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Exploring the Opportunities, Challenges, and Ways Forward of Women in STEM Fields: A Case Study

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Abstract: ***The underrepresentation of women in STEM fields impacts their participation in a male-dominated workplace. Moreover, gender discrimination and biases that affect their perceived abilities influence their decisions regarding their pursuit of STEM careers. Nonetheless, the involvement of women in STEM field continues to grow steadily. However, limited research exists to provide in-depth insights into the general experiences of women in STEM in the Philippines. Thus, this case study sought to explore the opportunities, challenges, and ways forward of women in STEM fields. The participant was selected through purposive sampling and underwent online interview via Zoom meeting. The recorded interview was transcribed and coded. Categories were clustered; then, emerging themes were derived. Based on the findings, despite the limited career advancement and gender discrimination in some aspects, women can still grow personally and professionally in STEM fields. Moreover, STEM fields offer equal job opportunities based on qualifications, and not on gender, enabling rewarding careers and driving technological advancement. However, women continue to encounter challenges caused by cultural traditions that favour men, even in the presence of opportunities. To overcome these challenges, women have adopted strategies aimed at empowering themselves, showcasing their capabilities, and challenging cultural norms within STEM fields. In conclusion, the challenges faced by women in STEM fields have diminished over time, while opportunities have expanded. Women have also demonstrated adaptability in their workplaces by employing strategic approaches and cultivating a positive mindset, allowing them to be treated equitably alongside their male counterparts.***

Keywords: opportunities, challenges, ways forward, women, STEM field

I. INTRODUCTION

In the 21st century, women's roles have been changing because of women empowerment, which serves as an essential tool for the world's socioeconomic development (Mandal, 2018). Moreover, the world has continued to progress towards the idea of women being free to act and make wise decisions for their good. However, many countries have not yet addressed gender-related inequalities, such as the gap between men and women's freedom of choice (Madusise, 2018). Thereby, discrimination, exploitation, and underrepresentation of women in all sectors continue to emerge.

One of the global concerns about STEM is the underrepresentation of women in this field. Most of the jobs related to STEM (e.g. engineering, statisticians, software developer, scientist, etc.) remained male dominated which became an obstacle for women to pursue STEM-related jobs (Amon, 2017). Moreover, only 40% of women are working in STEM fields in the world (Holman et al., 2018). According to results, there is an uneven percentage of gender distribution in engineering showing that 93% of males are engineers while there

are only 7% female engineers in the UK and US (Office of the Scientist, 2016). In spite of being male-dominated, there are still women pursuing STEM careers because working in these fields tend to earn substantially higher salaries and greater working opportunities (Kniffin et al., 2018).

Women in male-dominated STEM fields face negative experiences related to stereotypes that favour men. Despite the decrease of gender stereotypes over the past several decades, gender bias persists in both explicit and subtle ways. Even on self-reported attitudes and beliefs, it was better for a man to work and a for woman to stay at home. Furthermore, women are still perceived as "warm" but "incompetent", "caring", and "emotional," rather than words, such as "competent" or "intelligent" (Charlesworth et al., 2019). As a result, these stereotypes increase the attrition rate among women professionals (Casad et al., 2020).

In the Philippines, women are also often seen in low skilled positions and are less likely to progress professionally in STEM fields (International Labour Organization News, 2021). However, even with the awareness that women are getting left behind in the industry, still, they are more likely to lose their job than men. Roughly 30% of women were portrayed as engineers, scientists, and technicians in the country which creates a huge gap between the percentage of men in STEM workforces (Baron, 2022). Despite the increasing number of women in STEM, the progression over the decade has been uneven as female representation in engineering remains stagnant and declining in computer sciences.

Women are predominantly employed in the S&T fields of nursing, midwifery, and health. The results from 1990 to 2015 indicate that there has been a significant rise in the number of women engaged in Science and Technology (S&T) in the Philippines, and the gap between the proportion of men and women in this field has decreased (Arguelles et al., 2022). According to UNESCO (2017), numerous programs and campaigns have been established to advocate for gender equality in STEM education and professions. These include strategies to enhance girls' and women's entry and engagement in STEM education and training, to boost the visibility and representation of women in STEM fields, and to confront and eliminate gender stereotypes and biases in STEM education and workplaces. With this, there is still a dire need for monitoring and studying women in STEM fields to further know their stand in the Philippines even with increased acknowledgement of the importance of gender equality in STEM fields and initiatives to increase women's participation (Arguelles et al., 2022). Alongside this, there is limited exploration of the ways forward for women in STEM. While there is growing recognition of the challenges faced by women in STEM, there is limited research on effective strategies and initiatives to support the advancement and retention of women in these fields (National Academies of Sciences, Engineering, and Medicine, 2018).

Thus, the main objective of this study was to explore the experiences and identify the opportunities, challenges, and ways forward for women in STEM fields in the Philippines. Moreover, this study aimed to investigate the factors that enabled or hindered women's success in STEM and the strategies they had used to overcome challenges.

Background of the Study

Women are still underrepresented in the field of STEM caused by gender inequalities which includes numeric underrepresentation and stereotypes, lack of social capital, and threatening academic climates (Casad et al., 2020). Masculine characteristics (e.g., independence, competitiveness) are valued more than the feminine characteristics (e.g., communal, nurturing) which gives men more opportunities for advancement. Due to lack of social capital, women have less research support, lower salaries, smaller lab spaces, and fewer advancements compared to men. Women tend to experience a sense of exclusion and impolite comments. In addition, women felt more hostility, tension, and discomfort in their workplace environments than men in STEM fields.

Similarly, the Philippines also experienced underrepresentation of women in STEM fields for the same reason. In spite of the evident growth of the STEM workforce in the country and the domination of Filipinos globally in the same field, women do not seem to cascade as part of that growth. According to the study of Philippine Business Coalition for Women Empowerment (2019), work practices in STEM workforces still follow the norm that favours men. Though other companies promote a gender sensitive environment, many other factors hindered women from grabbing the opportunity to work in high-skilled positions to showcase their

credibility. Results showed that the hindering factors to gender equality in STEM workforces are due to the male dominance in leadership and management positions.

