COMM 600

Table of Research Findings

RESEARCH TOPIC:

GENDER DIFFERENCES IN STEM COURSEWORK

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| **Source** | **Defintions/****Key Terms** | **Focus of Study**  | **Methodology** | **Findings** | **Personal Reflection** |
| Mahoney, M.“Students' Attitudes Toward STEM: Development of Instrument for High School STEM-Based Programs” | students attitudes, reliability, STEM education, high school, secondary school, science, technology, engineering, math, gender difference, college preparation | Study sought to find reliable instruments to measure high school students’ attitudes towards taking STEM, science, technology, engineering and math, classes. Measuring the quality of attitude will have a beneficial outcome of enabling students to have a positive attitude toward enrolling in STEM classes. Success in STEM courses at the high school level translates to students choosing STEM careers to pursue in college, which in turn leads to a supply of candidates in the STEM career fields to ensure the country’s competitive edge in global markets. | The author sought to create a reliable instrument to measure attitude, which is clearly a qualitative measurement. Student focus groups were used, as well as a panel of experts including those in the STEM industry and teachers. Many statistical instruments were also employed, such as PCA, Principal Components Analysis, which does not assume any particular distribution, and Cronback’s alpha coefficients, for scale consistency, to yield both useful and reliable information from the collected data. The subjects included students from a school with a STEM focus as well as students enrolled in STEM classes through a college preparatory program within a public high school. These groups were chosen in particular to avoid misleading data based on a biased population sample. Three precise independent variables were also used, that is gender, grade level and school location.  | Though the study anticipated students from the STEM focused school would have more positive attitude results than the students simply enrolled in the STEM courses in college preparatory courses in a public high school, there was no significant correlation. Also, based on the statistics, ninth graders tended to have a significantly better attitude toward STEM courses, especially mathematics, than did eleventh graders. There was also a difference in attitude demonstrated between the boys and girls but it was not significant.  | As one who is wary of nonsense research, I found this study used a significant amount of data collected over a period of years which, to me, gave it much more validity. The list of questions used to collect the data was based on recommendations from a panel of experts instead of being based on preconceived assumptions. The author also used statistical methods which gave more credence to the results, rather than skewing them in the favor of expected findings. Conclusions also reflected good research practices by clearly delineating the results even when results were not as expected. Rather than justifying the unexpected result, he used it as a point for further research. I feel the instrument to measure attitude he created will be a great benefit in steering students toward STEM classes. |
| O'Shea, M., Heilbronner, N. N., & Reis, S. M. “Characteristics of Academically Talented Women Who Achieve at High Levels on the Scholastic Achievement Test-Mathematics” | qualitative research, females, achievement tests, gender differences, college entrance exams, family environment; math, sciences, engineering, technology, education, scholastic aptitude test | Widely recognized research shows females tend to score lower on Academic Acheivement tests and college entrance exams in mathematics. Also, females tend to pursue less graduate degrees and careers in the STEM, science, technology, engineering and math field. Based on these contentions, the study sought to specifically investigate 23 academically talented young women who did indeed excel on the SAT mathematics section. Similar characteristics and environments demonstrated by this group of young females studied could possibly lead to interventions in the future to encourage young females to excel in mathematics and pursue STEM graduate degrees and careers. | The study was extremely focused on a precise segment of only 23 women, which comprised only about 5% of a larger population of females. While the population investigated was precise, a wide variety of shared characteristics were investigated in order perhaps nurture these qualities in other, less academically elitist segments of female student body as a whole. Some of the characteristics investigated were the common measures of intelligence recorded in their report cards, IQ scores and permanent school records. Other non-academic information was collected such as involvement in school, home environment, support of family, education level of parents, teacher interactions and school environment and support.  | Success of the academically talented young women in high school translated to pursuit of advanced degrees in STEM and careers in the field. The study found the young women’s personal perception of how well they are doing can frame their success or failure in mathematics and in turn their success on SAT math. Strictly academic strengths were not necessarily the only support offered these talented young women. Support of teachers, test-taking strategies, family members with degrees in mathematics based fields were also present. Academic and environmental support was shown to be a significant component in the abilities of these young women to perform well on SAT math giving them greater opportunities in college and career choices. | Though I know each of these young ladies likely worked very hard to achieve their individual levels of success in mathematics and in life, I also feel it is in large part due to the tremendous amount of support they were offered within the school and home environment. In saying this, I am not implying they would fail without it, but rather, I would hope there would be a way to support those less fortunate, those who do not have that great math teacher, those who were never taught the hints for test taking, and those whose parents cannot help them. Because of the experience I had in teaching in a school where 56% of the students lived at or below the poverty level, I am not quick to judge the parents, nor am I quick to judge the school systems. If we witness the profound difference support can make in a student’s success, our funding ought to go in that direction. The supports were pretty basic, not rocket science, not new math, not project based learning, just support and encouragement on the most basic level. Such support does not cost near as much as reinventing the wheel.  |
| Shapka, J., “Trajectories of Math Achievement and Perceived Math Competence Over High School and Postsecondary Education: Effects of an All-Girl Curriculum in High School” | gender, mathematics education, high school, post-secondary, longitudinal,multilevel modeling | The study sought to determine if the success of girls in single gender STEM curricula in high school carried over to postsecondary education. The girls studied were ninth and tenth graders taking math and/or science in a single gender classroom. This single gender classroom opportunity was voluntary, yet only those students who had averaged 70% or better in their seventh and eighth grade mathematics courses were eligible for enrollment. This longitudinal study specifically examined the topics of achievement and perception of mathematics over time from high school through college.  | Introductory statements discuss considerable previous research on girls’ success rates in math and science in grade school, pointing out few studies are longitudinal, that is, the success or failure of girls in math has not been followed over a period of time to post secondary institutions. This study seeks to provide information regarding whether or not girls relative success in single sex mathematics classes is sustained during the transition to post secondary institutions. Success in mathematics was a function of achievement and self perception of competence. Data in this study was comprised of student records and self- reporting. A variety of controls were used, including both male and female students from coeducational mathematics courses. Covariates such as parental education, parental expectations and pre-secondary mathematics success were also employed as possible indicators of outcome in mathematics achievement over the long term. | Findings showed no evidence of definitive success of single sex mathematics courses with respect to transitioning either academic performance or perceived success through post-secondary education. Actual performance levels for girls in single sex math courses, in fact steadily decreased from the time the girls entered the program through college. Academic success for both boys and girls in coeducational classes exhibited a u-shaped curve, were there was a dip during the transition to high school, and a recovery period in the last years of high school math through college. With respect to self perception of mathematics competence, all classes of subjects had a similar shape graph with a slight increase from entrance into high school to graduation then a slight decline upon entering college. Evaluation of the findings discussed the possibility of studying a larger population of students in the future since the small sample could have led to flat results. Also, the relatively small population studied may not demonstrate the impact of socialization on both achievement and self perception of competence in mathematics.  | For me, the most compelling result of this study was the fact it seemed to refute the positive impact of single sex mathematics classrooms for girls. The author does acknowledge the constructs of the study may have led to this result. However, the author does say at one point the dramatically different, steadily declining plot of girls in single sex classrooms may indicate the girls actually have a more consistent performance. This circumstance can be used to support these girls through the period of decline. Also, I very much agree with the author’s view further investigation of the socialization of these girls needs to be completed. The fact they chose to be in the single sex mathematics classroom could have impacted the results. There is no way of knowing if the girls had been a part of a coeducational class if their decline would have been more or less dramatic. Studies prompting the research into transition of mathematics success, demonstrated positive results in single sex classrooms for girls. It will be interesting to follow subsequent research into possible interventions to support college success.  |
