INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY: APPLIED BUSINESS AND EDUCATION RESEARCH
2025, Vol. 6, No. 7, 3335 – 3346
http://dx.doi.org/10.11594/ijmaber.06.07.10

Research Article

From Imbalance to Inclusion: A Quantitative Study on Gender Participation Trends in Engineering and Architecture Education (AY 2020–2025)

Chrisjay S. Torres[1]*, Peter G. Narsico[2]

[1]Enrolment Technical Office, Cebu Institute of Technology- University, Cebu City, 6000, Philippines
[2]College of Management, Business, and Accountancy, Cebu Institute of Technology- University, Cebu City, 6000, Philippines

Article history:
Submission 03 June 2025
Revised 30 June 2025
Accepted 23 July 2025

**Corresponding author:*
E-mail:
chrisjay.torres@cit.edu

ABSTRACT

Gender disparity remains a persistent issue in science, technology, engineering, and mathematics (STEM) education, particularly within engineering and architecture programs. While national and institutional initiatives have promoted inclusivity, localized assessments are essential to determine whether these efforts translate into sustained enrolment equity. This study employed a quantitative descriptive-comparative design, drawing on institutional freshman enrolment data from Academic Year (AY) 2020–2021 to AY 2024–2025. A total of 10,052 enrolment records were analyzed across multiple programs, disaggregated by gender. Descriptive statistics, visual trend analysis, and a chi-square test for trend were applied to assess gender participation over time. Findings revealed fluctuating patterns of female enrolment, with a notable increase in AY 2021–2022 (+52.1%) followed by modest growth and stabilization. While some programs (e.g., Architecture, Chemical Engineering) approached gender balance, others (e.g., Electrical and Mechanical Engineering) remained strongly male-dominated. The chi-square test indicated no statistically significant linear trend in female participation across years, $\chi^2(1, N = 10{,}052) = 1.68, p = .196$. Although there are signs of progress in selected programs, the lack of a significant trend suggests that institutional efforts toward gender inclusion have not yet resulted in consistent, system-wide change. The study highlights the need for program-specific interventions, continuous monitoring, and intentional policy implementation to address persistent enrolment disparities in STEM fields.

Keywords: *Gender disparity, Engineering education, STEM equity, Enrolment trends, Inclusion, Philippines*

How to cite:
Torres, C. S. & Narsico, P. G. (2025). From Imbalance to Inclusion: A Quantitative Study on Gender Participation Trends in Engineering and Architecture Education (AY 2020–2025). *International Journal of Multidisciplinary: Applied Business and Education Research. 6*(7), 3335 – 3346. doi: 10.11594/ijmaber.06.07.10

Introduction

Globally, the pursuit of inclusive education in science, technology, engineering, and mathematics (STEM) has gained traction as institutions and policymakers seek to address persistent gender disparities. While access to higher education has expanded, the underrepresentation of women in technical fields—particularly engineering and architecture—remains a critical concern, especially in developing contexts where systemic barriers and sociocultural norms continue to influence academic and career choices (Fernandez et al., 2023). Research highlights that despite increased enrolment in STEM programs, women often face implicit biases, limited mentorship opportunities, and a lack of representation in leadership roles, which collectively hinder their sustained participation and advancement in these fields (Ewim & Dosunmu, 2025). Moreover, gendered perceptions of competence and belonging in STEM environments contribute to lower self-efficacy among female students, further reinforcing traditional gender divides in disciplines like engineering and architecture (Wang et al., 2023). Addressing these multifaceted challenges requires not only policy reforms but also culturally responsive interventions that promote equity and inclusion at every stage of the educational pipeline.

In the Philippines, educational reforms and gender equity initiatives have aimed to close these gaps. However, national enrolment patterns still reveal disparities in program participation, especially in traditionally male-dominated STEM fields. Despite efforts by institutions such as the Department of Science and Technology (DOST) and the Department of Education (DepEd) to promote STEM pathways for young women, systemic challenges persist—including gendered perceptions of competence, limited access to mentorship, and sociocultural expectations that shape academic choices (Punzalan, 2022). Recent studies also highlight that while female participation in STEM education has increased, women remain underrepresented in engineering and technology programs, and are less likely to transition into STEM-related careers after graduation (UNESCO & IFC, 2025). Tracking gender representation in specific programs is essential not only to assess institutional inclusiveness but also to guide evidence-based planning and advocacy for more equitable learning environments.