In general, women are the ones who are underrepresented in most of the professional careers, especially in the STEM fields. Although observed in many parts of the world, such gender inequality is not evident in the Philippines wherein there are more certified professional women than men. More specifically, there is an opportunity for more women and members of cultural minorities to work in engineering and other technical fields. Moreover, 47% of Filipino government officials and corporate executives are women. These employment and gender statistics place the Philippines as the 5th out of 135 countries in terms of narrowing the "gender gap index". With that, the Philippines' future economic competitiveness is believed to be significantly impacted by the "feminization" of non-traditional employments in society (Llenares et al., 2014).

Gendered Socialization Theory

The Gendered Socialization Theory was generally based on the idea of gender roles, which is that boys are raised to conform to the male gender role, and girls are raised to conform to the female gender role (Martin & Reinking, 2018). While experts still do not agree if the socialization and stereotypes of gender is based on genetic differences, its practices are apparent from an early age. According to the study of Gunderson et al. (2011, as cited in Martin & Reinking, 2018), one of the reasons why women leave the professional STEM field is because they are bombarded with socialized ideas and negative stereotypes, specifically about their mathematical abilities. It has been shown that these mentalities and stereotypes are often unconsciously carved through the minds of girls at their young age by their parents or teachers which ultimately diminish their interest in STEM fields.

Gender Roles

The current state of women in STEM fields has shown positive developments, as there has been an increase in the number of women pursuing careers in STEM. Nonetheless, there are still aspects of the situation that have not changed. Even if there are certain fields within STEM, such as biology, that have a higher proportion of women than others, they still tend to leave the STEM fields for their family and responsibilities (Heilbronner, 2012).

A study conducted by Makarova et al. (2016) concluded that young women engaged in vocational education and training were perceived in accordance with the widespread societal stereotype of the female role. Because they have experienced being assigned to the "wrong sex", young women expect a gender-based labour division throughout their internship. As a result, the young women's experience of being treated as inherently incapable of executing a task without the assistance of male co-workers constitute discrimination against women as "second class" professionals and confines them to specific activities within the industry, suggesting that "Women should differ from men in ways that negatively reflect on their ability to perform high-powered jobs."

Similarly, the underrepresentation of women in academic science represents a significant loss of potential talent and capabilities, regardless of gender. While some science fields have seen an increase in the number of women, this does not necessarily indicate the absence of gender bias. In fact, some women may continue to pursue academic science despite the negative impact of unintentional gender bias from faculty members. Furthermore, it is unclear whether women's preferences for other fields and lifestyle choices that lead them to leave academic science are influenced by experiences of bias to some extent. If faculty gender bias limits women's participation in science, it not only undermines academic meritocracy but also impedes the expansion of the scientific workforce, which is necessary for advancing national competitiveness in the coming years (Moss-Racusin et al., 2012).

The differences in the numbers of males and females in terms of educational attainment and STEM-related occupational attainment was explained by having traditional gender role beliefs. Male with stronger traditional gender role beliefs explained a higher rate of attainment of PMET-related careers (physical sciences, mathematics, engineering, and technology). But in females, having stronger traditional gender beliefs resulted in attaining lower levels of education in adulthood because women believed that their role is they are the caretaker

of the family and they rely on men's role as the breadwinner of the family. In addition, they are less likely to be employed in PMET- related courses physical sciences, mathematics, engineering, and technology (Dicke et al., 2019).

Based on the survey conducted by Ikkatai et al., (2020), there is a large difference between nursing and mechanical engineering in terms of gender gap perception of gender suitability. It implies that people perceived nursing as the best occupation for women and mechanical engineering as the worst. People that scored low scores on egalitarian attitudes strongly believed that women are better suited in nursing, pharmacy, law, and music than those fields related to physical sciences which are more suited to men. Therefore, the research findings show that there are still some people with stereotypic mindset that view science as good for men, but not for women.

Stereotypes

According to Piatek-Jimenez et al. (2018), women question their belonging in STEM fields because of their female social identity and their STEM social identity. In STEM fields, they viewed it as having the traits of being 'analytical' and 'thinks logically' which was rated as male dominated or mostly of the men have this kind of traits which is applicable in STEM careers. In addition to that, society expects women to make personal sacrifices like family choices (marriage, having children) which makes them leave a STEM career. Moreover, students who have a more educated mother than father lessen the social gender stereotypes as they demonstrated less traditionally gender views on academic and professional success.

Gender stereotypes with respect to stereotypical male-favouring and female-favouring abilities are common among men and women, mostly in the country with a large gender gap. According to Moè et al. (2020), male STEM students more frequently support gender stereotypes that are viewed favourably by males, which is at least partly consistent with men's better mental rotation abilities than women. This can lead to the incorrect assumption that women generally aren't able to study and succeed in STEM fields. Nonetheless, female STEM students hold a larger conviction than female non-STEM students that male-favouring abilities are flexible, demonstrating their beliefs that they can advance and excel in traditional male-favouring tasks.

Previous studies found that women are perceived to be less agency-driven, more communal, and more passive than what is required for a successful scientist. Research has shown that prejudice and discrimination against women in occupational and social roles are due to the perceived incongruity between women's traits and the traits associated with effectiveness in those roles. Similarly, stereotypes about women that do not align with those of scientists underlie discrimination against women in STEM fields. This provides evidence that women may lack role congruity with scientists, which has not been previously explored. The perceived mismatch between the female gender role and the role of a scientist may affect the evaluation of female scientists, who may be perceived as overly communal, insufficiently agentic, or too passive to succeed in science (Carli et al., 2016).

Although women now earn more college degrees than men, they are still underrepresented in STEM fields. The gender gap in STEM fields can be attributed to a variety of factors, including differences in skills and preferences, as well as discrimination and bias. It is also found that women who do enter STEM fields are more likely to leave those fields than men, and that this can be due to a variety of factors, including family responsibilities and a lack of support and opportunities for advancement. In addition, it is found that gender stereotypes are still prevalent in the STEM fields and affect women's participation and success. Women are often perceived to be less competent in these fields, which can lead to discrimination in hiring, promotion, and pay. Stereotypes also affect women's confidence and interest in pursuing STEM careers, as they may feel like they don't belong or that they will face additional barriers (Kahn & Ginther, 2017).

