Examining Gender Variation in Academic Performance of Planning Project Paper Course

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ABSTRACT

The overall academic performance of Town and Regional Planning students in research-oriented courses, particularly the Planning Project Paper, is generally good. However, whether academic performance in this course differs significantly by gender remains uncertain. Therefore, this study aims to examine gender differences in students' academic performance in the Planning Project Paper course. A quantitative, cross-sectional research approach was employed, using students' gender and final course marks at the end of the semester as the primary data. The data were analyzed using an independent-samples t-test in IBM SPSS Statistics version 26. The results indicated that the difference in academic performance between male and female students was not statistically significant, $t = -1.071$, $df = 35$, $p = .291$, ($p > .05$). Although female students obtained a mean score approximately 3.77 marks higher than that of male students, the observed difference was insufficient to establish a statistically significant gender difference. The effect size, expressed as Cohen's $d = -0.358$, suggested a modest difference in magnitude, with the negative sign indicating the direction of the difference according to the coding and group order used in the analysis. These findings suggest that gender was not significantly associated with academic performance in the Planning Project Paper course within the cohort examined. Nevertheless, the findings should be interpreted cautiously because of the relatively small sample size and the study's focus on a single course and cohort. Future research should involve larger samples across multiple cohorts and academic years to provide a more comprehensive understanding of gender differences in academic performance among Town and Regional Planning students.

Keywords: academic performance, gender differences, independent-samples t-test, Planning Project Paper, Town and Regional Planning students

INTRODUCTION

Academic performance is an assessment of the level of achievement for specific tasks in a particular course by the students, normally at the end of semester (Kumur et al., 2019). Scholars strongly believed that academic performance of students were influenced by many factors. Among those factors were educational, socioeconomic, and individual characteristics (Suleiman et al., 2024). Moreover, Khan and Golder (2020) opined that the factors of academic performance of students were gender, teacher-student relationship, participation in academic, participation in co-curricular activities, academic skill, duration for academic study, subject planning, academic lessons preparation and support from the family.

Currently, many scholars have examined gender variation in the academic performance among the students. For instance, Nasir et al. (2025), Cen et al. (2025), Gaffar et al. (2024), Aziz et al. (2024) as well as Tsaousis and Alghamdi (2022) have conducted studies regarding this topic. Apparently, the concept of gender is multi-faceted and characterized by dynamic definitions and interpretations (Adesiyan et al., 2024). It is due to the

current definitions recognized that gender extends beyond the dichotomous types of male and female (Adesiyan et al., 2024). The emergence of intersex and transgender people gives a challenge to the traditional categorization of gender that is linked merely to biological sex (Hyde et al., 2019). However, to avoid the complexity of gender interpretation, this research follows the definition of gender by Parajuli and Thapa (2017) as socially constructed differences between male and female.

Previous studies have extensively examined gender differences in students' academic performance across various educational contexts, including general education (Tsaousis & Alghamdi, 2022) and higher education (Abedin et al., 2023). Research has also explored this issue within professional programs in the built environment, particularly architecture (Asaju et al., 2025). However, research examining gender differences in

academic performance within Town and Regional Planning program remains limited, particularly in research-oriented courses such as the Planning Project Paper. This gap warrants further investigation into whether academic performance in planning research courses varies by gender. Accordingly, this study seeks to answer the following research question: Is there a statistically significant gender difference in students' academic performance in the Planning Project Paper course? To address this question, the study aims to examine gender differences in students' academic performance in the course.

LITERATURE REVIEW

Numerous studies have examined gender differences in students' academic performance across different educational levels and academic disciplines. The findings of these studies can generally be classified into three main categories. First, some studies have reported that male students outperform their female counterparts. Second, other studies have found that female students achieve higher academic performance than male students. Third, several studies have reported no statistically significant gender differences in academic performance. These contrasting findings suggest that the relationship between gender and academic achievement may vary across educational contexts, academic disciplines, and assessment settings. Accordingly, this section reviews selected empirical studies representing these three categories to establish a broader understanding of gender differences in academic performance and to identify the research gap concerning students enrolled in the Planning Project Paper course within Town and Regional Planning program.