Recent studies have emphasized the importance of localized assessments. These go beyond national statistics to examine program-specific trends. This is particularly important in engineering and architecture, which serve as gateways to innovation and national development but often reflect gendered enrolment biases. While some institutions report increased female participation, there is limited understanding of whether these changes signify consistent progress or temporary shifts. Fan et al. (2024) emphasize that persistent gender wage gaps and structural inequities in the architecture, engineering, and construction (AEC) sectors across Asia-Pacific economies highlight the need for targeted strategies and disaggregated data to inform inclusive policy development. Their findings underscore the importance of institutional-level diagnostics to address not only access but also retention and advancement for women in technical fields. In the Philippine setting, de Castro (2023) highlights that although more women are entering engineering programs, many still face workplace and academic environments that are not conducive to long-term retention and advancement. Moreover, UNESCO (2020) underscores the need for disaggregated, context-specific data to inform gender-responsive STEM policies, particularly in regions where sociocultural norms heavily influence educational trajectories.

In the context of the university identified in the study, engineering and architecture programs, preliminary enrolment data over the past five academic years reveals a complex pattern: certain programs, such as Architecture and Chemical Engineering, approach gender parity, while others—including Mechanical, Electrical, and Computer Engineering—remain overwhelmingly male. These patterns raise questions about the trajectory of inclusion and the extent to which institutional efforts are translating into sustained change. This disciplinary imbalance is not unique to the institution in question; global and regional studies consistently show that while fields like chemical and environmental engineering have made strides toward gender balance, mechanical and electrical engineering continue to exhibit some of the lowest female participation rates (Nguyen, 2020). Understanding these internal disparities is essential for designing targeted interventions that move beyond aggregate statistics and address the cultural and structural dynamics within specific academic programs.

Despite increased awareness and institutional efforts toward inclusive STEM education, gender disparities remain evident across engineering and architecture programs. While some courses demonstrate incremental gains in female representation, others continue to reflect traditional gender divides. Without a systematic, data-driven investigation of gender enrolment trends over time, it remains unclear whether such shifts represent meaningful progress or isolated fluctuations. Preliminary trend analysis suggests that there is no significant linear change in the proportion of female freshmen enrolees across academic years 2020–2021 to 2024–2025, highlighting the need to probe deeper into enrolment distributions and gender-specific trajectories across programs. Understanding these patterns is crucial for guiding policies, improving equity, and fostering more inclusive academic environments within STEM fields. Specifically, the study is guided by the following questions: (1) What are the enrolment trends of male and female freshmen in engineering and architecture programs from AY 2020 to AY 2025? (2) How do gender participation patterns vary across specific academic programs within engineering and architecture? (3) Is there a significant change in the proportion of female enrolees over the five-year period? (4) Which programs demonstrate consistent gender balance, widening disparity, or evidence of inclusive progress? and (5) What implications can be drawn from the observed gender participation trends for promoting equity in STEM education at the institutional level?

Methods

This study employed a quantitative descriptive-comparative research design, which involves summarizing observed data patterns (descriptive) and comparing them across defined groups or time frames (comparative) to detect meaningful differences without manipulating variables. Descriptive statistics were used to examine patterns and trends in gender-based enrolment across engineering and architecture programs, while comparative analysis allowed for program-level differentiation across academic years. The approach was appropriate for analyzing existing institutional data to derive meaningful insights on participation by sex over time. Additionally, the population included all first-year undergraduate students officially enrolled in engineering and architecture programs at this university in Cebu City from Academic Year (AY) 2020–2021 to AY 2024–2025. No sampling was conducted, as the study utilized a complete census of available enrolment records for the five-year period. Data were disaggregated by gender (female and male) and program, covering ten distinct undergraduate degrees in STEM fields.

Upon receiving approval from the Director of Management Information Systems and External Affairs, we directly accessed and extracted enrolment data from the institutional system. The dataset, which included the total number of male and female enrolees per program per academic year, was then compiled and organized using Microsoft Excel to ensure accuracy and consistency for analysis. Since the data were already publicly archived and anonymous, no direct instrument or participant interaction was necessary. Enrolment data were formally requested from the institution's enrolment technical office and management information systems office through a documented research clearance process. Upon approval, datasets were compiled and cleaned to remove any inconsistencies or duplicates. Gender classifications were based on the binary designations recorded in institutional systems. Ethical permission for access and use of anonymized data was granted by the institution's designated authority.

Data were analyzed using both Microsoft Excel and descriptive statistics techniques. Frequency counts and percentage distributions were computed to determine gender compositions annually. Comparative tables were generated to highlight year-on-year changes. Special attention was given to computing proportions of female enrolees across programs to assess shifts toward or away from gender parity. Emerging patterns were interpreted to determine whether trends reflected widening gaps, stable disparities, or evidence of inclusive progress. A chi-square test for trend was conducted to assess whether a significant linear change occurred in the proportion of female enrolees across five academic years; no additional inferential statistical tests were employed.