In the study of McKinnon & O'Connell (2020), there are top three stereotypes for women working in STEM fields. According to the participants, women are perceived as bitchy, lack credibility, and often judged based on appearance if they are confident enough to publicly communicate in their work. These perceptions are consistent with prior studies that found women as less credible than men and they are just expected to be warm

and nurturing. Also, it is also said that if women are not seen as empathetic and nice, then they are more judged harshly as they do not conform to this stereotype.

Socialization

In a study by Gao & Yang (2021), the two stages of gender socialization gradually shaped the differences between men and women. In a social context, the presence of gender roles, low career expectations from parents, and gender stereotypes coming from their culture negatively affects women's achievement motivation. These factors hindered the advancement of women to strive in the society.

In the study of Lloyd et al. (2018), fathers aspired for their children to attend university more than mothers, although this difference was not evident for students with STEM aspirations. The study also found that boys and girls aspired to different types of STEM careers, with boys being more interested in engineering professions and girls in life sciences. Parents seemingly provided similar supportive environments for their children regardless of gender, but the influence of others' beliefs and self-perception on suitability for STEM was more prominent for boys than girls.

The findings from the study by Lawson et al. (2015), showed that family socialization throughout early life contributes to gendered segregation of the labour market, providing support for the expectancy value theory. Moreover, the views of mothers and the amount of time parents spent with their children 15 years later predicted the gender typicality of their occupational accomplishments. It implies that early family socialization interventions may be necessary in order to maintain competitiveness in the global economy. Additionally, efforts to encourage more gender-neutral options among young people should consider both mothers and fathers as role models and assistance for their children's career growth.

In a study by Luo et al. (2022), social factors can be an influence for students on pursuing STEM-related careers: Students that have higher parental education level are most likely to earn a STEM degree because they tend to provide educational resources for STEM learnings, encourage them to apply in STEM, and model a positive attitude towards STEM; Teachers or mentors can help shape female students' positive attitude toward STEM careers and form a STEM identity. Also, they can be the role model for females who want to pursue STEM-related careers; and peer group that a student belonged to can influence (but not that big influence) the student's STEM choices by showing a support for pursuing specific STEM careers and also, by assessing the interest and achievement in science and mathematics of their peers.

Expectancy Value Theory

According to the theory of Expectancy Value, there are various factors in which the expectations of a child develop (de Cabo et al., 2020). Examples of this is the development of self‐concept and perception of their social influencers like teachers and parents, who play an important part in their growth. A person's subjective values are also influenced by motivational factors such as attainment value, enjoyment, usefulness, and expenses. However, the downside of this theory is that it acknowledges societal views that might lead to gender stereotypes, particularly in affecting adolescent career choices.

On the other hand, this theory also claims that achievement‐related choices can be predicted by a person's expectations of success as well as their subjective preferences (Leaper, 2011). As a result, it may be assumed that students will be inclined to pursue the academic choices in which they believe that they can excel and in which their surroundings are encouraging—without gender stereotyping and cultural beliefs. In relation, students are more likely to remain in STEM when success expectations and the value of STEM disciplines are high. Encouragement from close families and peers are also important in deciding whether or not an adolescent will pursue a STEM‐related career.

Past Experiences

According to Dabney et al. (2011), participation in Out-of-School-Time (OST) activities have been found to be associated with an increased chance of students pursuing STEM careers. The association between

the participation of students in science-related activities and choosing a STEM career may be related to factors such as self-efficacy, academic confidence, and social acceptance. It also found out that the gender and early interest in science and mathematics during secondary school is significant in choosing a STEM career in university.

According to Leaper & Starr (2019), different experiences of women can affect their motivation and aspirations in STEM both positively and negatively. Seventy percent of women reported experiencing STEM-related gender bias and eighty-three percent of women reported experiencing sexual harassment. This kind of experience weakens the motivation and aspiration of women in STEM while encouragement from friends and the support of the family can strengthen women's motivation and aspirations in STEM.

In the study of Jaeger et al. (2017), the Life Experiences and Role Negotiations (LEARN) model was developed to understand how women possibly navigate their professional and personal lives. It is found that lifelong learning, both formal and informal, plays a crucial role in helping women with STEM doctorates adapt to changes in their career paths and in balancing work and family responsibilities. The LEARN model highlights the importance of understanding how women negotiate their roles and responsibilities in both their personal and professional lives, and how they continuously learn and adapt to new situations.

According to Miller et al. (2017), students' participation in STEM competitions affects the participation of students in pursuing STEM-related careers. For example, the participation of women in robotics may affect their interest in engineering (positively or negatively). More men than women admitted that participation in STEM competitions has made them more interested in pursuing STEM-related careers. With that, participating in this kind of competition improves the self-efficacy of a student which predicts both academic and career-related choices. Having self-efficacy in a specific area may increase the chance to choose a career related to that area.

The underrepresentation of workers in specific STEM sub-fields can be diminished by encouraging more students to participate in STEM competitions.

Affective Experience

In the study of Sadler et al. (2012), the findings highlight the experiences and attitudes developed prior to high school that make a crucial contribution to the current disparity in interest in STEM careers exhibited by female students and the imbalances specifically in workplaces. An additional gender effect during high school causes both females with and without an initial interest in STEM careers to have lower odds than the corresponding male counterparts to have a STEM career interest. Even though sexism is rarer than a generation ago, this may still be the result of females' various experiences in high school science classes. Teachings and instructions used in science class may be male-favouring and may also fail to connect science in an engaging way to young females' lives and interests. Female students may still experience less opportunities in science-related clubs and activities which is the reason why females with a STEM careers are severely outnumbered by males.

