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The Gender Gap in the STEM fields among Different Universities in Lebanon

Reem Saado

Abstract

This paper examines how gender inequality serves as a critical barrier that prevents women and girls from entering the STEM fields. The paper focuses explicitly on this issue within Lebanese universities. Toward that end, this paper presents the findings of a survey distributed to universities across Lebanon. The aim of the survey was to measure the attitudes of Lebanese students concerning women and girls in the STEM fields. This analysis is followed by a set of recommendations to promote women and girls in STEM and offers some suggestions for future research on the subject.

Introduction

The STEM (Science, Technology, Engineering, and Mathematics) sector is an ever-developing field. With expected rapid growth over the coming decades, people holding degrees in STEM fields can access highly rewarding and well-paying jobs (Veleen et al., 2019). However, the gender gap in the STEM field persists. STEM is dominated by men. One recent study estimated that women make up 49% of the entire labor force, however, they make up only 24% of the STEM workforce (Veleen et al., 2019). Using a thorough literature review and a survey administered to Lebanese university students, this paper aims to uncover the ways that gender discrimination affects the STEM fields in Lebanon.

Literature Review

A range of research has highlighted the factors contributing to women's underrepresentation in the STEM fields over the past decade (Lund et al., 2019). According to Pierce (2013), a major obstacle to women's careers in STEM is normative gender roles and stereotypes. Gender roles impose restrictions on a woman's ability to choose and commit to a career in the formal workforce. Rather, they perpetuate the notion that women should "work" in the domestic sphere, be a loving wife, and be an active mother (Nimmesgern, 2016).

These gender norms also impact the ways that girls interact with STEM fields in early education. This has an important effect on their initiative to join the STEM fields. According to the American Association of University Women (AAUW), girls' achievements and interests in the STEM fields are shaped by the environment around them. For instance, when teachers and parents motivate and inspire girls' intelligence, they perform better in math and science. However, most people believe that girls are not qualified enough to do well in science and math, which in turn disincentivizes women and girls to continue a career in the STEM fields (Pierce, 2013).

Additionally, researchers have expressed that the gender gap in this field is likely due to the decreased motivation of women and girls, not their intellect (Leaper and Starr, 2019). According to Chartouny and Sarouphim (2017), in Lebanon, both genders had a positive approach towards mathematics and were excited to learn mathematical studies in middle school (grades 7–9). However, their results showed that over time, teachers gave more attention to boys than they did to girls in math classes, which caused a decline in girls' interests in mathematics. Another article noted that sexual harassment and STEM-based gender bias also affected women's motivation in STEM (Leaper and Starr, 2019). Women did not feel safe being in predominantly male spaces or fields. In addition to that, research shows that women leave STEM careers due to the social culture that undermines their motivation (Leaper and Starr, 2019). Another reason for the gender gap in the STEM field is the wage gap between both genders: even though women in STEM fields tend

to earn more than women in other fields, they still earn significantly less than men do (Michelmore and Sassler, 2016).

At the level of the workplace, studies have found that employers in the STEM sectors are biased in favor of male employees. Moss-Racusin et al. (2012) give several examples of this bias, including one case where faculty members consistently favored male candidates for a laboratory position even though the credentials for both genders were the same. Irrespective of their level of education, these faculty members demonstrated gender bias. There is a prevalent cultural norm that classifies the STEM field as "male only" (Corbett et al., 2010). In other words, culture normalizes the gender stereotypes of favoring one gender over the other.

However, the STEM sector has slowly recognized the value of women in the field. According to the American Association for the Advancement of Science (AAAS), diversity of gender would increase innovation, problem solving, flexibility, and better decision-making. Additionally, the inclusion of women in STEM would boost the global economy, as research has found that the involvement of women in STEM would result in an increase in the global GMP by $12 trillion by the year 2025 (Silva, 2019).