This study adhered to the ethical standards of educational research by ensuring that all data used were secondary, anonymized, and secured through institutional authorization. No personal identifiers were accessed, and results were presented in aggregate form to protect individual privacy. Ethical clearance was obtained from the institution's designated authority, and the study complied with data protection policies mandated by the institution.

Result and Discussion

Enrolment Trends of Male and Female Freshmen in Engineering and Architecture Programs from AY 2020 to AY 2025. The first question was on enrolment trends of male and female freshmen in engineering and architecture programs from AY 2020 to AY 2025. Table 1 displays the annual enrolment figures for female and male freshmen in engineering and architecture programs over a five-year period, from Academic Year (AY) 2020–2021 to AY 2024–2025. The data include the total number of enrolees by sex for each academic year, along with their corresponding percentage distributions.

Table 1. Freshmen Enrolment by Sex in Engineering and Architecture Programs, AY 2020–2021 to AY 2024–2025

Academic Year	Female	Male	Total	% Female	% Male
2020–2021	560	966	1,526	36.7%	63.3%
2021–2022	852	1331	2,183	39.0%	61.0%
2022–2023	760	1243	2,003	37.9%	62.1%
2023–2024	789	1318	2,107	37.4%	62.6%
2024–2025	813	1420	2,233	36.4%	63.6%

The table presents a five-year overview of gender-disaggregated enrolment trends in engineering and architecture programs. While the total number of freshmen steadily increased from 1,526 in AY 2020–2021 to 2,233 in AY 2024–2025, the proportion of female enrolees remained relatively stable. Female representation peaked at 39.0% in AY 2021–2022 but gradually declined to 36.4% by AY 2024–2025. Male enrolment consistently comprised a larger share of the student population, maintaining a range between 61.0% and 63.6%. These figures suggest that despite overall growth in enrolment, the gender distribution has not experienced a marked shift toward greater parity. The percentage of female students fluctuated only slightly across academic years, indicating that increased enrolment may not directly translate into improved gender balance within these fields.

Figure 1 illustrates the annual enrolment numbers of male and female freshmen in engineering and architecture programs from Academic Year (AY) 2020–2021 to AY 2024–2025. The chart presents two lines corresponding to each sex, plotted across five academic years to show enrolment trends over time.

The line chart presents the annual enrolment of male and female freshmen in engineering and architecture programs across five academic years, from AY 2020–2021 to AY 2024–2025. Throughout the five-year period, male enrolment consistently surpassed female enrolment, maintaining a dominant share each year. While both groups show gradual increases in absolute numbers, the female line remains consistently lower than the male line, reflecting a persistent gender imbalance, and the gap between the two appears relatively stable, with no clear visual indication of convergence or significant trend change over time.

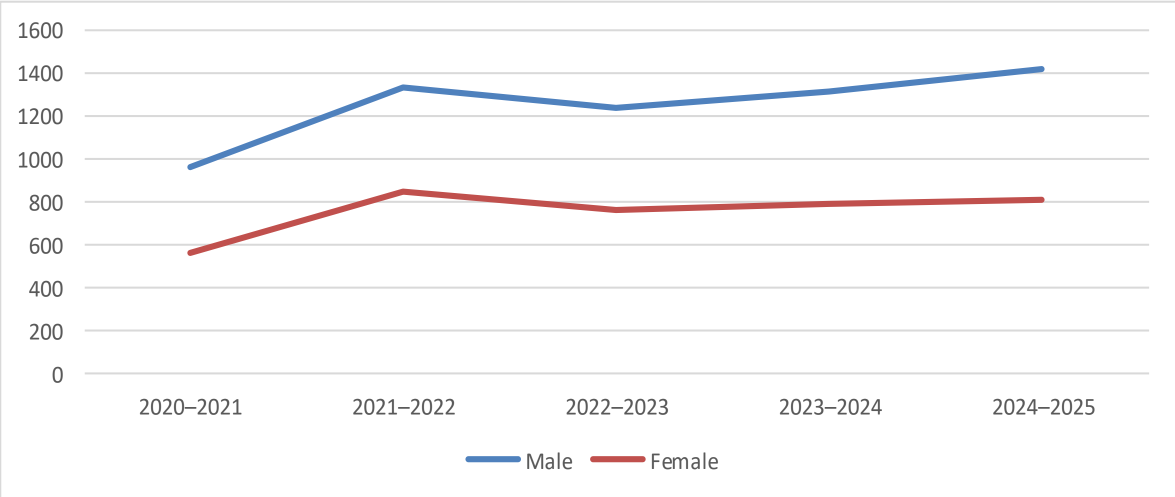

Figure 1. Freshmen Enrolment Trends in Engineering and Architecture by Sex, AY 2020–2021 to AY 2024–2025

The table below presents the annual growth rates of freshmen enrolment by gender from Academic Year (AY) 2020–2021 to AY 2024–2025. It breaks down both the numeric increases and percentage changes for female, male, and total enrolees across the five-year period.

