INFLUENCES OF FRIENDS AND FAMILY ON WOMEN'S PURSUIT OF COMPUTING; A SEQUENTIAL EXPLANATORY DESIGN

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Influences of Friends and Family on Women's Pursuit of Computing:

A Sequential Explanatory Design

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Abstract

The participation of female students in STEM majors, particularly computing and engineering, has remained low. In this study, our goal is to understand the most important factors influencing female students towards computing majors. We studied the impact of family and friends on four different racial groups including White, Black, Hispanic, and Asian students who chose computing majors (n=1650). The results of the study indicated friends had a positive significant role on White female students' major decisions.

Introduction

Women earn less than 20% of bachelor degrees in computing and engineering fields in the United States (US) [1]. However, while this is not a new problem, a solid solution has not been proposed yet. There have been numerous studies around the factors influencing female student participation in these fields as following; researchers identified friends [2],[3], family [4], [5], engagement with teachers [6], cultural factors [7], math grades [8], and involvement in school activities [2] as having impact on students decisions towards computing fields.

In this study, we will focus on peer and family support among four different cultural groups including White, Black, Hispanic, and Asian students to illustrate the most important factors influencing students' paths through the computing fields in the US. The rest of this poster is as follows: review of the literature, framework which shaped this study, review of the methods, the results, discussion, and lastly the conclusion of this study.

Literature Review

Numerous studies illustrated the importance of family and friend relationships on students' academic achievement regardless of race and gender [9][10][2]. First, we will focus on research around the importance of family, and next we will discuss the peer impact on students' academic performance specifically in STEM related fields.

Family is one of the most important environments in which children can raise their self-consciousness [11]. According to Sanders [12] students get positive influence indirectly from the cumulation of factors including teacher and parent on their academic achievement. In addition, Muller [13] found parents' education, parents' employment status and family income level have a relationship to students' academic success [13]. Breakwell found that student positive attitudes towards science was positively associated with having parents who supported science [14]; furthermore, Ing found different parental motivational practices influence students' occupational pursuit in STEM fields [15]. However, one of the most important factors to take into consideration is the parents' expectations. According to the literature, parents' expectations differ from their children's gender identities, and they expect higher math and science grades from their boys compared to girls [11]. So, we can conclude families have an important role on students' academic accomplishments, precisely on girls who want to pursue STEM fields.

Also, "friendships play a critical role in structuring the human life course" [16]. Friends have an important role both as encouraging and discouraging factors for the academic achievement of students [17]. A study from Zimmerman focused on peer effects in academic outcomes based on SAT scores. In his research, he found that students who were impacted most from their peers were the ones categorized in the middle of the SAT distribution, and the least effected students are those in the top of SAT distribution [18]. According to a recent research study on race gaps in SAT scores; Black, and Hispanic student scores are significantly below and towards the bottom of the distribution compared to White and Asian students. Asian students were categorized at the top and White students have the second place [19]. Therefore, from these studies we can conclude that White students are experiencing the most impact from their peers among all racial groups.

Theoretical Framework

The framework that guided this study was ecological systems theory. In this theory Bronfenbrenner (2005) identified five environmental systems including individual self, micro system, mesosystem, exosystem, and macrosystem in which humans are impacted during their lives [20]. Researchers have used this framework to address students' educational achievements and failures [21][22].

Wooley described the key strength of this framework as the emphasis on micro systems of family, friends, school, and neighbors [22]. For the context of this study we focused on the micro system influences including family and friends.

Methods

The method which shaped this study is a sequential explanatory design, in which first we analyzed the quantitative data to answer our research question: *What factors (family, friend) influence students' academic achievements in computing fields across different racial groups?* And next, we will identify participants through the purposive sampling method in order to interview and deeply understand the underlying stories around these important factors.