Previous Studies on Gender Variation in Academic Performance of Students

Several previous studies have reported that male students outperform their female counterparts in academic performance. For instance, Nasir et al. (2025) investigated gender differences among health sciences students across four dimensions: academic performance, aptitude, emotional intelligence, and grit. Their findings indicated that male students performed better than female students in academic performance, aptitude, and emotional intelligence. However, no statistically significant gender difference was observed in grit. The authors further highlighted the potential influence of psychological and social factors in shaping students' aptitude and achievement (Nasir et al., 2025). These findings suggest that gender differences may vary across different dimensions of student development and academic outcomes.

Similarly, Cen et al. (2025) examined gender differences in the relationship between mental health and academic performance among undergraduate medical students. Their findings indicated that mental health status was not significantly associated with academic performance among male students, whereas poorer mental health among female students was significantly associated with lower academic performance. Among female students, symptoms of somatization, interpersonal sensitivity, depression, paranoid ideation, and psychoticism, as well as sleep and dietary-related factors, were reported to be associated with poorer academic outcomes (Cen et al., 2025). This study highlights the potential importance of mental health and well-being in understanding gender-related patterns in academic performance. Nevertheless, these findings should be interpreted within the context of medical education and should not automatically be generalized to other academic disciplines.

Kumur et al. (2019) investigated gender differences in students' academic performance in a statistics program. Using a t-test to analyze the data, the researchers found that male students performed better than female students during both the 2014/2015 and 2015/2016 academic sessions. The study also raised concerns regarding female students' participation and opportunities to achieve comparable academic outcomes. However, the relationship between female enrolment and academic performance requires further empirical investigation before lower enrolment can be established as a direct explanation for the observed performance differences (Kumur et al., 2019).

In another study, Eshetu et al. (2015) examined gender differences in academic achievement using regional and national examination results. Their findings indicated that male students achieved higher average scores than female students in both examination contexts. The chi-square test further revealed that female students constituted a smaller proportion of the highest-achieving groups and a larger proportion of the lowest-achieving groups. The researchers also identified limited tutorial classes and inadequate guidance services as potential factors affecting female students' academic achievement (Eshetu et al., 2015). These findings highlight the possible influence of educational support and learning opportunities on academic outcomes. However, the extent to which these factors explain gender differences would depend on the evidence and analytical methods employed in the original study.

Overall, these studies provide examples of research reporting higher academic performance among male students in particular educational settings. Nevertheless, the findings also indicate that academic achievement may be associated with a range of psychological, social, and educational factors. Consequently, gender differences should not be interpreted as evidence of inherent differences in academic ability, as performance may also reflect differences in learning environments, student well-being, educational support, and assessment requirements.

Further studies have reported higher academic achievement among female students across different educational levels and academic disciplines. For example, Asaju et al. (2025) have analyzed the gender and academic performance among 167 undergraduate architectural students. The finding reveals that female students have a higher cumulative grade point average (CGPA) compared to males, showing higher overall academic performance. Nevertheless, male students score better than females in studio-related courses. It is believed that the high achievement of female students in theoretical coursework has influenced their academic performance. While better hands-on design tasks are the factors of higher scores of male students compared to female students (Asaju et al., 2025).

Based on a study done by Gaffar et al. (2024) regarding the gender disparity in academic performance among the undergraduate dental students. Their research findings showed a significant gender disparity in academic performance among the students. It is because female students consistently perform better than males throughout the academic year and in the examinations.

Aziz et al. (2024) examined gender differences in academic performance among secondary school students, focusing on mathematics and English. Their findings indicated that female students consistently achieved higher grades than male students in both subjects. The researchers associated female students' stronger academic performance with positive study habits, effective parental involvement, and higher levels of motivation (Aziz et al., 2024). These findings suggest that academic achievement may be influenced by learning behaviors, family support, and motivational factors, in addition to gender-related differences in observed performance.