Table 2. Year-on-Year Freshmen Enrolment Growth Rates in Engineering and Architecture Programs by Gender, AY 2020–2021 to AY 2024–2025

Academic Year	Female Enrolees	Female Growth Rate	Male Enrolees	Male Growth Rate
2020–2021	560	–	966	–
2021–2022	852	+52.1%	1,331	+37.8%
2022–2023	760	−10.8%	1,243	−6.6%
2023–2024	789	+3.8%	1,318	+6.0%
2024–2025	813	+3.0%	1,420	+7.7%

Note. Growth rates are calculated as the percentage change in enrolment compared to the previous academic year, rounded to one decimal place. A dash (–) indicates the baseline year with no prior data for comparison.

Over the five academic years observed, enrolment in engineering and architecture programs showed notable fluctuations. The most significant growth occurred in AY 2021–2022, with female enrolment increasing by 52.1% and male enrolment by 37.8%—a year that appeared to signal meaningful strides toward gender inclusivity. This aligns with broader regional efforts to promote women's participation in STEM, which include pandemic-era policy shifts and inclusive scholarship initiatives (UNESCO & IFC, 2025). However, this momentum was not sustained, as both groups saw a decline in AY 2022–2023, suggesting broader challenges such as lingering effects of COVID-19 or institutional limitations may have influenced enrolment numbers (Dizon & Molina, 2023).

From AY 2023–2025, enrolment gradually recovered for both genders. Male students experienced stronger growth rates than female students, suggesting a resurgence of male-dominated trends in participation. This is consistent with findings that female retention in STEM fields may be disproportionately affected by post-crisis disruptions and institutional environments that do not actively sustain gender inclusivity (Chen et al., 2024). While the overall increase points to renewed interest in these programs, the uneven pace of recovery highlights the need for consistent and targeted strategies to advance gender equity, particularly in traditionally male-dominated STEM fields.

Gender Participation Variation Patterns. The second concern was gender participation patterns vary across specific academic programs within engineering and architecture. To better understand gender participation patterns in engineering and architecture programs, the courses were categorized based on the relative representation of male and female enrolees in AY 2024–2025. These categories include (A) female-dominated or gender-balanced programs, (B) programs with a moderate male majority, and (C) male-dominated programs. The following tables summarize enrolment figures by sex and highlight notable trends where applicable.

Table 3 presents the enrolment figures of female and male students in selected engineering and architecture programs categorized as either female-dominated or gender-balanced for the academic year 2024–2025. The table also notes key enrolment characteristics of each program.

Table 3. Female-Dominated and Gender-Balanced Programs in Engineering and Architecture, AY 2024–2025

Program	2024–2025 Female	2024–2025 Male	Notable Trend
BSARCH	279	197	Female-led growth
BSCHE	35	38	Balanced enrolment

The programs categorized as female-dominated or gender-balanced in AY 2024–2025 show notable representation of women, particularly in Architecture (BSARCH), where female enrolees outnumber their male counterparts. Chemical Engineering (BSCHE) reflects near parity in enrolment, with comparable numbers of male and female students, indicating relatively balanced participation in that discipline. Additionally, table 4 presents the enrolment numbers of female and male students in engineering programs classified under the moderate male majority category for the academic year 2024–2025.

Table 4. Engineering Programs with Moderate Male Majority Enrolment, AY 2024–2025

Program	2024–2025 Female	2024–2025 Male
BSCE	365	544
BSIE	25	15

The programs classified under the moderate male majority category—such as BSCE and BSIE—exhibit enrolment figures where male students slightly outnumber female students. While gender disparity is present, it is not as pronounced as in traditionally male-dominated fields, suggesting these programs may offer more accessible entry points for female participation within engineering disciplines. Moreover, table 5 displays the enrolment figures of female and male students in engineering programs characterized by male-dominated participation for the academic year 2024–2025.

Table 5. Male-Dominated Engineering Programs, AY 2024–2025

Program	2024–2025 Female	2024–2025 Male
BSCPE	36	125
BSECE	10	31
BSEE	15	171
BSME	37	272

The programs categorized as male-dominated—such as BSCPE, BSECE, BSEE, and BSME—demonstrate substantial gender disparities in AY 2024–2025, with male enrolees significantly outnumbering female students. These patterns reflect enduring structural and cultural barriers in engineering education, including gendered perceptions of competence and limited exposure to technical experiences. Recent findings by Guo et al. (2024) emphasize that gender differences in STEM aspirations and participation are shaped by both individual academic strengths and broader societal norms, which vary across contexts and persist despite increasing gender equality efforts.

