
Thank you for your cooperation.
Sincerely,

Shelly J. Chromack

Shelly Chermack
Washington Technology Magnet High School
1495 Rice Street
St. Paul, MN 55117
(651)744-8271
shelly.chermack@spps.org

September 2016

Dear Ms. Chermack

I have received and read your letter about conducting research on self-esteem curriculum and single-sex groups. I understand you goal is to improve student math grades and math self-concepts through a self-esteem curriculum and improved self-esteem.

I give permission for my child,

_____
_____,

to participate in the research project that is part of your graduate degree program. I understand that all results will be confidential and anonymous and that my child may stop taking part at any time without negative consequences.

Signed,

_____
_____
(Parent/Guardian)

Date:_____

Saint Paul Public Schools
A World of Opportunities

Washington Technology Magnet
1495 Rice Street, Saint Paul, MN 55117-3864
(651) 293-8830 • Fax (651) 228-4331 • www.washington.spps.org

September 16, 2016
Dear Parent or Guardian;
I am completing my master's degree in education at Hamline University. As a part of my graduate work, I plan to conduct research during the second quarter of school. The purpose of this letter is to ask your permission for your child to take part in my research. This research is public scholarship and the abstract and final product will be cataloged in Hamline's Bush Library Digital Commons, a searchable electronic repository and that it may be published or used in other ways. I may also publish or use my findings in the future.
My research is going to be based on student academic records and surveys. Student survey answers and student grades will be the majority of my data collection. I will also be teaching a self-esteem improvement curriculum as part of my regular mathematics curriculum. Some classes will have students working in groups of all girls and all boys working in separate groups.
The idea behind my research and data collection is to look for a connection between an improved self-esteem and improved grades. I also want to look for a connection between students working in single-sex groups and increased math grades. Lastly, I want to see if the single-sex groups lead to increased math self concept.
All students participating in my research will have their grades examined. They will also take surveys on self-esteem, self-confidence and their perceptions of school and mathematics. Some students will be working in single-sex groups while participating in the self-esteem curriculum. Another set of students will be working in single-sex groups during the entire duration of the research. Some students will not receive the self-esteem curriculum.
If your child participates in my research, his or her identity will be protected. No names or identifying characteristics will be used. Student surveys will be done on the iPads to avoid any possibility of handwriting identification. All results will be confidential and anonymous. This eliminates risks for your child and other participants. Also, you or your child may decide not to participate at any time without any negative consequences. Participation in my research is voluntary and you or your child may choose to withdraw from the project at any time without negative consequences.
I have already received permission to do this research from principal Dr. Mike McCollor, the district St. Paul Public Schools, and Hamline University Graduate School of Education.
Please return the signature page of this permission form. If you have any questions, please contact me.
Thank you for your cooperation.
Sincerely,

Shelly J. Chermack

Shelly Chermack
Washington Technology Magnet High School
1495 Rice Street
St. Paul, MN 55117
(651)744-8271
shelly.chermack@spps.org

September 2016

Dear Ms. Chermack

I have received and read your letter about conducting research on self-esteem curriculum and single-sex groups. I understand you goal is to improve student math grades and math self-concepts through a self-esteem curriculum and improved self-esteem.

I give permission for my child,

_____
_____,

to participate in the research project that is part of your graduate degree program. I understand that all results will be confidential and anonymous and that my child may stop taking part at any time without negative consequences.

Signed,

_____
_____
(Parent/Guardian)

Date:_____

Appendix B

Question 1 (1 point)

Solve for x:

$$\frac{4}{5} = \frac{x}{20}$$

- a x = 100
- b x = 16
- c x = 4
- d x = 19

Question 2 (1 point)

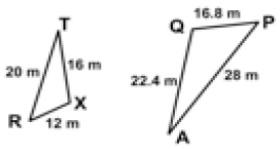
Solve for x:

$$\frac{x+2}{10} = \frac{x+1}{7}$$

- a x = 4/3
- b x = 3/4
- c x = 2
- d x = 1/3

Question 3 (1 point)

Finish the **similarity statement** for the two triangles:



Δ TRX ~ Δ _____

Blank 1:

Question 4 (1 point)

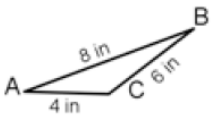
If two triangles are similar, then **corresponding angles** are _____ and **corresponding sides** are _____