Towards that end, organizations all over the world, including in Lebanon, continue to fight for women's equal representation in the STEM fields. For instance, the WISE Campaign (Women into Science, Engineering and Construction) in the United Kingdom is collaborating with the UKRC (UK Resource Centre for Women) in order to ensure that all academic institutions and industries are supporting more women to be part of their programs. The L'Oreal and UNESCO "Women in Science" program is an international network for women in 100 countries that awards women's achievement, excellence, and discovery in the STEM fields. The US Embassy in Beirut, Lebanon, offers specific programs to educate girls about the STEM world such as the TechGirls program, which is a summer exchange program funded by the US Department of State that provides girls between the ages of 15-17 in the Middle East, North Africa, and Central Asia region an opportunity to pursue careers in science and technology. In addition to that, the Association of Women in

Science in the US supports and encourages professional women in science to continue their career successfully. The Department of Energy STEM Mentoring program, which began in 2011, provides female undergraduates one-to-one mentoring with scientists. These female scientists can act as role models to motivate the undergraduate students to seek a degree in STEM and mitigate the negative effects of gender stereotypes.

Methodology

The STEM field in Lebanon is predominantly male (Chartouny and Sarouphim, 2017). There is limited research in Lebanon that examines the underrepresentation of women in the STEM field. Moreover, gender discrimination in Lebanon pressures women and girls into certain careers (Chartouny and Sarouphim, 2017).

The goal of this study is to assess the factors that prohibit Lebanese women and girls from pursuing a degree in STEM. To better understand these factors, this study included a survey that was distributed to different universities across Lebanon. The sample for this study consists of 212 (43% women and 57% men) undergraduate students pursuing a STEM degree across different universities in Lebanon, who responded to this survey. Eight different universities were included in the survey, each one situated in a different region of Lebanon, in order to cover a wider scope. These regions included Akkar, Baalbek, Hermel, Beirut, Beqaa, Mount Lebanon, Nabatieh, North Lebanon, and South Lebanon. After explaining the purpose of this study to the universities and obtaining their permission to collect data, the survey was distributed to students online via email due to the restrictions imposed by COVID-19. Because the survey was distributed online, students had enough time to complete it. The survey was distributed to students in different STEM majors such as Computer Science, Mathematics, Engineering, Biology, Chemistry, Information Technology, and Physics. The survey was created on Google Forms and it included 18 different questions. Some of these questions were multiple choice questions, some were open-ended questions, and some were linear scale questions.

Results and Analysis

As shown in Figure 1, 52.6% of the students claimed that the percentage of women in their STEM Major classes is between 30%-50% and 42.7% of the students stated that the representation of women in their field is between 10%-30%. However, only 4.7% of the students claimed that the number of women in their classes were between 50%- 80% of the total class. Furthermore, results indicated that most students who found women's participation to be between 50-80%, were those who majored in Biology or Chemistry.