Similarly, Tsaousis and Alghamdi (2022) investigated gender differences among high school graduates applying for higher education. Their analysis covered four cognitive and academic domains: verbal ability, school performance grades, scholastic aptitude, and quantitative ability. Overall, female students demonstrated stronger performance in verbal ability and school performance grades. A significant gender difference was also identified in the scholastic aptitude domain, although the findings were less robust because of the presence of numerous non-invariant items within that domain. In contrast, no statistically significant gender difference was observed in quantitative ability. The authors' findings highlighted the importance of verbal ability and previous academic achievement in understanding the observed differences between male and female students (Tsaousis

and Alghamdi, 2022). These results suggest that gender differences in academic performance may depend on the particular abilities measured and the assessment instruments employed.

In another study, Etaga et al. (2017) examined gender differences in academic performance among statistics students using an independent-samples t-test. The results indicated that female students obtained a higher final CGPA than male students. The researchers attributed this difference to female students' greater efforts to improve their academic performance compared with their male counterparts (Etaga et al., 2017). Nevertheless, differences in students' effort should be interpreted in accordance with the evidence provided by the original study, particularly when considering whether effort was measured directly or inferred from the observed academic outcomes.

Collectively, these studies provide evidence that female students may achieve higher academic results in cert-

ain educational settings. However, the findings also indicate that the observed differences may be associated with study habits, motivation, family support, verbal ability, previous academic achievement, and students' engagement with learning. These factors warrant consideration when examining gender differences across academic disciplines.

In contrast to studies reporting higher academic achievement among either male or female students, several researchers have found no statistically significant gender differences in academic performance. For instance, Abedin et al. (2023) investigated gender differences in academic performance among 156 university students. The researchers employed independent-samples t-tests and analysis of variance (ANOVA) to examine differences in students' academic outcomes. Their findings indicated that the observed differences between male and female students were not statistically significant (Abedin et al., 2023). This finding suggests that gender may not necessarily be associated with significant differences in academic achievement within every university student population.

Similarly, Onwumelu (2023) examined gender differences in academic performance among statistics students using ANOVA. Although the study identified a small difference in mean CGPA between male and female students, the difference was not statistically significant. Consequently, the findings did not provide sufficient statistical evidence to establish a gender-based academic performance difference within the sample (Onwumelu, 2023). This result highlights the importance of distinguishing between numerical differences in average academic scores and differences that are statistically significant.

Goni et al. (2015) also investigated gender differences in academic performance among 322 students in an education-related discipline. Using a t-test to analyze the data, the researchers found no statistically significant difference in academic performance between male and female students (Goni et al., 2015). The findings provide further evidence that gender differences in academic achievement are not consistently observed across educational settings.

Taken together, these studies demonstrate that the relationship between gender and academic performance is not uniform. Although the mean scores of male and female students may differ numerically, such differences do not necessarily indicate a statistically significant gap. The findings also suggest that the magnitude and statistical significance of gender differences may vary according to the student population, academic discipline, sample size, and assessment methods employed.

The studies reviewed demonstrate three broad patterns in the relationship between gender and academic performance. First, some researchers have reported higher academic achievement among male students, with possible explanations involving psychological and social factors, mental health, educational support, and performance in practical or design-oriented coursework. Second, other studies have found that female students achieve higher academic results, with potential contributing factors including study habits, parental involvement, motivation, verbal ability, performance in theoretical coursework, and learning effort. Third, several studies have reported no statistically significant gender differences, even when numerical differences in mean academic scores were observed.

These contrasting findings indicate that gender differences in academic performance should be interpreted within the context of the educational setting, the nature of the academic discipline, and the methods used to assess achievement. Furthermore, the factors associated with higher academic performance should not be regarded as universal explanations, as their relevance may differ between student populations and educational environments.

Despite the range of studies conducted in secondary education, higher education, statistics, health sciences, medical education, and architecture, the specific context of Town and Regional Planning education warrants further investigation. In particular, the Planning Project Paper differs from conventional examination-based courses because students are required to undertake a structured research process involving problem identification, literature review, research design, data collection, data analysis, interpretation, and academic writing. These requirements provide a distinct context in which to examine possible gender differences in academic performance.