Word Bank:

Congruent Bisected Proportional Equal

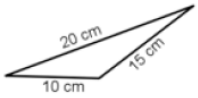
Question 5 (1 point)

Select the triangle that is similar to the one below:

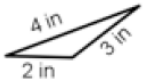


a

b

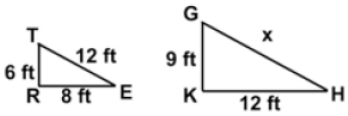


c



Question 6 (1 point)

If ΔTRE ~ ΔGKH, find the value of x.



a x = 16
b x = 15
c x = 12
d x = 18

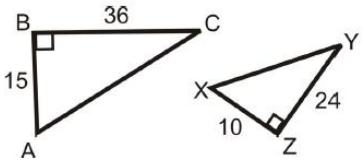
Question 7 (1 point)

In a garden, there is an 8-foot-tall statue. When the statue casts a shadow of 5 feet, a nearby tree casts a shadow of 30 feet. How tall is the tree?

a 40 ft.
b 48 ft.
c 42 ft.
d 50 ft.

Question 8 (1 point)

Which similarity theorem allows these triangles to be similar:



a AA
b HL
c SAS
d SSS
e AAS

Unit 6 Post Test

Name:_____ Period:_____ Date:_____

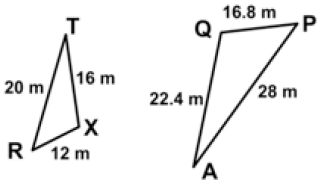
Learning Target 9.3.3.4: *I understand the concept of similarity, can identify similar figures and their corresponding parts, and can use proportional reasoning to determine the measures of corresponding sides of similar figures. I can solve real world applications involving similar figures.*

1. (1) Solve for x:

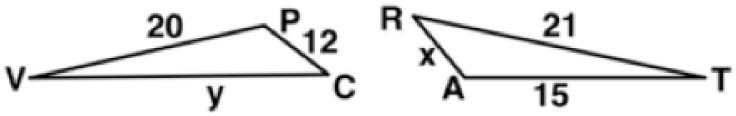
$$\frac{3}{x} = \frac{15}{4}$$

2. (1) Write a similarity statement for the two triangles.

ΔRTX ~ _____



3. (3) Given that ΔRAT ~ ΔCPV, answer the following:

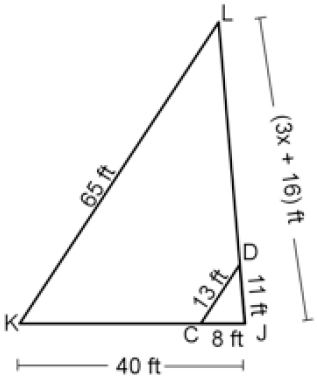


a. What is the similarity ratio?

b. Solve for x.

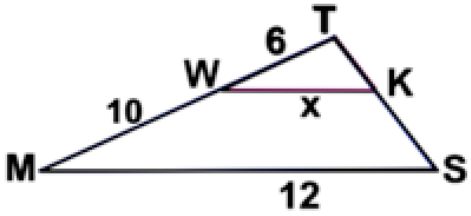
c. Solve for y.

4. (1) If two figures are similar, then their sides are _____ and their angles are _____.



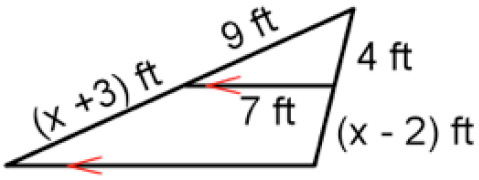
5. (4) Solve for x **in two different ways**, showing all of your work:

6. (2) These triangles are similar. Solve for x:



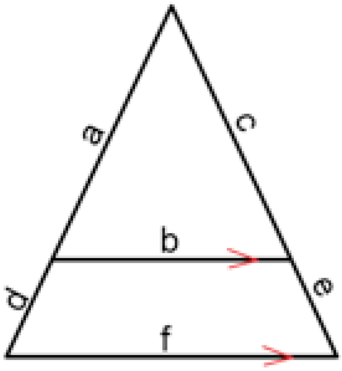
7. (2) In a garden, there is a 10-foot-tall statue. When the statue casts a shadow of 3 feet, a nearby tree casts a shadow of 9 feet. How tall is the tree? Show your work.