Math and physics identities are significant for determining engineering choices at the start of college. Aside from that, acknowledgement from others and the personal interests of a student in a subject are also favourable predictors of their future careers. On the other hand, students' performance and competence views are negative predictors of engineering career choice, but can be modified by others' attention and recognition. According to Godwin et al. (2016), gender differences in math and physics identities and agency beliefs were also discovered to be one of the factors why women are less likely to pursue careers in engineering than men.

A study by Mau & Li (2018), results showed that gender, race, math/science self-efficacy, and familial influence were significant predictors of STEM aspirations. Other significant factors included higher socioeconomic status (SES), parental educational expectations, and math achievement. However, some factors such as student educational expectations, parent involvement, school belonging, math/science teacher's positive influence, and unfair treatment lost their significance when other variables were considered. Female and minority students faced several barriers that impacted their interest in STEM careers, such as lack of confidence, unfair treatment, discrimination, financial pressure, stereotypes, and biases. Their study highlights the

importance of counsellors and other stakeholders providing system-wide support to increase academic, career, and personal/social success for underrepresented students in STEM. The results suggest that subject-specific self-efficacy is a strong moderator of career aspirations among high school students.

According to Sassi (2022), the collectivism of a country can affect gender inequality specifically in the engineering industry. In addition, it is also stated that engineering is not visualized as a gendered field in many non-western cultures, it is commonly a way to maintain financial stability. In simpler words, different cultures and experiences exhibit distinct task values, particularly those that are more collectivist than those that are highly individualist.

Social and Cultural Expectations

It has been determined that the low participation of women in science cannot be attributed to biological differences or a lack of skills. Rather, it is influenced by socio-cultural factors that shape women's decisions about their careers and lifestyles. These factors include gendered expectations related to work-family balance, inflexible tenure-track timetables, and employment options. Additionally, women tend to prefer careers that focus on people rather than things, which can lead them to choose professions outside of math-intensive fields. However, women with strong math skills also have good verbal skills, giving them a broader range of career options. Thus, it should be noted that differences between countries and cultures may influence gender stereotypes and discrimination (Avolio et al., 2020).

According to the study of Chan (2022), girls had lower levels of self-efficacy in STEM, which resulted in lower interest and motivation to pursue careers in STEM than boys. Furthermore, students who strongly endorsed traditional gender role beliefs exhibited greater gender disparities in their self-efficacy, interest, and aspirations in STEM. Hence, it is found that there is a need for gender-responsive pedagogy and access to female role models to boost girls' self-efficacy and challenge traditional gender roles among all students.

Moreover, in the study of Crumb & Kyte (2017), it is said that girls start to lose interest in STEM as they enter their ninth grade because of their perceptions in Science and Mathematics. In this high school year, boys are more likely to excel in STEM subjects than girls which lowers their expectations. According to this research, one of the reasons why the trend of women in STEM is declining is because their expectations as ninth graders plays a vital role in choosing their future courses. These foreshadows gendered pathways into STEM in higher education.

The predominance of male in STEM fields gives the idea to people that sciences are masculine which becomes the main obstacle for women to achieve pursuing careers within STEM fields. Due to masculine image of science, women think that those science-related jobs are more suitable for men than women. Other than that, women face cultural pressure to be a mother and wives which creates conflict between science career and family responsibilities. This is mainly the reason why men are more successful in scientific careers and women cannot succeed at scientific work (Sarseke, 2017).

According to O'Brien et al., (2015), it is crucial from a theoretical and practical standpoint to identify the factors that influence ethnic variation in STEM gender stereotypes and women's participation in STEM. For instance, if specific ethnic groups of women are more likely to show interest in STEM fields and are less likely to hold gender-STEM stereotypes than other women, then understanding the causes of these variations may help shape initiatives targeted at boosting women's participation and achievement in STEM.

Synthesis

Various factors such as gender socialization, gender bias, traditional gender role beliefs, lack of supportive environments, and societal stereotypes contribute to the underrepresentation of women in STEM fields. Family socialization experiences and parental views shape students' career aspirations, while positive role models and supportive peers can have a positive impact on students' pursuit of STEM careers. Socio-cultural factors also play a significant role in shaping women's decisions about their careers and lifestyles. There are hindrances that women face that's why many of them continue leaving STEM fields. Creating a more gender-

equal atmosphere in STEM fields is crucial in ensuring that women are better represented and can fully realize their potential in these fields.

Research Questions

At the end of the study, the researchers aimed to provide answers to the following questions:

1. What are the most significant workplace experiences of women in STEM fields?
2. What are the opportunities for women in STEM fields?
3. What are the most significant challenges for women in STEM professions?
4. What are the strategies of women in STEM fields to address the significant challenges and can facilitate the ways forward for women in STEM fields?

II. METHODOLOGY

Research Design

This study utilized a qualitative research method to explore the lived experiences of women, including their opportunities, challenges, and ways forward in the STEM field. In light of the research objective, a case study approach was employed as the research design. This approach aimed to comprehend and analyse complex social problems from the viewpoints of their participants (Fessakis et al., 2013). Case study is a comprehensive analysis of a single case, which may involve an individual, a group, or a community. Therefore, using this approach enabled the researchers to provide an in-depth interpretation of the experiences of women in the STEM field.

Sampling Method

The method that was used for this study was purposive sampling. It is a form of non-probability sampling wherein participants are selected based on the given criteria relevant to the study. Purposive sampling focuses on the participants' characteristics that answers the research questions (Rai & Thapa, 2015). Moreover, this method was considered based on the limitations and availability of the participants. Thus, considering that the participant has the appropriate knowledge needed to effectively share their general working experiences in the STEM field; this method helped to obtain the desired results of the study.

Participant

The researchers determined and chose the participant for this study based on the following criteria: (1) must be a female working in the STEM field; (2) has at least two years of working experience in the STEM field; (3) must be working in an urban area; and (4) has only one STEM-related job in span of at least two years of work.

Research Instrument

This study utilized a semi-structured interview guide to obtain data from the participant's stories and experiences. This approach allowed participants to freely respond to open-ended questions, while the researchers analysed their responses to gain a better understanding of their experiences. To ensure accuracy and completeness of the data, the online interview via Zoom was recorded and transcribed. Additionally, the contents of the interview guide underwent content validation by a teacher with expertise in Research subject to ensure its reliability and appropriateness. Suggestions or revisions of the questions based on the study's context were taken into consideration.