Accordingly, the present study addresses this research gap by examining gender differences in the final academic marks obtained by Town and Regional Planning students in the Planning Project Paper course. Specifically, the study investigates whether the mean academic performance of male and female students differs statistically. The findings are expected to contribute to a more discipline-specific understanding of gender and academic achievement in planning education. The following section describes the research methodology adopted to achieve this objective.

METHODOLOGY

This research used a quantitative, cross-sectional approach by recording the students' gender and academic performance from the Universiti Teknologi MARA Perak Branch, Seri Iskandar, Malaysia during the semester of March - August 2025. The selected course was the Planning Project Paper. The subject had 37 registered students during the semester. This course was chosen for this study due to the general academic performance of the students which is good. However, which gender performs better in this course is still unknown.

The Planning Project Paper course introduces Part 6 students enrolled in the Diploma in Town and Regional Planning program to fundamental research methods and academic writing skills. Students are given the opportunity to select research topics based on their interests, provided that the topics are relevant to town and regional planning and receive approval from their appointed supervisors during the proposal stage. The course is conducted through continuous supervision throughout the final semester of the diploma program to guide students in completing their research projects.

In addition, two research workshop sessions are organized at the beginning and middle stages of the semester to monitor students' progress and ensure that their research activities remain aligned with the prescribed schedule. Student attendance is recorded for both supervisory meetings and research workshops. Each student is required to attend 20 supervision sessions with their respective supervisors as part of the process of completing the research project.

The written project paper is structured into three main chapters: (i) background of the study; (ii) data collection, analysis, and findings; and (iii) recommendations and conclusion. By the end of the semester, students are expected to demonstrate their ability to conduct research independently and produce an academic report addressing issues relevant to town and regional planning.

The data were secondary data obtained from the institutional records and were anonymized before analysis. The data consist of two primary variables: students' gender and their final marks for the course at the end of the semester. Gender is treated as the independent grouping variable, while final course marks constitute the dependent variable. It examines the academic performance of students within a single cohort. The final marks obtained by male and female students are compared to determine whether a statistically significant difference exists between the two groups. The analysis focuses on overall course performance rather than differences in individual assessment components.

The data were analyzed using IBM SPSS Statistics version 26. An independent samples t-test was employed to compare the mean final marks of male and female students. This statistical technique was selected because the study aims to determine whether the mean academic performance of two independent groups differs significantly. Gender is a categorical variable, while the final course marks are treated as a continuous outcome variable. The independent-samples t-test is appropriate for this comparison, provided that the observations are independent and the relevant distributional and variance assumptions are adequately addressed. The statistical results were interpreted using the t-statistic, degrees of freedom (df), and significance value (p), following established guidance on statistical analysis (Chua, 2006). The significance level was set at .05. Accordingly, a p-value below .05 indicates a statistically significant difference between the group means, whereas a p-value equal to or greater than .05 indicates insufficient statistical evidence to reject the null hypothesis.

Furthermore, to the significance test, the mean difference between male and female students was calculated to indicate the direction and magnitude of the observed difference in marks. Cohen's d was also used to estimate the standardized effect size. This measure provides information about the magnitude of the difference between the two groups, independently of the original marking scale. The null hypothesis ((H_0)) states that there is no statistically significant difference in the mean academic performance of male and female students in the Planning Project Paper course. The alternative hypothesis ((H_1)) states that a statistically significant difference exists between the mean marks of the two groups. By combining the independent-samples t-test, mean difference, and effect-size analysis, this study evaluates both the statistical significance and practical magnitude of the observed gender difference in academic performance.

FINDINGS AND DISCUSSION

This section presents the findings of the data analysis, beginning with a descriptive summary of students' overall academic performance in the Planning Project Paper course. Subsequently, an independent-samples t-test is presented to examine whether a statistically significant gender difference exists in students' academic performance.