The data used for the purpose of this study is coming from NSF awarded research study called FLIT-Path (Florida-IT-Pathways to Success). Flit-Path provides approximately 23 one-year fellowships to each large public institution in Florida including Florida International University (FIU), University of Central Florida (UCF), and University of South Florida (USF) to support senior students enrolled in one of the three computing fields including computer science, information technology and computer engineering. During the last two weeks of the semester, a survey containing questions around the background, interests, GPA, gender identities, demographics, encouragement towards computing from family, friends, and etc. distributed online between students utilizing Qualtrics survey system in Fall 2018. For the purpose of this study we only considered students who identified themselves as either female or male, due to the small number of other gender identity participation. Chart 1, illustrates the proportion of students in each institution.
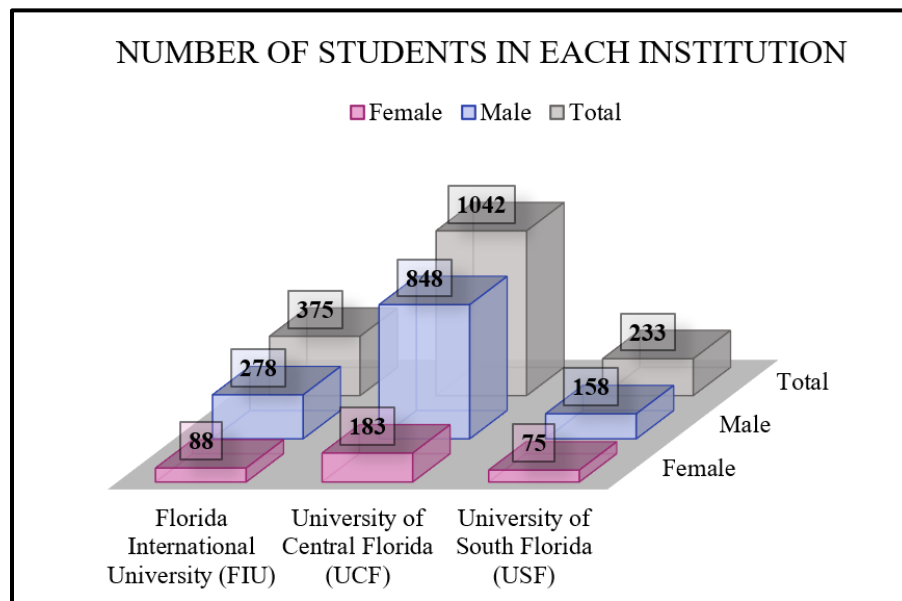

Chart 1

For this research study and for having a higher representation of female students, we merged the three fields, computer science, information technology and computer engineering groups into one computing field. Chart 2 illustrates the number of participants in each field before merging to the computing category.