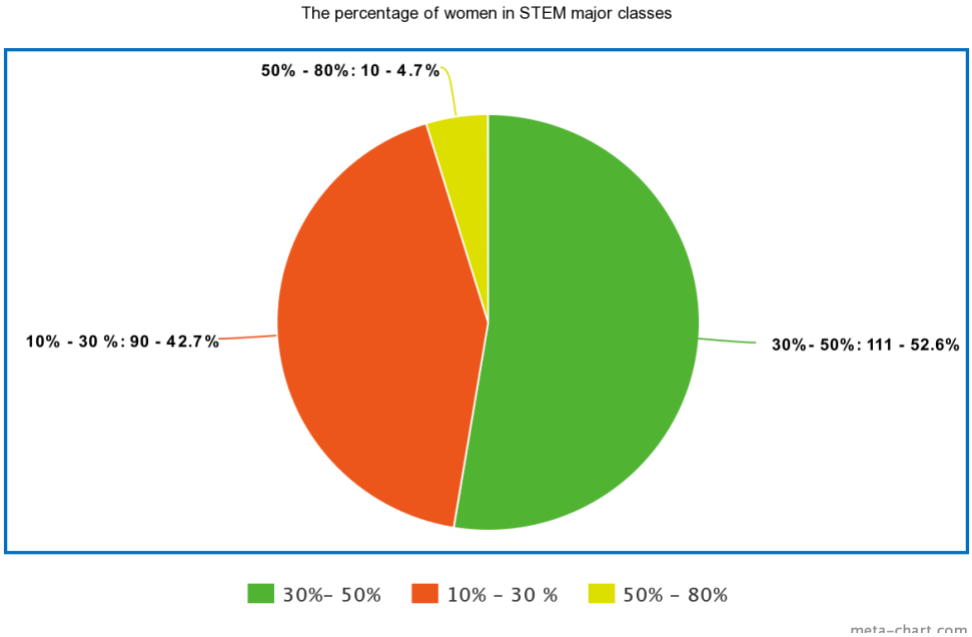

Figure 1 Percentage of women in STEM Major classes

This emphasizes the idea that majors such as Biology and Chemistry are science majors that are deemed "acceptable" for women to study. On the other hand, Computer Science, Mathematics, Information Technology, Physics, and Engineering majors are male-dominated and less desirable for women.

According to Figure 2, around 60% (120) of Lebanese students believe that women are discriminated against in the STEM fields because they are not encouraged enough, while 35.8%

(76) stated that the low rate of women's participation in STEM majors is likely due to the fact that women do not feel welcomed in such fields. Lastly, the majority of the students (58.4% or 124) claimed that society plays a major role in pressuring women to choose a "feminine" profession and thus something outside of the STEM fields.

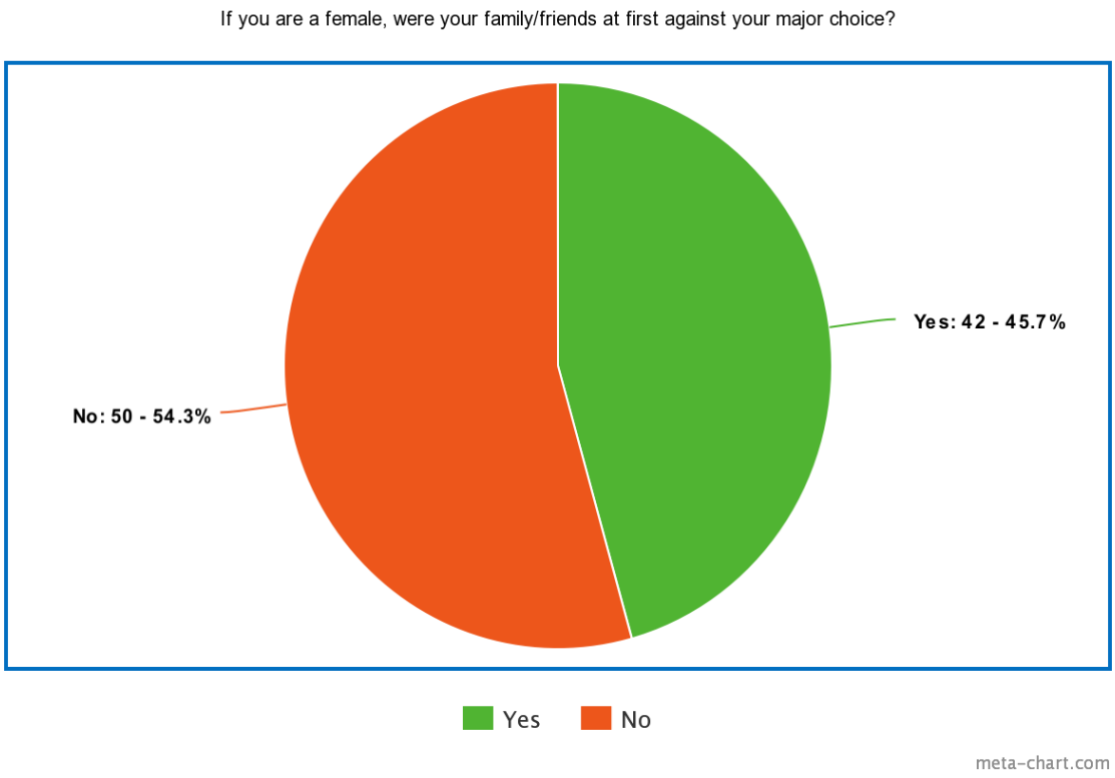

Figure 2 If you are a female, were your family/friends at first against your major choice?