Academic Performance of All Students

Overall, students demonstrated a satisfactory level of academic performance in the Planning Project Paper course. Table 1 presents the descriptive statistics for students' final marks. The marks ranged from a minimum of 37 to a maximum of 90, indicating a range of 53 marks. The mean score was 67.11, with a standard deviation of 10.530. These results indicate that the average academic performance was 67.11 marks, while the standard deviation reflects the extent to which individual students' marks varied around the mean.

Table 1: Statistics of Students' Final Mark

	N	Minimum	Maximum	Mean	Standard Deviation
Final Mark	37	37	90	67.11	10.530

Academic Performance of Students Based on Gender

Table 2 presents the descriptive statistics of students' academic performance according to gender. Male students obtained a mean mark of 64.87, with a standard deviation of 9.342 and a standard error of the mean of 2.412. In comparison, female students achieved a higher mean mark of 68.64, with a standard deviation of 11.219 and a standard error of the mean of 2.392.

These findings indicate that female students achieved a mean mark approximately 3.77 marks higher than male students. However, the standard deviation was higher among female students, suggesting greater variability in their academic performance compared with male students. The standard error of the mean was relatively similar for both groups, indicating comparable levels of precision in estimating their respective mean marks. Nevertheless, these descriptive statistics alone cannot establish whether the observed difference in mean marks is statistically significant. Therefore, an independent-samples t-test was conducted to determine whether the difference in academic performance between male and female students was statistically significant.

Table 2: Statistics of Students' Final Mark According to Gender

	Gender	N	Mean	Standard Deviation	Standard Error Mean
Final Mark	Male	15	64.87	9.342	2.412
	Female	22	68.64	11.219	2.392

With that, Table 3 presents the results of the independent samples t-test conducted to examine whether a statistically significant difference existed in academic performance between male and female students enrolled in the Planning Project Paper course. The analysis yielded a t-value of -1.071 with 35 degrees of freedom (df = 35) and p value of .291. Since the p-value exceeded the significance level of .05, the difference in mean marks between male and female students was not statistically significant. Therefore, the null hypothesis was not rejected. The mean difference between the two groups was -3.77 marks, calculated by subtracting the female students' mean mark from the male students' mean mark. This negative value indicates that female students achieved a higher mean mark (68.64) than male students (64.87). However, the observed difference was insufficient to establish a statistically significant gender difference in academic performance within the study cohort.

The effect size, measured using Cohen's d, was -0.358, indicating a modest, standardized difference between the two groups. The negative sign reflects the direction of the difference based on the order in which the groups were compared, rather than a negative effect on academic performance. Although female students obtained a higher mean mark, the effect-size estimate should be interpreted alongside the non-significant p-value and the limitations of the sample. Overall, the findings suggest that gender was not significantly associated with differences in academic performance in the Planning Project Paper course among the students examined. Although female students recorded a higher average mark, the evidence does not support the conclusion that the difference was statistically significant. This finding applies to the cohort studied and should not be generalized to all Town and Regional Planning students without further investigation involving larger samples and additional cohorts.

Table 3: Independent Samples T-test for Academic Performance and Gender

		Levene's Test				**t-test for Equality of Means**					**Cohen's d**
		For Equality of Variances							**95% Confidence Interval**		**Value***
		F	**Sig.**	**t**	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**Lower**	**Upper**	
Final Mark	**Equal variances assumed**	0.019	0.89	-1.071	35	0.291	-3.77	3.519	-10.913	3.374	-.35800241 (negative modest effect)
	Equal variances not assumed			-1.11	33.485	0.275	-3.77	3.397	-10.677	3.137	

*Note: 0.0 – 0.2 = weak effect; 0.21 – 0.50 = modest effect; 0.51 – 1.0 = moderate effect, greater than 1.0 = strong effect (Muijs, 2004). The negative sign (-) only indicates direction, not the quality. Negative d value means group 1 (male) scored lower than group 2 (female).