Procedure

The researchers prepared the online interview questions based on the research objectives and questions. These questions underwent validation by English, education, and research teachers to ensure clarity, relevance, and comprehensiveness. Prior to scheduling the interview, the participant was provided with an informed consent form, along with the research questions, to ensure her full understanding of the nature of the research study. After the informed consent form had been signed, the online interview was scheduled at a mutually convenient time via Zoom to ensure accuracy. During the interview, participant was asked to elicit responses. The recorded interview was transcribed and analysed using thematic analysis which led to identifying key themes and patterns. These themes were formulated to provide a comprehensive understanding of the research

questions. Content analysis was also conducted to support the emerging themes from the interview. Member checking was done to validate the accuracy and credibility of the findings. Finally, a report was written based on the research findings.

Data Analysis

Thematic analysis was used to analyse the responses given by the participant during the online interview. According to Braun & Clarke (2006), this method mainly focuses on generating themes and selecting codes based on transcriptions of data. It is also a flexible research tool that approaches research samples in an inductive manner. In this method of analysis, the researchers follow a systematic procedure which includes familiarizing themselves with the data by watching the video recordings of the interviews. The correctness of the data was ensured by these taped interviews, allowing the researchers to understand the participant's responses with ease. The researchers began transcribing the responses after they became familiar with the data, which led to the creation of the initial codes. Important key points that could be used to interpret the data were provided by the initial codes created from the transcribed responses. As the initial codes were completed, the researchers created themes that gave consistent meaning to participant's response. The constructed themes were assessed by the researchers to confirm their validity. The main idea of the data was then defined after examining the themes. Finally, after defining the themes, the researchers proceeded to report the analysis. After the themes had been established and reduced into categories, content analysis was used to determine the meanings between these specified concepts. With the use of this method, the researchers were able to systematically label the content of the themes and make an inference between its patterns. Thus, the analysis process was significant for this study in which the researchers' aimed to extract information to determine the relationship between the factors that causes a phenomenon to happen.

Ethical Consideration

This study focused on investigating the general experiences of women in the STEM field, a sensitive and personal topic that requires adherence to research ethics. Research ethics is crucial in guiding researchers towards appropriate conduct and protecting the privacy and well-being of participants (Abrar & Sidik, 2019). As such, ethical considerations were considered throughout the research process to ensure participant confidentiality and prevent harm.

Informed consent

Informed consent was obtained by giving a consent letter to the participant as a formal agreement before the online interview to ensure their complete understanding of the study as to purpose and nature, voluntary participation, and extent of participation.

Confidentiality

Only the researchers had access to the research data and personal information of the participant to maintain confidentiality.

Anonymity

This study was conducted with utmost anonymity, with the use of pseudonyms and the avoidance of face exposures to protect participant privacy.

Risk of harm

Some research questions might be overly personal and sensitive, which could result in a privacy invasion and could also leave a negative effect towards the participant. In order to avoid such occurrences, the researchers provided a set of questionnaires for the participant to be aware of the possible questions before proceeding to the online interview proper.

Trustworthiness

The researchers used member checking as a validation technique to ensure the credibility of results. This process involves returning the transcription copy and a summary of research findings to the participant for confirmation, verification, and modification of their response.

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III. RESULTS AND DISCUSSION

1. Most significant workplace experiences of women in STEM fields

Theme: Significant workplace experiences of women in STEM fields.

In general, women in a specified workplace may take various roles and may gain new experiences. When asked about the significant workplace experiences of women in STEM fields, the findings identified three different categories of workplace experiences gained by the participant. Enumerating, these are: (1) all genders are treated equally; however, it is more convenient for males; (2) self and career growth; and (3) no difficulties in job application and able to adapt to the workplace.

Category 1. All genders are treated equally; however, it is more convenient for males.

Women are now empowered in their respective works. To expand further, the concept of women empowerment in the workplace has evolved from a negative focus to a more positive perspective. It involves granting women increased greater autonomy, access to resources, and the ability to represent themselves responsibly in a particular work environment, based on their own interests and values (Isaacs, 2022).

Based on findings, the participant experienced equal treatment in her workplace. All engineers were able to work in a gender-neutral environment. She said, "*Sa other aspects naman ng work or paano 'yung trato nila samin in daily life, same naman. Kumbaga, parang kung paano naman nila tri-neat ako e– as a female engineer over dun sa ka-batch ko na male engineer, same lang naman. Wala naman silang pinapakitang any favouritism*." However, the participant also mentioned it was more convenient for males to have opportunities in STEM fields. She mentioned, "*To fix things, to troubleshoot, so may mga hardware replacement, so kung iisipin, 'ah baka mas okay na guys or lalakeng engineers 'yung mailagay natin sa department na 'yon kasi on the go.' So, mas madali na maipadala, wala ng other things na kailangan pa i-prepare or i-paalam pa if ever sa parents, so laging on the go 'yung guys*," which means that the participant experienced equal treatment in her workplace, however there are some instances that evidently, it is more convenient for males to have opportunities unlike in the case of females.

Similar to the present findings, the study of Riffle (2013), states that the proportion of women in STEM fields is rising, but are still underrepresented and are employed in environments that are different from those of their male counterparts in STEM fields. However, by addressing workplace issues through various programs promoting gender equality, the new norm may be experiences of collegiality, equal treatment, and eventually higher job satisfaction and productivity for all STEM workers.

This only implies that despite being in the modernized era, gender discrimination in some forms may still be evident in STEM fields. This discrimination is present in various ways, such as limited career advancement opportunities. This issue can create a challenging and unwelcoming atmosphere for women and other marginalized genders in STEM-related workplaces.

