Factors Contributing to Women's Underrepresentation in STEM Fields: An Analysis of Three Studies

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Abstract—This extended abstract aims to summarize three studies which explore the factors that contribute to the underrepresentation of women in STEM fields, particularly in engineering, computing, and IT – to examine existing research on the gender gap in STEM and identify factors that contribute to the underrepresentation of women in these fields.

I. Introduction

In recent years, the issue of underrepresentation of women in Science, Technology, Engineering, and Mathematics (STEM) fields has gained significant attention from researchers, educators, and policymakers. Despite the efforts to promote diversity and inclusion in these fields, the gender gap in STEM remains a persistent issue. While many studies have explored this topic, the underrepresentation of women in STEM majors and careers continues to be a significant problem.

This analysis focuses on research published in the past years from USA and Norway to provide a global perspective on the factors that contribute to the underrepresentation of women in STEM. The analysis is divided into three main sections:

1) factors influencing women's decisions to pursue STEM education and careers,
2) experiences of women in STEM fields, and
3) interventions and initiatives aimed at increasing gender diversity in STEM.

The primary aim of this analysis is to identify common themes and factors that contribute to the underrepresentation of women in STEM fields, with a particular focus on computer science and engineering. By examining the insights and findings of these three research papers, this extended abstract seeks to shed light on the challenges that women face in STEM and the potential solutions to increase their representation in these fields.

The following sections of this extended abstract will provide a review of each paper, and draw comparisons and conclusions based on the collective findings. Through this analysis, we aim to contribute to the ongoing discussion on how to increase gender diversity in STEM and address the underrepresentation of women in these fields.

II. Background

The study "Solving the equation: The Variables for Women's Success in Engineering and Computing" by Christianne Corbett and Catherine Hill [1], examines the factors that contribute to the underrepresentation of women in engineering and computing fields in the United States. The report draws on a range of data sources, including surveys of more than 3,700 female and male college students, interviews with women working in these fields, and analysis of secondary data sources. The study highlights several factors that contribute to the underrepresentation of women in these fields, including negative stereotypes and bias, lack of role models and support networks, and work-life balance issues.

The study "Gender and Computing: A Longitudinal Study of Norwegian Computing Students" by Guri Nortvedt and Arne Olav Nygard [3], focuses on gender differences in computing education in Norway. The study is based on a longitudinal survey of male and female computing students over a period of five years. The study highlights several gender differences in computing education, including differences in motivation, self-efficacy, and career aspirations. The report also identifies several factors that contribute to the gender gap in computing education, including stereotypes, peer pressure, and lack of role models.

The study "Women in IT and Their Educational Choices: A Norwegian Study" by Monica Johannesen and Anniken Karlsen [2], explores the factors that influence women's educational choices in the field of information technology (IT), and their decisions to pursue IT careers in Norway. The report is based on a survey of female IT students at Norwegian universities and colleges. The study highlights several factors that influence women's educational choices in IT, including personal interest, family and social support, and career opportunities. It also identifies several barriers to women's participation in IT education and careers, including negative stereotypes and once again – the lack of female role models.

III. FINDINGS

Women continue to be underrepresented in engineering and computing fields, and studies have identified several common barriers and challenges that contribute to this trend. One major barrier is gender stereotypes and biases, which can discourage girls and women from pursuing STEM careers. For instance, STEM fields are often portrayed as male-dominated and requiring traits that are traditionally associated with masculinity, such as competitiveness and assertiveness. These stereotypes can create a perception that women are less capable of succeeding in STEM fields [1], which can in turn discourage them from pursuing these careers.

Cultural and institutional barriers have also been identified as creating a hostile or unwelcoming environment for women in STEM fields. For instance, subtle forms of discrimination, such as "microaggressions", can create a hostile work environment for women in STEM. In addition to that, the lack of female role models and mentors in STEM fields can make it difficult for women to imagine themselves in these careers. Having female role models and mentors can help to combat these feelings and provide support and guidance [2], [3].

Work-life balance issues are also a significant factor that affects women's participation and advancement in engineering and computing fields. Women are often expected to balance work and family responsibilities, which can make it difficult to pursue careers in fields that are perceived as demanding or require long hours. This can also lead to women feeling like they have to choose between their careers and their families, which can further discourage them from pursuing careers in STEM. The lack of family-friendly policies in the workplace can also intensify these challenges.

Despite these challenges, the studies also revealed that women who have strong academic preparation, access to mentors and role models, and a supportive environment are more likely to persist and succeed in engineering and computing careers. Therefore, creating a more inclusive and supportive environment for women in STEM fields is crucial to addressing the underrepresentation of women in these fields.

Some studies have identified specific interventions that can help address these barriers and support women's participation and advancement in engineering and computing fields. For instance, providing mentorship programs that connect women with experienced professionals in their field can help to increase their confidence and provide valuable guidance. Additionally, implementing family-friendly policies, such as flexible work hours and parental leave, can help to reduce the burden of balancing work and family responsibilities. Finally, promoting diversity and inclusivity in STEM fields and addressing unconscious biases can help create a more welcoming environment for women and other underrepresented groups.

IV. CONCLUSION

The issue of the underrepresentation of women in STEM fields, specifically in engineering, computing, and IT, has been a persistent challenge that needs to be immediately addressed. The three studies summarized in this work identify several common barriers that hinder women's participation and success in these fields. These include gender stereotypes and biases, a lack of role models and support networks, and work-life balance issues. To overcome these barriers, the studies emphasize the importance of providing women with strong academic preparation, access to mentors and role models, and a supportive environment.

The studies recommend specific interventions, such as mentorship programs and family-friendly policies, to address the identified barriers and promote women's participation and advancement in STEM fields. These interventions will provide the necessary support and encouragement for women to overcome the obstacles that prevent them from succeeding in these fields. Furthermore, promoting diversity and inclusion in STEM fields through policies and programs is also essential in breaking down the barriers that women face.

Educators, employers, and policymakers have a critical role to play in creating an environment that encourages and supports women's participation in STEM fields. By acknowledging the barriers that women face and addressing them, we can work towards a more diverse and inclusive STEM workforce. A diverse and inclusive workforce brings together different perspectives and experiences, leading to innovative solutions to complex problems. In conclusion, addressing the underrepresentation of women in STEM fields is critical to creating a more diverse and inclusive workforce, and achieving this goal.

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