AN EXPLORATION INTO THE LACK OF FEMALE HIGH SCHOOL STUDENTS IN COMPUTER SCIENCE

Devon Skyllingstad
974 Dana Ave. Apt #2
Cincinnati, Ohio 45229
devon@cs.xu.edu

Abstract

There are a very small number of women throughout all levels of the computer science field. This paper describes a study in which high school students are surveyed to determine reasons why females do not get involved in computer science from high school onward. Various reasons such as lack of encouragement and low self-esteem are presented in this study to explain the lack of females in computer science courses. Recommendations of ways to increase the number of females involved in computer science are offered. Further work and research is therefore suggested by the outcomes of this research to determine specifically what can be done to increase the overall number of females in computer science.

1. Introduction

Many high school females are hesitant to enroll in computer science, and if they do, they are faced with a male-dominated classroom. With small numbers of women enrolled in high school computer classes, it is not a surprise that the number of women majoring in computer science in college is very low. While there has been research done on integrating women into the computer science field in college and in the workplace, there is little research that specifically targets high school students. With this in mind, a research study was created to look at high school seniors, both male and female, in an attempt to understand some of the underlying factors as to why there are not more women in computer science.

2. Methodology

2.1. Sample

Three high schools in suburban Cincinnati were included in the study: Ursuline Academy in Blue Ash, Ohio, St. Xavier High School in Finneytown, Ohio, and Mason High School in Mason, Ohio. Ursuline Academy (UA) is an all female, private high school. St. Xavier High School (St.X) is an all male, private high school. Mason High School is a coed public high school. The various schools were chosen mainly due to their composition of students. The goal was to get a diverse mix of students from diverse socioeconomic backgrounds, as well as students from same sex and coed schools. Surveys were distributed to Advanced Placement (AP) Calculus classes, AP Computer Science (CS) and regular CS courses. The sample included 50 students from UA and Mason, and 60 students from St. X. A variety of questions were included, focusing on perceptions, personal experience, and encouragement.

2.2. Statistical Testing

Various statistical tests, such as the Chi-Square test and Confidence Intervals, were applied to the results. For the Chi-Square test, the significance level was set to $\alpha = .05$. For the Confidence Interval test, a confidence level of 95% was chosen. All results mentioned in this paper had either the Chi-Squared or the Confidence Interval tests applied to them and were significant at the levels chosen.

3. Results

The first item of interest was the number of students interested in pursuing CS at a higher level. All of the students were approximately at the same skill level. Among the Mason students, only 20% of the females in the class were interested in possibly majoring in CS, as compared to 76.6% of males. One explanation for this discrepancy is the possibility that females may need more explicit encouragement to major in something that they may consider a 'male' field.

3.1. Encouragement

In the research, 73% of the students surveyed felt that males are encouraged more than females are. Only 5% of the students surveyed felt that females are encouraged more than males. Dennis Gooler [1] notes "Girls…often need guided encouragement in order to be successfully introduced to computers." Females need more encouragement, yet it is a widespread belief among students that males get more encouragement.

3.2. Perceptions

Females often do not think highly of themselves in a computer science setting. This may be due to a predominantly male computer environment in society.

The media markets computers and games almost exclusively to males. Piller [2] states that "computer use is pretty equal between girls and boys until the age of 10, when boys rapidly overtake girls." Therefore, females may have lost interest in computer science a number of years prior to high school, college, or the work force. 64% of students think that males like CS more than females do. Only 12% of the students surveyed felt that females like CS more than males do. Furthermore, 81% of students surveyed perceive CS as a predominantly male field.

3.3. Gender and Encouragement

Another group that is of interest are the females who stated that they would like to pursue computer science at a high level. Key insights were discovered in the process. Only 32.8% of all female students (UA and Mason female students) indicated that they were considering computer science as a possible major compared to 55% of all male students. Of the UA students who had expressed an interest in CS, 68% had been explicitly encouraged to pursue computer science. Yet, among the males who were interested in majoring in computer science, only 50% had been explicitly encouraged. However, among all students, both those who were interested in majoring and those who were not, the differences between males and females were minimal. One obvious conclusion is that the act of explicit encouragement has more of an effect among female students. Cindy Starr [3] notes "Without sufficient role models, high school girls may end their math and science training prematurely, thus precluding a major in science before they even begin college." Encouragement of females in high school and even before could make a difference in the field of computer science in terms of gender equality.

3.4. The Role of Self-Esteem

It is reported that females think they have less ability in the computer science field, while in actuality this is not true. 40% of Mason High School and St. X students feel that males have more natural ability than females. However, only 17% of students feel females have more natural ability than males. The research supports the idea that women have lower self-esteem about their abilities in computer science. It is no surprise then, that only 20% of Mason females would be considering computer science. However, only 4% of the females at UA thought that males were better than them in computer science, and as a result, 38% of UA students are interested in majoring in computer science. Based on these results, it seems that females with a higher self-esteem about their abilities in computer science may become interested in majoring in computer science. Therefore, with a mixture of encouragement and support for these female students, their self-esteem will rise and they may become interested about the field of computer science.

4. Recommendations

We have formulated recommendations based on the results of the survey and subsequent analysis.

- Starting from an early age, explicitly encourage females to become involved with various aspects of computers.
- Explicitly encourage females to take a CS course in high school, to allow them to become involved in a classroom where they can succeed with computers.
- Introduce female students to female mentors that can encourage students in their computer science endeavors.
- Promote to all students the idea that men and women can be and are successful in the computer science field.
- Explicitly tell female students that they have enough natural ability, even in the face of their own self-doubt.
- Develop an outreach program for female students providing female role models and explicit encouragement.

Conclusion

Through the current research and the analysis of other research done regarding women in computer science, it is possible to see different trends emerging. Males and females have similar perceptions about the role of men and women in computer science. However, this perception is one of male bias. Male and female high school students both feel that men are encouraged more and have more natural ability in computer science. This attitude about computer science leads to the diminishing numbers of females entering college with the intention of majoring in computer science. Females are more likely to react to the explicit encouragement of others and use this encouragement to pursue computer science. Through the aforementioned recommendations, it may be possible to increase the number of female students in computer science.

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Bibliography

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