Complementing this, a study by UNESCO and the International Finance Corporation (2025) highlights that while women in the Philippines are attaining higher education at increasing rates, they remain underrepresented in STEM fields—particularly in engineering—due to persistent gender norms, limited mentorship, and workplace barriers. These insights underscore the importance of addressing both quantitative and qualitative dimensions of gender inclusion to foster more equitable participation in engineering education.

Determining whether there is significant change in the proportion of female enrolees. The third question dealt with the determination whether there is a significant change in the proportion of female enrolees over the five-year period. Between AY 2020–2021 and AY 2021–2022, the proportion of female enrolees in engineering and architecture programs increased by 3%, reaching a peak of 39.0%. This marked a promising shift toward greater gender inclusivity. However, in the subsequent academic years, the female enrolment rate slightly declined and stabilized within a narrow range of approximately 36.4% to 37.9% by AY 2024–2025. While the initial growth indicates the potential impact of targeted interventions, the plateau suggests that these gains have not been sustained, underscoring the need for more comprehensive and long-term strategies to support women's continued participation in these fields.

To assess whether there was a statistically significant change in the proportion of female enrolees across five academic years, a chi-square test for trend was conducted. Table 6 presents the frequency distribution of male and female freshmen enrolment in engineering and architecture programs from AY 2020–2021 to AY 2024–2025. This dataset served as the basis for the trend analysis.

Table 6. Female and Male Freshmen Enrolment by Academic Year

Academic Year	Female	Male	Total
2020–2021	560	966	1,526
2021–2022	852	1,331	2,183
2022–2023	760	1,243	2,003
2023–2024	789	1,318	2,107
2024–2025	813	1,420	2,233

Note. Data used in the chi-square test for trend. Female enrolment proportions were assessed across the five academic years.

A chi-square test for trend was conducted to assess whether there was a statistically significant linear change in the proportion of female enrolees over five academic years. The analysis yielded a non-significant result, $\chi^2(1, N = 10{,}052) = 1.68$, $p = .196$, indicating no consistent upward or downward trend in female enrolment from AY 2020–2021 to AY 2024–2025. The computation was based on a complete census of the population, incorporating all available enrolment records during the specified period.

The finding that the change in the proportion of female enrolees over the five academic years is not statistically significant ($p = .196$) has important implications for the broader challenge of gender imbalance in STEM education. While descriptive data showed fluctuations and moments of progress—most notably in AY 2021–2022—these shifts do not represent a consistent or sustained trend toward greater female inclusion. This suggests that existing institutional strategies may be insufficient or unevenly applied across programs and academic years, echoing broader concerns that gender equity efforts often lack continuity and depth (UNESCO, 2024; Yu et al., 2024).

The result underscores the need for more deliberate, long-term interventions to promote gender equity. Rather than relying on passive or isolated gains, institutions must actively implement policies and learning environments that attract, support, and retain female students in male-dominated fields. Program-specific strategies—such as outreach, mentorship, and inclusive pedagogy—should be informed by disaggregated enrolment data, as global trends alone may obscure persistent local disparities (Ntombela et al., 2025). In short, the lack of a significant trend highlights that while inclusion has been part of institutional discourse, its outcomes remain inconsistent. Without stronger, evidence-based efforts, the transition "from imbalance to inclusion" may stall—leaving underlying structural and cultural barriers intact.

Programs that Demonstrate Gender Balance, Widening Disparity, or Evidence of Inclusive Progress. The fourth specific question identified which programs demonstrate consistent gender balance, widening disparity, or evidence of inclusive progress. Table 6 summarizes the gender participation patterns observed across selected engineering and architecture programs in AY 2024–2025. Each program is described based on its enrolment trend and corresponding characterization of gender balance.

Table 7. Gender Balance Patterns Across Selected Engineering and Architecture Programs, AY 2024–2025

Program	Pattern	Gender Balance Trend
BSARCH	Progressing	Increasing female enrolment each year
BSCHE	Balanced	Maintains close male-female ratio
BSCE	Stable Disparity	Consistently male-heavy, though with strong female presence
BSME	Widening Gap	Male enrolment has nearly doubled; females increased marginally
BSEE/BSECE	Persistent Imbalance	Female participation remains low and stagnant

Note. Gender balance trends are based on longitudinal enrolment data from AY 2020–2021 to AY 2024–2025 and reflect observed participation patterns rather than statistical test results.