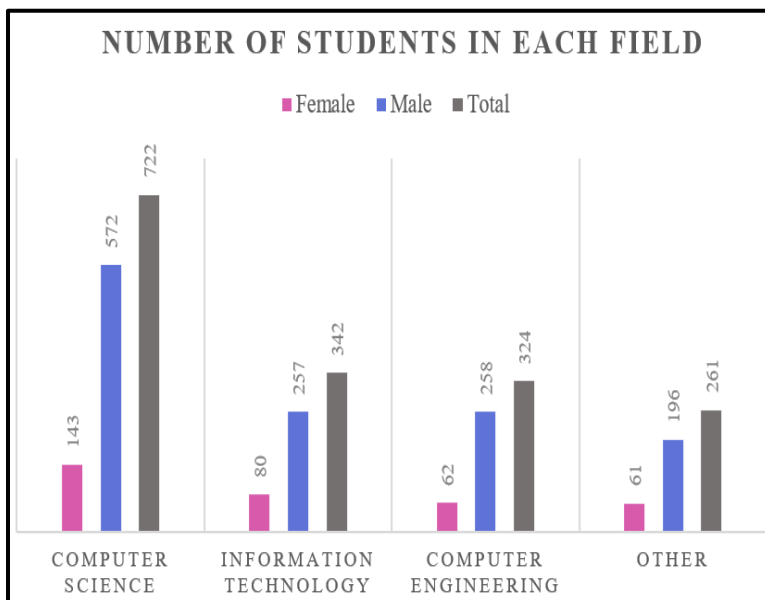**NUMBER OF STUDENTS IN EACH FIELD**

Chart 2

The number of female students in the computing field is as following; 107 White, 46 Black, 102 Hispanic, and 63 Asian students. The pie chart below (Chart 3) illustrates the percentage of female students with regards to their ethnicity in the computing field.
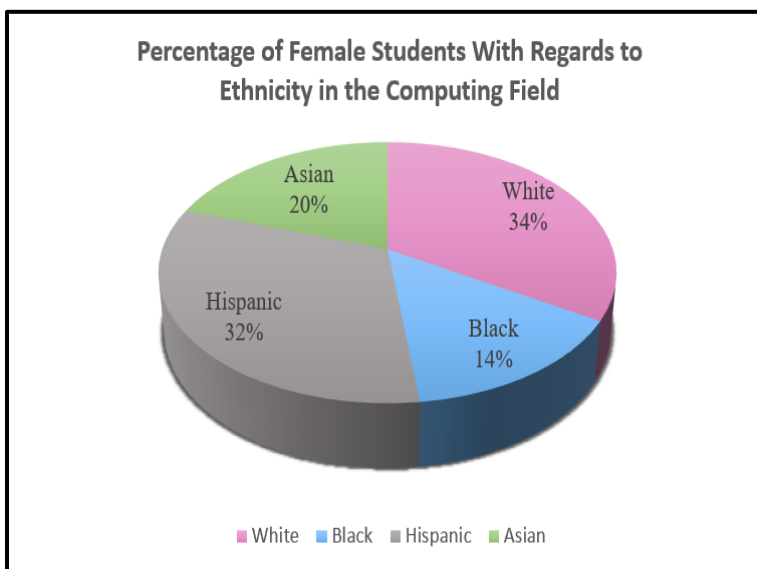

Percentage of Female Students With Regards to Ethnicity in the Computing Field

Chart 3

The data gathered though the Qualtrics survey system uploaded to the R environment for further analysis. In order to find if there is any significant level of encouragement towards computing for female students with different ethnicities Kruskal Wallis nonparametric test was used in R environment.

Results

The analysis of this research study was conducted in two different phases.

Phase 1: Analyzing the relationship between family encouragement and studying a computing field for female students with four different ethnicities (Table 1). As it is illustrated on table below, we were not able to find any significant relationship between family and encouragement towards computing fields on different racial groups for female students.

	Family Encouragement Towards Computing		
	Chi-Square	P-value	df
White	0.7113	0.399	1
Black	0.0022	0.9622	1
Hispanic	1.2231	0.2687	1
Asian	1.0914	0.2962	1

Table 1

Phase 2: Analyzing the relationship between friends and encouragement towards studying a computing field for female students with four different ethnicities (Table 2). The following table demonstrates a highly significant relationship on friends' impact on White female students towards the field of computing.

	Friends Encouragement Towards Computing		
	Chi-Square	P-value	df
White	9.7316	0.0018	1
Black	0.6685	0.4135	1
Hispanic	0.3298	0.5657	1
Asian	0.7962	0.3722	1

Table 2

Conclusion and Future Work

In order to attract more female students to the STEM fields, specifically computing and engineering, we need to be attentive about different factors which influence students' persistence. Although according to the literature, students get influenced by their families and friends, our data suggested White female students get significantly influenced by their friends towards computing fields. No other significant relationship among families or friends' impact in other racial groups however, was found. This study showed the importance of friendship on White female students' occupation in computing field. For the next phase of this study, we would like to do a qualitative study to better understand White, Black, Hispanic, and Asian female students experiences with their families and friends.

Acknowledgement

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