8. (2) Solve for x:



9. (1) A model house is built with a scale factor of 1cm:3ft to the original house. If the original is 31.5 feet high, how many cm tall is the model house?

10. (3) *Circle* the correct setups and *cross out* the incorrect ones.

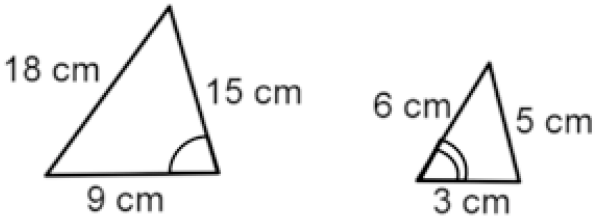


$\frac{a}{b} = \frac{a+d}{f}$ $\frac{a}{c} = \frac{d}{e}$ $\frac{b}{c} = \frac{f}{c+e}$

Learning Target 9.3.3.6: *I can logically justify the similarity of two triangles.*

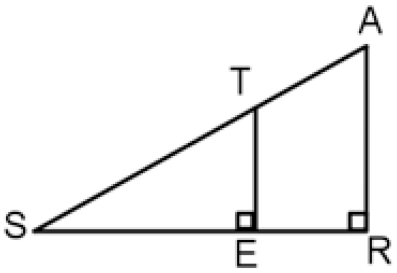
1. (1) Are these two triangles similar? _____

If yes, what theorem/postulate did you use?



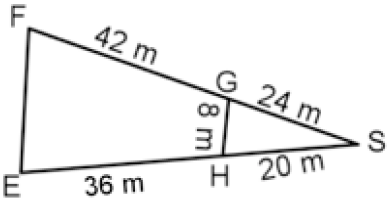
2. (1) Are ΔSTE and ΔSAR similar? _____

If yes, what theorem/postulate did you use?



3. (1) Is ΔFSE similar to ΔGSH? _____

If yes, what theorem/postulate did you use?



4. (1) Draw ΔJKL and ΔMNP. Can you conclude that ΔJKL ~ ΔMNP based on the following information?

If, yes, what theorem/postulate did you use?

$$\angle K \cong \angle N, \quad \frac{JK}{MN} = \frac{KL}{NP}$$

Appendix C

Student Self-Esteem Survey

Please record the appropriate answer for each item, depending on whether you: Strongly agree, neither agree or disagree, disagree, or strongly disagree with it.

1 = Strongly agree
2 = Agree
3 = Neither agree or disagree
4 = Disagree
5 = Strongly disagree

_____ 1. On the whole, I am satisfied with myself.
_____ 2. At times I think I am no good at all.
_____ 3. I feel that I have a number of good qualities.
_____ 4. I am able to do things as well as most other people.
_____ 5. I feel I do not have much to be proud of.
_____ 6. I certainly feel useless at times.
_____ 7. I feel that I'm a person of worth.
_____ 8. I wish I could have more respect for myself.
_____ 9. All in all, I am inclined to think that I am a failure.
_____ 10. I take a positive attitude toward myself.
_____ 11. I can think of lots of ways to make good grades.

_____ 12. I energetically pursue my school work.

_____ 13. There are lots of ways to meet the challenges of any class.

_____ 14. Even if the course is difficult, I know I can find a way to succeed.

_____ 15. I've been pretty successful in school.

_____ 16. I can think of lots of ways to do well in classes that are important to me.

_____ 17. My past academic experiences have prepared me well for the future.

_____ 18. I get the grades that I want in my classes.

_____ 19. In general I consider myself a very happy person.

Please record the appropriate answer for each item, depending on whether you: Strongly agree, neither agree or disagree, disagree, or strongly disagree with it.

1 = Strongly agree

2 = Agree

3 = Neither agree or disagree

4 = Disagree

5 = Strongly disagree

_____ 20. Compared to most of my peers I consider myself more happy than others.

_____ 21. I care too much about my weight and body shape.

_____ 22. I like math class.

_____ 23. I receive good grades in my math classes.

_____ 24. My math classes reflect how well I really understand math.

_____ 25. My math teachers know when I'm understanding math or not.

_____ 26. My math teachers answer my questions.

_____ 27. I ask questions in math class.

_____ 28. I feel comfortable in my math class.

For the following, indicate whether the following statements are:

1 = Not at all like me

2 = Barely like me

3 = Slightly like me

4 = Somewhat like me

5 = Very much like me

_____ 29. It is important to be liked and approved by others.

_____ 30. I would rather take personal responsibility for getting the job done than depend on someone else.

_____ 31. It is more important that I know I've done a good job than having others know it.

_____ 32. I am more apologetic to others than I need to be.

_____ 33. I prefer learning from my own mistakes rather than being corrected by others.

For the following, indicate whether the following statements are:

1 = Not at all like me

2 = Barely like me

3 = Slightly like me

4 = Somewhat like me

5 = Very much like me

____ 34. I am more concerned that people like me than I am about making important achievements.

____ 35. I am usually the last person to hear that I have hurt someone by my actions.

____ 36. I set my own standards and goals for myself rather than accepting those of other people.

____ 37. When I have a problem, I like to go off on my own and think it through rather than being influenced by others.

____ 38. I am afraid of hurting other people's feelings.

____ 39. I prize being a unique individual more than being a member of a group.

____ 40. If somebody criticizes my appearance, I feel I am not attractive to other people.

____ 41. I feel I have to be nice to people.

____ 42. If I think I am right about something, I feel comfortable expressing myself even if others don't like it.

____ 43. I get uncomfortable when I am not sure how I am expected to behave in the presence of other people.

____ 44. I sometimes unintentionally hurt the people I love the most by what I say.

____ 45. I am not influenced by others in what I decide to do.

____ 46. It bothers me when people try to direct my behavior or activities.

____ 47. I do things that are not in my best interest in order to please others.

____ 48. I am uneasy when I cannot tell whether or not someone I've met likes me.

____ 49. I find it difficult to say "no" to people.

____ 50. I get uncomfortable around a person who does not clearly like me.

For the following, indicate whether the following statements are:

1 = Not at all like me

2 = Barely like me

3 = Slightly like me

4 = Somewhat like me

5 = Very much like me

____ 51. I am reluctant to ask for help when working on a difficult and puzzling task.

____ 52. If I think somebody may be upset at me, I want to apologize.

____ 53. When I am with other people, I look for signs whether or not they like being with me.

____ 54. If a friend has not called for a while I get worried that he or she has forgotten me.

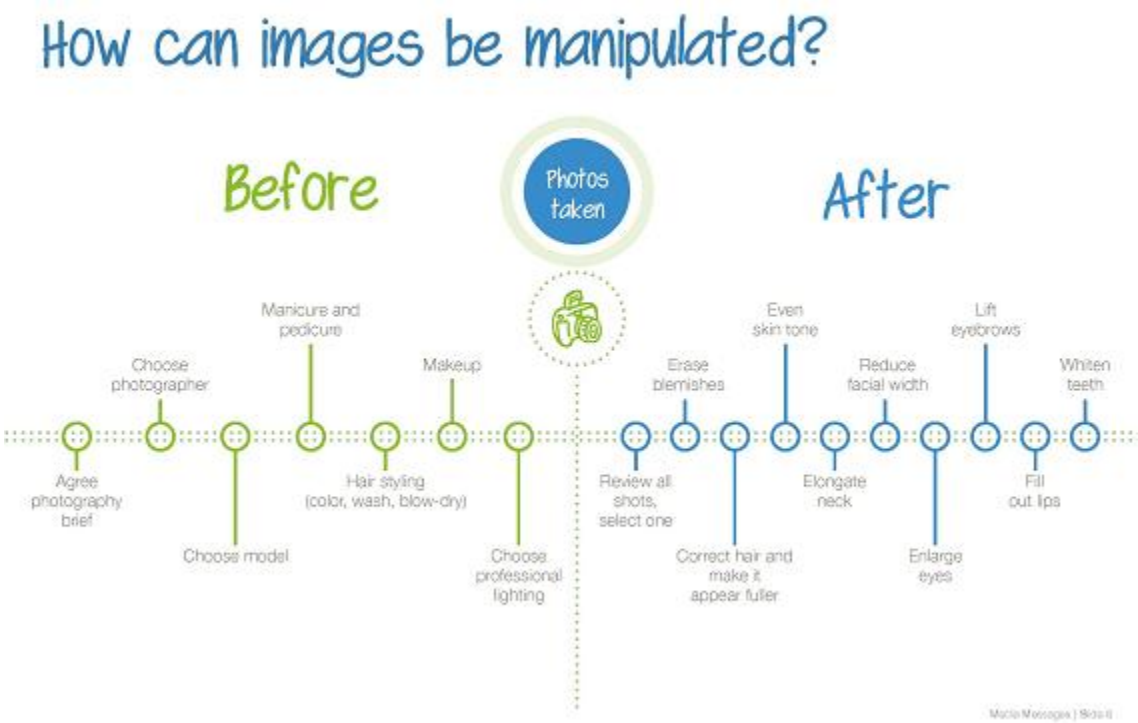
____ 55. I feel more comfortable helping others than receiving help.