The summarized trends reflect a spectrum of gender participation patterns across engineering and architecture programs. BS Architecture (BSARCH) demonstrates a clear upward trajectory in female enrolment, suggesting growing interest and sustained entry of women into the field—a trend supported by inclusive design initiatives across Europe and Asia (World Bank, 2019). In contrast, Chemical Engineering (BSCHE) maintains a steady male-female ratio, aligning with findings that chemistry and materials science are among the few STEM subfields approaching gender parity (Yamio, 2023). Civil Engineering (BSCE) continues to show a persistent male majority, though the presence of women remains substantial, reflecting global patterns where women's participation in infrastructure-related fields is increasing but still constrained by traditional gender roles and workplace cultures (Romea, 2019).

Mechanical Engineering (BSME) stands out with a widening gender gap, where male enrolment has nearly doubled while female growth remains minimal. This mirrors international data showing that mechanical and electrical engineering remain among the most male-dominated STEM disciplines (Meiksins & Layne, 2022). Meanwhile, programs like BSEE and BSECE exhibit entrenched gender imbalances, with little to no change in female representation over recent years. These persistent disparities are consistent with findings from the Philippines and the broader Asia-Pacific region, where women comprise only 36.3% of the STEM workforce and face significant barriers to entry and retention (Rappler, 2023; UNESCO, 2023).

Implication from Observed Gender Participation Trends. The final question sought to identify implications from the observed gender participation trends for promoting equity in STEM education at the institutional level. Addressing persistent gender disparities in engineering and architecture education requires a multifaceted and evidence-based strategy. Male-dominated programs such as BSME and BSEE demand targeted recruitment initiatives that actively engage female students through inclusive outreach, early exposure, and stereotype-challenging interventions (National Academies of Sciences, Engineering, and Medicine [NASEM], 2020; Abolle-Okoyeagu et al., 2024). These efforts are most effective when paired with visible role models, as research shows that exposure to relatable and successful women in STEM significantly enhances female students' motivation, self-efficacy, and sense of belonging (Tal et al., 2024; Bustamante-Mora et al., 2025).

Programs like BSARCH, which have demonstrated steady gains in female enrolment, can serve as institutional exemplars, offering insights into inclusive practices that may be transferable across disciplines (UNESCO, 2023). To ensure the sustainability of such efforts, longitudinal monitoring of gender participation is essential. Tools like the STEM Equity Monitor and UNESCO's SAGA framework emphasize the importance of tracking enrolment, retention, and graduation data to evaluate the impact of gender equity policies over time (Department of Industry, Science and Resources, 2024; UNESCO, 2018).

Finally, curricular interventions—including mentorship programs, flexible learning pathways, and gender-sensitive pedagogy—play a critical role in supporting underrepresented groups (Evagorou et al., 2024; Ro et al., 2021). These strategies not only address structural barriers but also foster inclusive learning environments that empower students to persist and succeed in technical fields. Together, these approaches contribute to a more equitable and responsive educational system capable of transforming gender dynamics in STEM.

Summary of Findings. Between AY 2020–2021 and AY 2024–2025, a total of 10,052 freshmen enrolled in engineering and architecture programs at the institution. Female participation ranged from 36.4% to 39.0%, reflecting a consistently male-dominated composition. Although total enrolment increased for both genders, the growth was stronger among male students, keeping the gender gap relatively stable over time. While female enrolment experienced a notable rise in AY 2021–2022, the trend did not continue in subsequent years. A chi-square test for trend confirmed that the changes in female participation were not statistically significant, χ^2 (1, N = 10,052) = 1.68, p = .196, indicating the absence of a consistent upward trajectory. Gender distributions also varied across programs: architecture and chemical engineering neared gender parity, while mechanical, electrical, and computer engineering remained predominantly male. Industrial engineering showed signs of favoring female participation more recently. These patterns highlight uneven progress in addressing gender disparities. Programs like BS Architecture have shown encouraging trends, while others such as BSME and BSEE remain resistant to change. The findings suggest that existing inclusion efforts may lack the depth or consistency needed to effect long-term transformation. Targeted strategies—such as inclusive outreach, mentorship, and curriculum reform—are needed to move from temporary gains to lasting gender equity in STEM education.

Conclusion

This study examined gender participation trends in engineering and architecture programs across five academic years, revealing persistent imbalances and uneven progress toward equity. Although a temporary surge in female enrolment was observed in AY 2021–2022, no statistically significant linear trend emerged over time. While certain programs—such as Architecture and Chemical Engineering—approached gender parity, others, notably Electrical and Mechanical Engineering, remained predominantly male with minimal shifts in representation. These findings highlight that institutional efforts have yielded localized improvements but have not yet translated into sustained, system-wide inclusion.