Relatedly, 45.7% of females stated that their families and friends were against their choice of major (Figure 3). This suggests that familial and community pressure plays an important role in discouraging women and girls from pursuing majors in the STEM fields. Moreover, some Lebanese students, approximately 14.1%, (30 students), professed that they believe the reason for women's underrepresentation in the STEM fields is because society thinks that men are more capable than women and other students. Further, 15.5% (33 students) asserted that the STEM majors are strictly male professions, which is not surprising considering the findings from the literature review presented above.

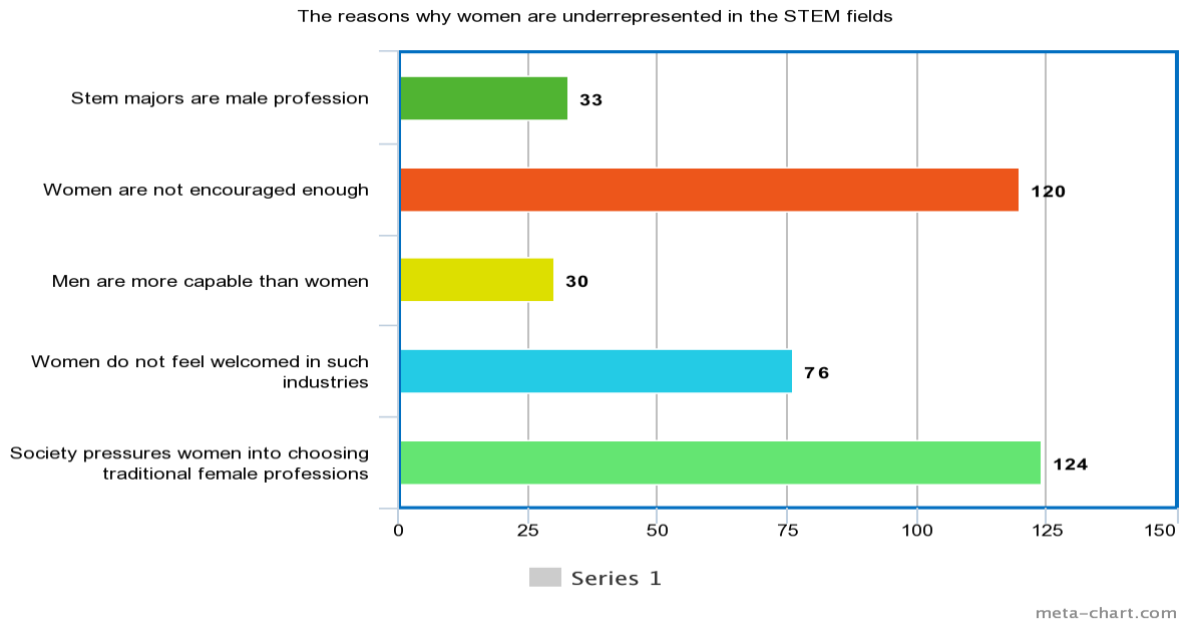

Figure 3 The reasons why women are underrepresented in the STEM fields

In addition, Figure 4 shows that 28.1% of respondents asserted that women should not receive equal opportunities in terms of education and planning careers in the STEM fields, since they believed that women's primary role is to be a wife and to take care of their families. Some responses included: "Women don't fit in such male dominated domains;" "It's a shame for women to work in a place full of men;" and "Women can't handle the same pressure as men." Students also mentioned several over reasons that might prevent women from pursuing a STEM degree, including the gender wage gap.