____ 56. My close friends and family are too sensitive to what others say.

____ 57. I censor what I say because I am concerned that the other person may disapprove or disagree.

____ 58. I don’t like to answer personal questions because they feel like an invasion of my privacy.

Appendix D


How can images be manipulated?
Before
Photos taken
After
Agree photography brief
Choose photographer
Choose model
Manicure and pedicure
Hair styling (color, wash, blow-dry)
Makeup
Choose professional lighting
Review all shots, select one
Erase blemishes
Correct hair and make it appear fuller
Even skin tone
Elongate neck
Reduce facial width
Enlarge eyes
Lift eyebrows
Fill out lips
Whiten teeth

Workshop 2 of 5
Media Messages

Name: .....

How can images be altered?

The final images you see in professional media are the result of several decisions made by producers before and after a photograph is taken.

Watch the "Dove: Evolution" video. Write down all the different decisions you notice being made below.

1.1 What decisions were made before the photos were taken?

Hair is blow-dried

1.2 What decisions were made after the photos were taken?

Teeth whitened

Workshop 2 of 5
Media Messages

Name: .....

d Your friend uploads a retouched selfie:

What message is this trying to get across?	It's unfair to compare anyone to this because...

e You read this Tweet from a celebrity website:

What message is this trying to get across?	It's unfair to compare anyone to this because...

f You're playing a video game and meet one of these "ideal"-looking heroes:

What message is this trying to get across?	It's unfair to compare anyone to this because...

Workshop 2 of 5
Media Messages

Name: .....

Extension sheet

Can you decode messages in advertising?

Think of an advertisement you've seen recently.
How did the ad work to encourage you to buy that specific product?
The ad I'm thinking of: .....

Promise: What does this ad promise? How do they use images and words to do this?	
Feelings: What do people think and feel after seeing the ad?	
Actions: What do people do after seeing the ad?	
Results: Do you think the product will live up to its promises?	
Fix: How might people try and "fix" the feelings they are left with?	

Challenge media messages that promote appearance ideals!

Workshop 2 of 5
Media Messages

Name: .....

Going further

Media messages: key messages to remember

Images of people in the media, such as in advertising, entertainment, and social media, are often manipulated and drastically altered to reflect current appearance ideals.	Ideals of attractiveness are based on opinion, not fact, and are changing all the time. This makes them unrealistic and actually impossible for most people to live up to.
You can challenge media messages by changing the media (like words, pictures, and films) you consume and create. Be true to yourself and your friends, and publish what's real.	

In what ways could you take action to challenge messages and images in media that promote these ideals or norms? Record your answers below.

Taking action for yourself

What I did: .....

.....

How I felt: .....

.....

Taking action for others

What I did: .....

.....

How I felt: .....

.....

Things you could do:

Choose one brand or media outlet (magazine, website) that promotes ideals of appearance, and email or tweet them to challenge how they use altered images in their advertising or editorial.	Look carefully at your own recent posts on social media and reflect on the person you are "creating" through your self-publishing. Is it a true reflection of you and your life? Or are you reflecting the media messages that are found in professional media?

Celebrate your individuality and the diversity of the people you know.
Aim to be the best you can be — you are one of a kind!

Workshop 2 of 5
Media Messages

Name: .....

Can you decode media messages?

Is it fair to compare?
Choose one or two examples. For each example:
- What message is the media sending about ideals of appearance?
- Why is it unfair to compare ourselves to this?

a You pass this store window displaying "ideal"-looking mannequins:

What message is this trying to get across?	It's unfair to compare anyone to this because...
If you buy these clothes, you'll look "perfect" like these mannequins.	Most mannequins are an unrealistic body shape and size.

b You read a magazine headline:

What message is this trying to get across?	It's unfair to compare anyone to this because...

c You watch the latest video from your favorite artist:

What message is this trying to get across?	It's unfair to compare anyone to this because...