Category 2. Self and Career Growth

Self-growth focuses on personal development and improvement in various aspects of life. Career growth, on the other hand, pertains specifically to professional advancement and development within one's chosen career path. The desire for self-growth and a successful career is a common aspiration among employees. The likelihood of realizing this aspiration is the fundamental focus of career growth prospects. Career growth prospects can be defined as the opportunities for promotion and the acquisition of career development experiences. They are considered crucial factors that fuel motivation and drive individuals to excel in their work (Okurame, 2014).

Based on the findings, the participant was able to obtain new learnings in her workplace that contributed to her gradual self-growth that eventually leads to career development. She said, "*So, nung first few months ng career ko, dun sa position, siyempre medyo takot din ako in a way sa lahat ng actions ko and I'm doing my best na maaral agad-agad 'yung lahat ng binibigay sa 'kin…So yung parang ang laking part din siya ng self-growth ko and pag career-growth ko sa mga experiences na natutunan ko dito sa job*."

In the study of Wentling & Thomas (2009), it was found that when employees were exposed to a workplace culture and environment that placed emphasis on their growth and development, it had a positive influence on their career growth. This employee-oriented approach encompassed several elements, including the provision of training and development programs. By offering these programs, organizations gave their employees the opportunity to acquire new skills, expand their knowledge base, and enhance their expertise. As a result, employees were better equipped to take on new challenges and advance in their careers which is similar to the present findings.

This simply indicates that individuals working in STEM fields can develop personally and professionally as a result of diverse, significant workplace experiences. Self and career growth can be achieved while working in a STEM field through new and beneficial learnings. This can help women realize their own potential and gain the ability to advance in a particular work inside their workplace

Category 3. No difficulties in job application and able to adapt to the workplace

Some women decide to pursue careers that are not in-line with their academic majors due to difficulties in job application and adaptation. Finding a STEM-related job as a female professional can present unique challenges and require adaptability. Historically, the fields of science, technology, engineering, and mathematics have been male-dominated, creating a gender imbalance that can affect various aspects of a woman's career in STEM.

Based on the findings, the participant experienced no difficulties in job application after graduating college. The participant also mentioned that… She said, "*Feeling ko naman hindi na rin kayo mahihirapan kasi based na rin sa mga experience ng ng friends ko pag-graduate naman naming, nakakuha naman kami din agad ng job*." Supporting the idea of adapting in a specific workplace, she also said*, "siguro, ang way talaga nung company na 'yon, or nung [name of company], is to learn by experience. So, nung time na 'yon, kahit kabado ako or anything, triny ko pa rin 'yung best ko na maging successful 'yung implementation. So, after the first implementation, they trusted na– na kaya ko ng gawin 'yung mga susunod so mas binibigyan na nila ako ng mga mas mabibigat na task.*"

Similar to the present findings, the research conducted by Fatourou et al. (2019), highlights the ongoing issue of women being underrepresented in STEM education and careers globally. This gender disparity not only affects the STEM workforce and research but also has prompted the implementation of measures, projects, and initiatives to promote gender equality making it easier for women to be employed in a STEM-related job. Moreover, women will have the opportunity to leverage their capabilities and skills, leading to a quicker adaptation to their work environment.

This only shows that finding a job related to the usual male dominated STEM fields and being able to adapt to its workplace can be easy in todays' generation. Both males and females are professionally accepted in STEM fields. In addition, demonstrating exceptional performance and adapting effectively within a STEM-related workplace is a valuable strategy for earning the trust and confidence of one's employer.

2. Opportunities for women in STEM fields

Theme: Opportunities for women in STEM fields

Having opportunities allows women to engage in learning, advance their careers, and contribute their unique perspectives and skills in the field of STEM. Findings showed that two categories highlighted from the participants when asked about their opportunities in STEM fields are: (1) less to no restrictions in terms of job opportunities; and (2) advancement of technology that causes all genders to have broader choices in STEM fields.

Category 1. Less to no restrictions in terms of job opportunities.

According to Maceira (2017), gender equality has a significant and increasing impact in both the labour market and economic growth. By addressing structural weaknesses identified in the Europe 2020 strategy, improving gender equality and providing equal opportunities can have positive effects on employment, productivity, and challenges related to an aging population.

Based on the findings, the participant experienced less to no restrictions in terms of job opportunities in STEM. She said, "*I think hindi na mahirap or wala ng restrictions sa pagdating sa job opportunities kung i-babase siya sa gender nung tao. Basta kaya mong gawin yung ibibigay na trabaho sayo and handa kang tanggapin nung company na yun or nung job opportunity or job position na yun, kaya mo na makuha yung position na inaapply-an mo,*" which means that you can get a job opportunity without restrictions as long as you are qualified to handle the work given by the company.

In recent years, there has been a significant increase in the number of women earning PhDs and pursuing careers in academic sciences. Despite this progress, women continue to face challenges in terms of representation and perceived success compared to their male counterparts. Therefore, substantial changes must take place that enable them to have equal opportunities to secure and advance in their professional positions (Henley, 2015).

It is only implied that women still face challenges in both the academic and commercial realms despite making contributions to the natural and social sciences, as institutional barriers persist and contribute to a gendered hierarchy. Studies continue to suggest strategies that prevent women from experiencing disproportionate advantages so that they can break through these barriers that prevent them from reaching higher positions.

Category 2. Advancement of technology that causes all genders to have broader choices in STEM field

As our society becomes increasingly digitized, universities are recognizing the importance of STEM careers and their alignment with technological advancements. In response to this shift, universities are actively promoting and emphasizing STEM fields in their educational programs. According to a study conducted by the Organization for Economic Cooperation and Development (OECD), there is a projection that many of the currently high-demand jobs will cease to exist by 2030. Instead, these jobs will be replaced by new opportunities directly or indirectly linked to STEM fields. This indicates the growing significance of STEM education and careers in meeting the evolving needs of the job market and preparing individuals for the future workforce (International Science Teaching Foundation, 2023).

Based on the findings, the participant mentioned that the advancement of technology opens up to more job positions and opportunities. She stated, "*technology is not stagnant, so hindi nag-s-stop ang technology to upgrade. So palaging may bago at may bagong technologies; so, for sure marami at maraming mag-o-open ng opportunities to study or to handle yung mga new technologies. So, I think unending naman yung mga job positions na pwedeng i-offer nung mga companies,*" which means that there are many job opportunities offered by companies in terms of handling and studying the continuous advancement of technology.