| Shaw, E. J., & Barbuti, S. “Patterns of Persistence in Intended College Major With a Focus on STEM Majors | STEM education, higher education, curricula, college majors, multicultural issues, gender disparity, gender difference, science, technology, engineering and mathematics | “Major persistence,” or not changing or switching majors in college after expressing an initial choice of major was the focus of this study. The subject population was over 50,000 students who had completed SAT exam questionnaires. Additional information was collected regarding students who took AP exams. The focus in collecting this information was to determine if students who expressed an interest in a STEM degree program on the questionnaire as well as AP coursework, switched majors by their third year in college or persisted in their initial choice. The subjects who expressed a STEM based major were examined to gain insight into possible reasons these students do not complete a degree in a STEM field. | The study is founded in SCCT, or Social Cognitive Career Theory, which the author attributed to the works of Lent and Brown (2006). Three essential aspects of SCCT used in the study were self efficacy, outcome expectations and personal goals. These aspects were framed around how they could influence a student to persist with a STEM field degree choice to the point of graduation in the initial chosen field. For the purposes of this study, the influence of variables such as academic skills, race, gender, and socioeconomic circumstances upon the three essential aspects of SCCT were considered as influential factors in major persistence.  | Certain characteristics of students studied had an influence on major persistence in STEM fields. The researchers noted these characteristics were not consistent for each of the STEM fields. For instance, self efficacy, or a student feeling they were skilled in a STEM field, showed no correlation to major persistence for those majoring in computer sciences. In other major fields, success in math and science in high school as well as taking AP exams showed a relationship with both self efficacy and major persistence. The authors noted limitations to the usefulness of the study such as not following the students through graduation, and the omission of the students’ feelings about environmental assistance and impediments. A more focused study was suggested to hone in on how to support students in major persistence by overcoming self efficacy beliefs and anticipate challenges to being successful in the STEM field. | The large data set of this study from over 50,000 student surveys gave a broad range of subjects to avoid bias due to demographics or geographical region. Personally, I feel there are, however, a couple of potential issues to the data collection which may still skew the data in some respects. First of all, picking of a major on an SAT questionnaire may not be a true statement of a student’s intentions. The focus of the task at hand when students are taking an SAT test is likely the culmination of months of preparation, stress and anxiety upon which the student’s future in college and indeed their life, may be based. Picking one’s intended major is certainly not a priority on that particular day. Also, the focus on students who took AP exams may not be a measure of potential success, since not all school curriculum includes AP courses, and many students who take honors classes in STEM subjects are likely just as likely to persist in an expressed major intention in a STEM field. |
| Xu, Y. J., “Gender Disparity in STEM Disciplines: A Study of Faculty Attrition and Turnover Intentions | women scientists, women faculty, dispropor-tionate representa-tion, gender differences, faculty mobility, labor turnover, sciences, technology, engineering, mathematics, higher education, sex role | A debate over the reason for less women having terminal degrees in STEM fields, leading to fewer female members in STEM related fields is the focus of this study. The two distinct schools of thought explaining this circumstance are those who attribute the disparity to gender-based socialization and those who attribute it to structural issues within society at large or within the academic community. Participants in the study were from over 950 post secondary institutions employing 27,000 faculty members. Of these, 18,000 actual surveys were collected to determine the hiring and retention of female faculty members in STEM fields compared to male counterparts. | Two specific models were used in determining potential causes of lower female representation in STEM fields. The author credits Kulis et al. 2002; Pell 1996 with the pipeline model, and Sonnert and Holton 1996; Settles et al.2006 with the deficit model. The pipeline model assumes a seepage or loss of female faculty over time between the hiring process and through their career. Addressing the loss of faculty through the pipeline model leads to a recommendation of increasing the stream of female prospects into the faculty mix. The deficit model views the shortage as a function of gender bias in the workplace including limited opportunities for women and impediments in the hiring process in the academic environment. Increasing opportunities and removing barriers for women is the focus of the deficit model. | The author notes a limitation of the value of the data since it was collected in 1999, and also indicates the relatively small amount of female faculty members included in the study may influence validity of the findings. Data showed there were more female doctoral candidates in STEM fields compared to years past, but there was not a proportionate amount of female candidates hired. This would show the loss or seepage of women according to the pipeline model, happened during the hiring phase. Regarding structural aspects within the deficit model, data demonstrated female faculty do not feel supported within the realm of research, nor do they feel confident in being able to express their ideas freely. Suggestions from the study for acting upon the findings include ensuring fair hiring practices as well as structural supports where the female faculty feel they have a dialogue with both male and female collegues regarding their needs in order to be successful in their position.  | I enjoyed the balanced presentation of the data from the study through use of the pipeline and deficit models. Neither one or the other model gives a complete picture of the reason for female faculty attrition and turnover. Each model demonstrates a segment of the potential for acquiring and retaining female faculty members in the STEM field. |