Sit Down – Stand Up

Objective:
Students will have to think as a team and communicate to figure out an effective way for everyone to sit down and stand up together.

Materials:
None.

Procedure:
1. Move all the desks out of the way and have everyone stand in a circle.
2. Tell them to first sit down and stand up without using their hands (without the group.)
3. Then have them all hold hands and do the same. They can do it however they want as long as they hold hands.

Helpful Hints:
Time them to see how fast they're getting.

Marina Komarovsky '04

The Human Knot

Objective:
To break the ice in advisory and to encourage teamwork.

Materials:
None.

Procedure:

1. Have the freshman stand in a circle. Then instruct them to grab the hands of two different people in the circle who are not next to them. Everyone should be linked to two different people.
2. Instruct the freshman to untangle them so that everyone is standing in the circle holding hands to the person next to them, in other words, untangle the knot!

Helpful Hints:
Divide the advisory into two or three groups and see who can get untangled the fastest! Also, this is a relatively quick activity, so it is great to use if you have a little extra time.

Adapted from the "Leader Handbook"

Trust Blanket

Objective:
To test the freshman's trust of one another and to challenge them to truly work together.

Materials:
One blanket – it should have enough room for everyone to stand on it.

Procedure:
1. Lay the blanket on the floor and smooth it out so there are no folds.
2. Have all students stand on the blanket with their feet on the blanket: no feet can be touching the floor!
3. The students must work together to flip the blanket over without anyone's feet touching the floor.
4. If the students are successful, try folding the blanket in half and have them try again.

Balloon Building

Objective:
To work together as a team in a short amount of time to make an end product that will be workable.

Materials:
6 balloons for each team, 1 yard of masking tape for each team.

Procedure:
1. Divide the advisory into 4 teams.
2. Each team must make a structure with only the six balloons and tape – the goal of the structure is to be the tallest in the class.
3. The freshmen can blow up the balloons to be as big or small as they want. They are allowed 5 minutes of planning time, and 12-15 minutes to build the structure (depending on how much time is left.) In order to win, the structure must be able to stand on its own.

TAKE A WALK

Ask players to walk around the room. From time to time, call out a particular emotion or character type and have the players change their walk to show the new emotion or character. Encourage players to exaggerate, making their movements and expressions as big as possible. Tell them that anyone watching should be able to guess right away what emotion or character was called out. Help players notice how their movements change instinctively when they act out different emotions. Point out that their hands clench when they are “angry” or that they take smaller steps when they are afraid. Once players get the hand of it, speed up the game to give them practice changing emotions and characters quickly. Don’t forget to debrief at the end of the exercise!

Adapted from: Bedore, Bob. 2004. *101 Improv Games for Children and Adults*. Hunter House: Alameda, California.

HAVE YOU EVER?

The group forms a large circle. Have each group member mark their place with a small object. (Cup, hat, keys). While everyone is marking their spots the leader is standing in the center of the circle. Consequently there is one less spot than there are people. If you are indoors with a small group have people pull chairs in a circle.

Explain that this is a game like musical chairs. Instead of music, however, we will use questions. The person in the center will ask a question starting with “Have you ever…?” An example is, “Have you ever gone kayaking?”

If you have, you must exchange places with someone from another part of the circle who has also been kayaking. You cannot change places with someone to the immediate right or left of you. Only ask about something you have done yourself. Don’t ask “Have you been to Moscow?” unless you’ve been there.

When the first question is popped, people trade places leisurely. But it quickly becomes evident that the person who moves the slowest does not have a place to go except the center of the circle. That person steps to the center of the circle and asks the next question and the fun begins as people dash to find another spot in the circle.

Adapted from: Snow, Harrison. 1997. Indoor/Outdoor Team-building Games for Trainers: Powerful Activities from the World of Adventure-Based Team-Building and Ropes Courses. McGraw-Hill: New York

.

WHAT IS IT?

Divide the class into small groups and have each group sit in a small circle. Hand one player in each circle an “invisible” ball. Ask the player to decide how big and how heavy the ball is, using facial expression and body language to show this as the group members pass the ball around the circle.

After the ball has rounded the circle, hand the first player an “invisible” lump of clay. Ask the player to mold the clay into an object, silently acting out how to use the object, and then passing the object to the next player in the circle. The next player takes the object, uses it for a different purpose, and them mashes up the clay. Then the player sculpts a new objects and the activity goes so forth around the circle.