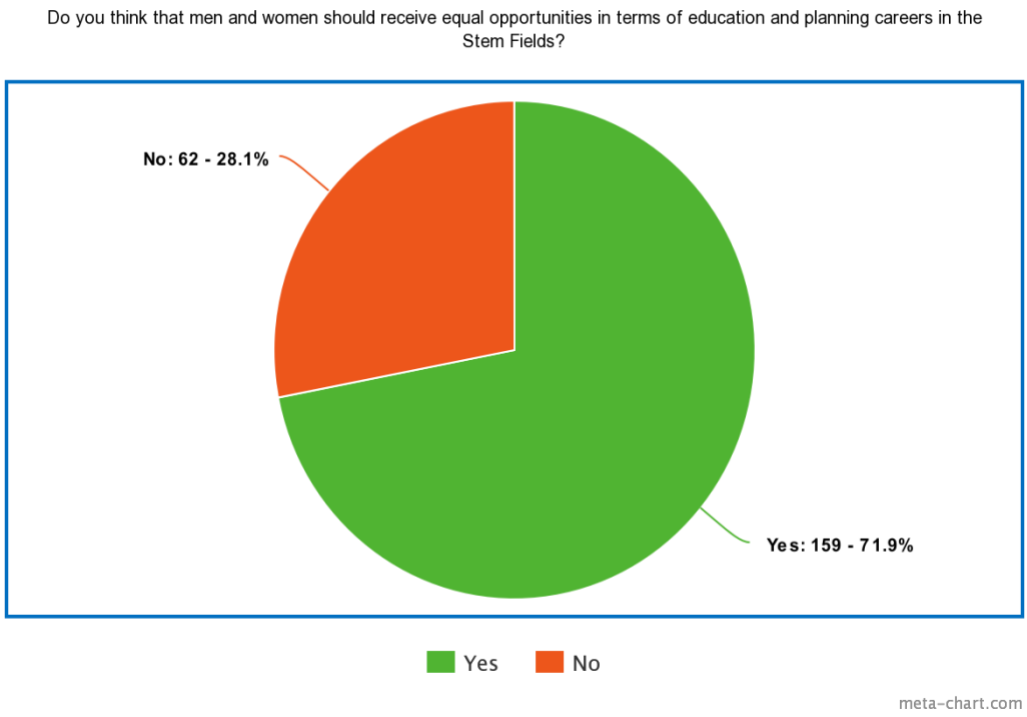

Figure 2 Do you think that men and women should receive equal opportunities in terms of education and planning careers in the STEM fields?

To study the reasons why these educated students believe and support gender discrimination, we examined the regions they are living in. We believe that the location, and therefore the social environment, where students are attending school affected students' responses. There is a discrepancy between the mentalities and the norms in the capital, Beirut, and other cities and governorates. While Beirut is considered to be a relatively progressive city containing diverse populations coming from multiple cultural backgrounds, other cities are more homogenous and, consequently, exhibit stricter social norms and traditions.

Furthermore, students in universities that are located in cities other than Beirut face higher gender inequality in the STEM fields. For example, 43.5% of women respondents (Figure 5) that said they faced gender discrimination in their major courses, are from Akkar, Baalbek, and the South.