In line with these findings, according to Deming & Noray (2018), STEM jobs are significant in introducing and expanding the reach of new technologies within the labour market. These jobs are at the forefront of technological progress and play a key role in making sure that innovative technologies are adopted and spread across different industries. As a result, there is a growing demand for individuals with specialized skills in science, technology, engineering, and mathematics (STEM), creating more job opportunities in these fields.

This only implies that the presence of STEM job opportunities is crucial for the introduction and dissemination of new technologies across various industries. Therefore, as technology continues to advance, the need for qualified professionals in STEM fields becomes even more relevant

3. Most significant challenges for women in STEM professions

Theme: Significant challenges of women in STEM professions

Despite the wide range of opportunities for women in STEM professions, they may still face challenges alongside their workplace—particularly in the traditionally male-dominated engineering industries. The results revealed that the participant highlighted two main categories when questioned about the most significant challenges of women in STEM professions. These are: (1) cultural traditions as the cause of belittlement; and (2)

loss of physical, mental, and emotional vitality.

Category 1. Cultural traditions as the cause of belittlement.

Expanding educational and career opportunities for underrepresented groups, such as women and minorities, is one of the top priorities in the STEM campaigns (Blackburn, 2017). Over the past few decades, progress has been achieved toward the objective of increasing women's participation in traditionally male dominated fields since many countries have backed the idea of achieving gender equality in STEM fields across all professions. However, the evident challenges for women in their respective STEM fields become the root of gender discrimination, for they were perceived by our culture as subordinate to men.

Based on findings, the participant mentioned that she also experienced belittlement in her profession in STEM fields. She said, "*may mga tao pa rin kasi na close-minded in a way nangmamaliit ng mga female pagdating sa engineering field,"* in which she pinpointed that there is still an involvement of cultural perspectives in her workplace. The participant also shared that she had been asked of questions like, *"Paano ka nagcome-up sa idea na makakatulong ka or magiging successful ka dun sa field na engineering eh hindi naman siya pambabae?*" which can only mean that there are still people who think that the STEM fields, particularly in the engineering field, is still a workplace for men.

Similar to this, in the study of Abuwatfa et al. (2021), it is discussed that societal norms and socio-cultural factors influence gender gaps in STEM disciplines and prevent women from advancing to senior rank positions. When all of these things are considered, women may be excluded from the scientific community. On the other hand, it is possible that men's influence on the workplace is a contributing factor to the underrepresentation of women in STEM professions. This mindset that started since early school ages laid the groundwork for the community's perception of STEM professions as being predominantly male.

This only implies that belittlement of women in STEM professions continues to this day. Many people still hold on to the cultural perception that engineering is a male-dominated field. The challenge for women to demonstrate their ability may still be seen despite the various efforts to promote women empowerment in fields that are often dominated by men.

Category 2. Loss of physical, mental, and emotional vitality

According to the study of McGee (2020), women who hold marginalized identities tend to experience sexism and racism, which includes harassment and degradation. These negative encounters have been shown to intensify the feeling of isolation and decrease a sense of belonging among women in STEM fields. Also, these factors affect the decision of women whether to continue pursuing STEM professions or not.

Based on the experience of the participant in this study, she said that, "*syempre ma-dodown ka. May times na ma-fe-feel mo lost ka, and makukuwestiyon mo rin yung sarili mo if you're doing the right thing– kung nasa tamang path ka ba*", if someone outside of her workplace doubt her ability as a woman in STEM. Due to structural prejudices, she began to feel lost and became anxious about her decisions.

This explains the similarity in the findings of Saravanan & Wilks (2014), which found that females frequently experience higher levels of stress and anxiety than their male. This only implies that belittlement of women in STEM professions continues to this day. Many people still hold on to the cultural perception that engineering is a male-dominated field. The challenge for women to demonstrate their ability may still be seen despite the various efforts to promote women empowerment in fields that are often dominated by men. counterparts. Not only that, women in STEM fields have to deal with institutional barriers like gender biases and unsupportive environments which ultimately affects their general mental health (Bernstein, 2011).

This simply shows that women's physical, mental, and emotional well-being is significantly impacted by gender disparities in STEM professions. They often second-guess their choices because of societal stereotypes, particularly since women are less likely than men to pursue STEM professions. As a result, women who work in fields where men predominate face personal difficulties as long as people harbor doubts about their capabilities.

4. Strategies of women in STEM fields to address the significant challenges and can facilitate the ways forward for women in STEM fields.

Theme: Ways forward of women in STEM fields

In order to succeed in their workplace in STEM fields, women are expected to form strategies to address the significant challenges that they are experiencing in their workplace and can facilitate ways forward. When asked about the ways forward for women in STEM fields, the findings identified two categories of ways forward that were considered by the participant. These are: (1) having healthy social relationships; and (2) exerting more effort and having a positive mindset.

Category 1. Having healthy social relationships.

Women have considered different ways forward and strategies in order for them to succeed in their career. One of their ways is keeping a good relationship with their customer. According to Qasim & Asadullah (2012), poor customer support service leads customers to switching to alternative options and undermines the relationship between the service provider and customers. Additionally, it results in negative word-of-mouth.

Based on the findings, the participant mentioned having a good relationship with the customer as one of her ways forward. Having a healthy relationship with your customer would be easier for them to trust you in doing the work and also the management. She said, "*So if ever na gan'on, mas gamit na gamit yung pagkakaroon ng good customer relationship para mag-trust sa inyo yung tao para yung services niyo yung kunin and also para maging confident din sila na kapag kunyari may mga incident na nangyari, pangalan mo or ikaw yung una nilang mababanggit na alam na you can solve the issue kasi good impact din yun pagdating sa evaluation nung mga higher management*," meaning, the participant viewed this strategy as one that could help her to succeed in her career.