Encourage players to make increasingly unusual objects after the obvious ideas have been used up. Make sure that they are all using the objects in an effective manner.

Let your players experiment with the game to see what they come up with. This game is great for developing the communication skills of body language and gestures. Don’t forget to debrief!

Adapted from: Bedore, Bob. 2004. *101 Improv Games for Children and Adults*. Hunter House: Alameda, California.

COMMON GROUND

Form equal sized teams of 3-6 players. Give each team a sheet of paper and a pencil. Tell teams their challenge is to list everything they can think of that all team members have in common.

For example, attending the same school, prefer the same kind of music, have the same brand of tennis shoes. The only rule is they cannot list similar body parts, i.e. "We all have two arms, etc."

Tell teams they have three minutes to create their lists, so they need to work quickly. To add to the excitement, tell the teams when they have 1 minute left, thirty seconds, and so forth.

When time is up, find out which team has the longest list and ask them to read the similarities they listed. Then ask teams whose similarities have not already been read aloud to read some of theirs.

Discussion:

- How easy was it to discover something in common with another group member?
- How can similarities draw us closer together?
- How can our differences draw us closer together?

Adapted from: Keefer, Mikal (Compiler). All-Star Games from All-Star Youth Leaders. 1998. Loveland, Colorado: Group Publishing, Inc.
Source: Anonymous

GROUP JUGGLE

This exercise is an engaging way to learn the names of team members. The group stands in a large group circle. A bean bag, Kush ball, or similar device that is soft and throwable is tossed around from person to person till a sequence is established.

Everyone gets the ball once. Only the first person to toss the ball gets it twice. The person about to toss the ball calls out his or her name and the name of the person the ball is going to. After the first round ask the team if they think they can toss the ball in exactly the same sequence. Some doubt will be expressed, but it will become apparent that the task is easily done if each person can remember who they tossed the ball to.

Send the ball on another round. The fun starts as more balls, rubber frogs, and plastic doll heads are tossed into the fray. As bric a brac fills the air, the biggest challenge becomes catching a ball between bursts of laughter!

Adapted from: Snow, Harrison. 1997. Indoor/Outdoor Team-building Games for Trainers: Powerful Activities from the World of Adventure-Based Team-Building and Ropes Courses. McGraw-Hill: New York.

BACK TO BACK

Pads of paper, felt tip pens, copies of drawing on next page (or you can make up your own…best to keep it simple.)

The themes of this activity are coaching for results, listening, describing details, and following instructions. The task at hand is to draw a picture like your partner is holding without being able to see it.

Ask team members to pair up and sit back to back in chairs. On member is given a pad and pen, and the other member is given a piece of paper with a figure drawn on it. (See figure on next page.) The person with the figure drawing is the coach who guides his partner in drawing the figure without letting him see the original.

Rules: The language the coach uses can include symbols and metaphors but not a geometrical description of the figures. For example, do not use the words “square” or “circle” as you explain how to draw the figure. Instead use “box” or “shaped like an orange.”

When the time is up (1 minute – 5 minutes, depending on your group) let the pairs compare the drawing to the original figure and discuss the results. If appropriate, have the pairs switch roles and try their hand at a new drawing.

Discussion: Use this exercise to emphasize some of the challenges in communicating a vision. The difference between what one person says and what the other person hears is graphically and often dramatically represented. The exercise also brings out the challenge of giving good directions. No matter how clear they are to the giver, if the directions are not clear or are misinterpreted by the person receiving them, the results will be something other than what was desired. Being concise and checking for understanding are two of the keys to success. Good coaches know the importance of giving step by step direction and encouragement.

• What did your partner say that helped you draw the figure?
• What did you tell your partner that helped you get the information you needed to draw the figure?
- Is there a situation at work or school where communication is critical yet it’s not possible to do it face to face?
- When giving instructions, how can you make sure you get the results you want?
- When giving instructions to an employee, how do you check for understanding?
- What are the characteristics of a good coach?

Some pairs will do well, some wont. Since people tend to compare themselves with others, the pairs that had trouble reproducing the drawing may feel a bit disheartened. This is a good time to focus on the lessons learned. If the pairs who came up short learned something, then they had significant success no matter what their drawings looked like.