One limitation of the study is its reliance on binary gender data as recorded in institutional systems, which may not capture the full spectrum of gender identities. Additionally, the use of institutional data limits insights into the qualitative experiences or intersectional factors influencing student choices.

Future research should explore the drivers of program-level disparities by integrating qualitative inquiry with longitudinal tracking. Institutional stakeholders are encouraged to implement evidence-based, program-specific interventions that go beyond access—emphasizing mentorship, curricular inclusivity, and structural reforms. Achieving lasting gender equity in STEM requires not only strategic policy alignment but also a cultural shift toward genuinely inclusive academic environments.

Acknowledgement

We would also like to express sincere thanks to Mr. Butch M. Cortez, Head of the Enrollment Technical Office and Information Systems Development Department, for generously providing access to vital institutional data and for his continued support throughout the data-gathering and analysis process.

Special thanks are extended to Dr. Larmie S. Feliscuzo, Director of the Management Information Systems and External Affairs Office, for approving access to the institutional data and for the administrative support that greatly facilitated the smooth progression of this research.

To all my colleagues, mentors, and the academic community who provided valuable insights, and to my family and friends whose moral support uplifted me throughout this journey—thank you.

This work is dedicated to advancing gender inclusivity in STEM education and to all individuals who continuously advocate for equity, diversity, and inclusion in the fields of engineering and architecture.

References

Abolle-Okoyeagu, C. J., Mahon, R., Okpu, A., & Chima-Amaeshi, N. (2024). Bridging the gender gap in engineering: Strategies for retention and advancement of women in STEM fields. International Journal of Gender and STEM, 12(4), 55–72. https://www.dpublication.com/wp-content/uploads/2024/12/222-9905-.pdf

Bustamante-Mora, A., Diéguez-Rebolledo, M., Díaz-Arancibia, J., Sánchez-Vázquez, E., & Medina-Gómez, J. (2025). Inclusive pedagogical models in STEM: The importance of emotional intelligence, resilience, and motivation with a gender perspective. Sustainability, 17(10), Article 4437. https://doi.org/10.3390/su17104437

Chen, C., Doyle, J., Sonnert, G., & Sadler, P. M. (2024). Shrinking gender gaps in STEM persistence: A ten-year comparison of the stability and volatility of STEM career interest in high school by gender. International Journal of Science Education, 46(7), 1123–1145. https://doi.org/10.1080/09500693.2024.2388880

de Castro, J. J. (2023, September 7). Inclusivity, gender equality in engineering. Philippine Daily Inquirer. https://opinion.inquirer.net/166112/inclusivity-gender-equality-in-engineering

Department of Industry, Science and Resources. (2024). STEM equity monitor. https://www.industry.gov.au/publications/stem-equity-monitor

Ejim, D. R., & Dosunmu, A. G. (2025). Bridging gaps: The intersection of women in engineering and gender studies—Challenges, advances, and future directions. Discover Global Society, 3, Article 43. https://doi.org/10.1007/s44282-025-00184-7

Evagorou, M., Puig, B., Bayram, D., & Janeckova, H. (2024). Addressing the gender gap in STEM education across educational levels. NESET Report.

https://nesetweb.eu/en/resources/library/addressing-the-gender-gap-in-stem-education-in-schools/

Ewim, D. R. E., & Dosunmu, A. G. (2025). Bridging gaps: the intersection of women in engineering and gender studies—challenges, advances, and future directions. Discover Global Society, 3(43). https://link.springer.com/article/10.1007/s44282-025-00184-7

Fan, S.-L., Chai, C.-S., Lim, B. C.-Y., Lu, S.-M., & Gui, H.-C. (2024). Ameliorating the profound gender wage gap in the architecture, engineering and construction (AEC) industry among the APEC members: The could and should. Asian Journal of Business Research, 14(1), Article 240165. https://ajbr.co.nz/ajbr/ajbr240165.pdf

Fernandez, D., White, S., Smith, H. C. M., Connor, P. M., & Ryan, M. (2023). Gender inequality in science, technology, engineering and mathematics: Gendered time disparities in perceived and actual time spent in practical laboratory-based activities. Frontiers in Education, 8, Article 1194968. https://doi.org/10.3389/feduc.2023.1194968

Guo, J., Marsh, H. W., Parker, P. D., & Hu, X. (2024). Cross-cultural patterns of gender differences in STEM: Gender stratification, gender equality, and gender-equality paradoxes. Educational Psychology Review, 36, Article 37. https://doi.org/10.1007/s10648-024-09872-3