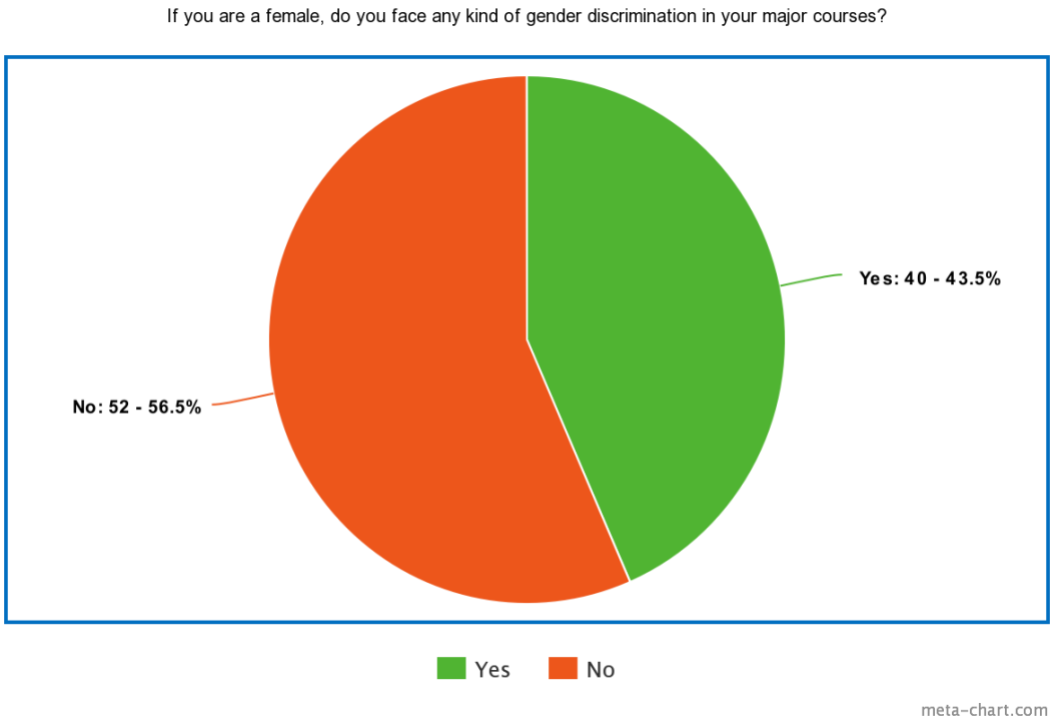

Figure 3 If you are a female, do you face any kind of gender discrimination in your major courses?

Recommendations

Previous literature suggests that family, instructors, society, and the cultural background can bolster women's aspirations in STEM. It is essential therefore to increase the awareness of university faculty in the STEM fields about gender biases and gender stereotypes toward women students in STEM (Leaper and Starr, 2019). Also, it is critical for friends to motivate women's involvement in STEM careers. Additionally, groups of women in STEM should get support and motivation on campuses (e.g., Women in Science and Engineering) in order to build a sense of belonging in STEM-related fields and to allow the women to feel like they are all standing alongside one another. In addition to that, promoting family support for women in STEM may increase their motivation (Harackiewicz et al., 2012). According to research, teachers can foster the student's mindset, especially those of women and girls, by emphasizing that hard work and practice can help them to reach better performance than innate intelligence (Berwick, 2019). For instance, if

teachers post images of women mathematicians and scientists in the classrooms, this can subconsciously boost women students' inspiration and motivation and can help them overcome the many challenges in STEM fields.

Conclusion

The main purpose of this paper is to promote gender equality in the STEM fields. Although important advancements have been made, what is missing is the role of social influences, from social media, family, and education. By posting more advertisements showing that women can be engineers, computer scientists, or doctors, this will challenge stereotypes that foreground men as the "face" of the STEM field. Shifting these stereotypes will empower women to realize that STEM is applicable to them, regardless of their gender. Additionally, awareness campaigns should be condcuted in most regions in Lebanon such as Baalbek or Akkar for families to pave the way for their daughters, siblings, and wives to pursue a degree in STEM. By creating a supportive environment, parents and teachers can encourage girls' intelligence and motivation in STEM.

Another recommendation is that programs can be implemented to teach kids, especially girls between the ages of 15-17 years old, coding or engineer skills and technologies for free. Girls' empowerment programs can motivate girls to consider entering male-dominated fields. To raise awareness among students in universities, courses in gender discrimination and sexual harassment should be mandatory for all students. These courses can build a community free of gender stereotypes and discrimination. In this study, many undergraduate female students complained about facing gender discrimination from instructors who taught their major courses. Thus, anti-gender discrimination policies should be applied at all universities in Lebanon. For example, in the Lebanese American University Student Conduct Handbook a "Discrimination, Harassment and Sexual Misconduct Prevention Policy" exists, which fosters an atmosphere free of discrimination, harassment, and sexual misconduct, and provides respect to all members regardless of their gender. Similarly, gender equality policies should be enforced in the workplace.

In conclusion, gender equality in the STEM fields in Lebanon is essential for increased growth and innovation in the economy.

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