Similar to the present findings, the study of Nguyen et al. (2019), the researchers state that the quality of the relationship between the customers and employees has a significant influence on customer's willingness to share positive feedback about the service of the employee. The findings highlighted three key factors that contribute positive word-of-mouth which are the competence of the employee is highly valued by the customer, personal connection or when a customer feels a sense of connection with employees, and the customer care by demonstrating a genuine concern by their well-being and satisfaction.

This only implies that developing a healthy social relationship especially with the customer can be a strategic approach for women working in male-dominated workplaces. Also, by doing this, she may gain a high level of confidence about her work from the trust and positive feedback that the customer gives to her. This kind of relationship can help women overcome some barriers in gaining opportunities and can create a pathway for success in challenging work environments.

Category 2. Exerting more effort and having a positive mindset.

Women working in male-dominated fields exert more effort in order to overcome the barriers in getting opportunities and to handle things positively as they face discrimination in their workplace. Women have to work harder than men since women face higher performance expectations from their employers even when they have the same job as men (Gorman & Kmec, 2007). According to the Mayo Clinic (2013), thinking positively has great benefits for our health and can also positively impact our work. Positive people are enjoyable to be around and that creates a positive and pleasant work environment. When these factors are combined, it sets the stage for success for both personal and professional lives.

Based on the findings, the researchers found out that the participant is making an extra effort regarding her work by being more resourceful and asking for help from her seniors. By doing this, she is getting more familiar and aware, which makes her work easier because she asks and improvises things when she is struggling with her work. She said, "*So I tried to be more resourceful sa pag-aaral ko nung bago ako. So for example, nung nagbigay sila ng mga learning materials, so kung ibang– yung ibang engineers na kasabayan ko male and female din. They stick to the materials that the company provided. Pero ako, nag-extend ako ng researches so pag may mga wordings or may mga terms ako na hindi ko na naiintindihan tapos wala siya don sa module na binigay*" and "*So, ako I tried also to interview or to ask yung mga seniors namin kapag may extra time na*

naiisisingit ko ano pa yung mga bagay na hindi ko pa alam sa process nung management". In addition, she mentioned that instead of taking those bad comments about her in a negative way, what she did is she developed a positive mindset towards it. She said, "*may mga clients na feeling mo kahit indirectly sinasabi sa inyo na, female ka ayaw kita sa data centres mo, hanapan mo siya ng way kung paano mo siya maiisipan na maging positive na lang yung pagtanggap mo instead na dibdibin mo siya or sumama pa yung loob mo dun sa client na di ka binigyan ng task just because female ka kasi at the end of the day, they're still the customers; sila pa din yung kailangan mong ma-please*."

Similar to these findings, women in STEM fields believe that they need to work harder than others to succeed in their workplace because most of the fields are male-dominated. The confidence and motivation to pursue STEM careers change depending on how much effort they think they have to put in. This means that when women see an underrepresentation of women in particular fields, they think they will have to work even harder to succeed. However, by doing this kind of strategy, it makes them feel more hopeful and positive about their chances of succeeding in these fields (Smith et al., 2012). Having a positive mindset is one of the keys to supporting yourself in achieving your dreams. This kind of mindset brings peace, success, happiness, and satisfaction. Positive thinking does not mean ignoring negative comments, but rather facing life's challenges with optimism (Wilson, 2017).

This only implies that exerting more effort and maintaining a positive mindset can significantly contribute to women's success in their careers. By putting extra effort, women can develop the necessary skills and competence needed to excel in their fields which allows them to stand out. Moreover, a positive mindset enables women to have a positive outlook in a cruel world, overcome obstacles, bounce back from setbacks, and persist in pursuing their goals.

IV. CONCLUSIONS

The findings show that the workplace experiences of women in STEM fields encompass a range of factors. While gender discrimination and limited career advancement opportunities persist, women also have the potential for personal and professional growth within these fields. Work experience provides new and beneficial learnings for women to realize their own potential and leverage their advancement within their workplace. Furthermore, finding jobs and being able to adapt in traditionally male dominated STEM fields can now be easy in modern society since the acceptance of both males and females in STEM fields has improved.

Findings also indicate that equal job opportunities exist within STEM fields, emphasizing the importance of qualifications rather than gender. The presence of these opportunities not only enables individuals to pursue rewarding careers but also plays a crucial role in advancing technology and its application in diverse industries. With technological advancements continuing to evolve, the demand for qualified professionals in STEM fields becomes increasingly significant since these professionals contribute to innovation, research, and development, driving progress in various sectors.

However, women in STEM professions face ongoing challenges rooted in gender bias and societal stereotypes. Women's overall well-being are significantly impacted by gender disparities and societal stereotypes particularly since women are less likely than men to pursue STEM professions. Women also encounter challenges in demonstrating their abilities and expertise despite efforts to promote women empowerment and gender equality in traditionally male-dominated fields.

To overcome these barriers, women in STEM fields have adopted strategic approaches to address the significant challenges they face and facilitate their ways forward. Having strong social relationships and exerting more effort while leveraging the power of positive thinking can empower women to overcome barriers, excel in their fields, and pave the way for future success in male-dominated workplaces.

Women still experience certain challenges and are still discriminated in male dominated STEM fields but it has become less severe compared to previous years. Meanwhile, opportunities for women have also improved over time and women have also learned to adopt a few strategic approaches to facilitate their ways forward in STEM fields.

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It is recommended to address issues about gender discrimination in the workplace by implementing company policies. Women are still experiencing discrimination in their workplace. To address this issue, the company should implement policies that promote gender equality. Such policies can include providing opportunities for career advancement and creating a safe and inclusive work environment free from harassment and bias. By prioritizing these policies, companies can work towards creating a fair and supportive workplace for all employees. Furthermore, there is a need to raise the awareness about the evolving cultural traditions. In this study, the participant highlighted the ongoing challenges faced by women in STEM fields, where societal norms traditionally discourage females from pursuing careers in male-dominated fields. To address this issue, the researchers suggest the need to increase awareness and acceptance of women working in STEM. Moreover, cultural traditions should not be used as a basis for undermining women's abilities or treating them differently based on their gender in the workplace.

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