Meiksins, P., & Layne, P. (2022). Women in engineering: Analyzing 20 years of social science literature. Society of Women Engineers. https://www.asce.org/publications-and-news/civil-engineering-source/civil-engineering-magazine/article/2022/05/engineering-struggles-to-achieve-gender-parity

National Academies of Sciences, Engineering, and Medicine. (2020). Promising practices for addressing the underrepresentation of women in science, engineering, and medicine: Opening doors. https://doi.org/10.17226/25585

Nguyen, U. (2020). Women in engineering: A review of the 2020 literature. Society of Women Engineers Magazine. https://swe.org/magazine/women-in-engineering-a-review-of-the-2020-literature/

Ntombela, B., Ramabodu, M. S., & Moloi, K. (2025). Strategies for empowering and retaining women in STEM fields: A systematic literature review. https://www.researchgate.net/publication/388855999

Punzalan, C. H. (2022). STEM interests and future career perspectives of junior high school students: A gender study. International Journal of Research in Education and Science, 8(1), 93–102. https://doi.org/10.46328/ijres.2537

Rappler. (2023, July 5). Only 3 in 10 workers in Philippine STEM are women – LinkedIn. https://www.rappler.com/philippines/gender-gap-workers-philippine-stem-linkedin-july-2023/

Ro, H. K., Fernandez, F., & Ramon, E. (Eds.). (2021). Gender equity in STEM in higher education: International perspectives on policy, institutional culture, and individual choice. Routledge. https://doi.org/10.4324/9781003053217

Romea, D. C. (2019). Breaking gender stereotype: A phenomenological study of the lived experiences of female civil engineers in the construction field. Ascendens Asia Journal of Multidisciplinary Research Abstracts, 3(2O). https://ojs.aareserchindex.com/index.php/AAJMRA/article/view/12302

Tal, M., Lavi, R., Reiss, S., & Dori, Y. J. (2024). Gender perspectives on role models: Insights from STEM students and professionals. Journal of Science Education and Technology, 33, 699–717. https://doi.org/10.1007/s10956-024-10114-y

UNESCO & International Finance Corporation (2025) – Closing the Gender Gap in Education and Employment in the Philippines Official report hosted by MSN News https://www.msn.com/en-ph/news/other/unesco-ifc-launch-global-report-on-gender-gaps-in-education-employment-in-the-philippines/ar-AA1HDRhh

UNESCO & International Finance Corporation. (2025). Gender gaps in education and employment in the Philippines. https://www.msn.com/en-ph/news/other/unesco-ifc-launch-global-report-on-gender-gaps-in-education-employment-in-the-philippines/ar-AA1HDRhh

UNESCO & International Finance Corporation. (2025). Gender gaps in education and employment in the Philippines. https://www.msn.com/en-ph/news/other/unesco-ifc-launch-global-report-on-gender-gaps-in-education-employment-in-the-philippines/ar-AA1HDRhh

UNESCO. (2018). Measuring gender equality in science and engineering: The SAGA survey of gender equality in science, technology and innovation policies (Working Paper 3). https://uis.unesco.org/sites/default/files/documents/saga-survey-gender-equality-wp3-2018-en.pdf

UNESCO. (2020). STEM education for girls and women: Breaking barriers and exploring gender inequality in Asia. UNESCO Bangkok. https://unesdoc.unesco.org/ark:/48223/pf0000375106

UNESCO. (2023). STEM education for girls and women: Breaking barriers and exploring gender inequality in Asia. https://unesdoc.unesco.org/ark:/48223/pf0000375106

UNESCO. (2024). New UNESCO report sheds light on gender inequality in STEM education. https://www.unesco.org/en/articles/new-unesco-report-sheds-light-gender-inequality-stem-education

Wang, N., Tan, A.-L., Zhou, X., Liu, K., Zeng, F., & Xiang, J. (2023). Gender differences in high school students' interest in STEM careers: a multi-group comparison based on structural equation model. International Journal of STEM Education, 10(59). https://stemeducationjournal.springeropen.com/articles/10.1186/s40594-023-00443-6

World Bank. (2019). Handbook for gender-inclusive urban planning and design. https://www.worldbank.org/en/topic/urbandevelopment/publication/handbook-for-gender-inclusive-urban-planning-and-design

Yamio, R. (2023, August 10). Women in STEM: Why so few? FlipScience. https://www.flipscience.ph/features/women-in-stem-why-so-few/

Yu, W., He, J., Luo, J., & Shu, X. (2024). Interventions for gender equality in STEM education: A meta-analysis. Journal of Computer Assisted Learning, 40(6), 2558–2573. https://eric.ed.gov/?id=EJ1448393