The result of no statistically significant gender difference was detected in the academic performance of students within this sample were parallel to the findings from studies done by Abedin et al. (2023), Onwumelu (2023) and Goni et al. (2015). Nonetheless, this finding shows contradiction to the studies conducted by Nasir

et al. (2025) and Cen et al. (2025) who discovered that male students outperform female students in academic performance. Moreover, this finding also disagrees with the studies done by Gaffar et al. (2024) and Aziz et al. (2024) who concluded that female students perform better than males in the academic achievement.

Overall, the findings suggest that gender was not a statistically significant factor associated with academic performance among students in the Planning Project Paper course within the cohort examined. Although female students achieved a higher mean mark than male students, the observed difference was not statistically significant. This finding suggests that gender alone may be insufficient to explain variations in students' academic achievement in this research-oriented course. Several factors may help explain the findings. First, the relatively small sample size may have limited the statistical power of the analysis, reducing the ability to detect a statistically significant difference between the two groups. Consequently, the absence of a statistically significant result should not be interpreted as definitive evidence that academic performance is identical between male and female students. Second, students' participation in supervision sessions and research workshops may have contributed to their academic performance. If students from both gender groups participated consistently in these learning activities, the guidance and academic support provided may have helped them develop the research and writing skills required to complete the course. However, this explanation remains tentative because the relationship between attendance, participation and academic performance was not directly examined in the present study.

Future research should therefore consider including a larger sample drawn from multiple cohorts to improve statistical power and strengthen the generalizability of the findings. Researchers should also examine students' attendance and participation in supervision sessions and research workshops, including the frequency of attendance and the extent of engagement in these activities. Where appropriate, these variables could be analyzed alongside gender to determine whether academic support and student engagement are associated with differences in final marks. Furthermore, future studies should investigate additional factors that may contribute to academic performance in the Planning Project Paper course. These may include prior academic achievement, research experience, motivation, time management, research self-efficacy, access to academic resources, supervisor support and the challenges students encounter during data collection and analysis. A broader analytical framework would provide a more comprehensive understanding of the factors associated with student achievement and help educators identify opportunities to improve teaching, supervision and learning support. In conclusion, the present study provides preliminary evidence that the difference in academic performance between male and female students was not statistically significant within the cohort examined. Rather than attributing academic achievement to gender alone, further research should adopt a broader perspective that considers student characteristics, learning experiences and academic support. Such evidence could inform the development of more effective supervision strategies and research-learning interventions for Town and Regional Planning students.

CONCLUSION AND RECOMMENDATION

The objective of this study was to examine gender differences in the academic performance of students enrolled in the Planning Project Paper course during the March - August 2025 semester. The findings revealed that there was no statistically significant difference in academic performance between male and female students in the cohort examined. Although female students achieved a higher mean mark than male students, the difference was not statistically significant at the .05 level. These findings suggest that gender alone may not adequately explain variations in students' academic performance in the Planning Project Paper course. However, this conclusion should be interpreted within the context and limitations of the present study. One of the main limitations of this research was its relatively small sample size, comprising only 37 students. This was attributable to the limited enrolment in the Planning Project Paper course during the semester under investigation. Nevertheless, the academic performance data of all 37 students in the cohort were included in the analysis. The study was also limited to a single course and one cohort from one academic semester, which may restrict the generalizability of the findings to students in other cohorts, academic years or educational settings. Furthermore, the study focused primarily on gender and final marks without examining other factors that may be associated with academic achievement. The marks were also given by different supervisors, and the effect of supervisors and of students' prior academic achievement was not controlled.

Future research should therefore involve larger samples drawn from multiple cohorts and academic years to improve statistical power and provide a more comprehensive understanding of gender differences in academic performance. Where feasible, studies could compare results across different institutions or academic settings to determine whether the findings are consistent across student populations. Researchers should also consider reporting confidence intervals alongside significance tests to provide a clearer indication of the precision of estimated differences. In addition, future studies should examine students' attendance and participation in supervision sessions and research workshops to investigate whether engagement in these learning activities is associated with academic performance. Other relevant variables could include prior academic achievement, research experience, motivation, time management, research skills, supervisor support and access to learning resources. Analyzing these factors alongside gender may help identify the conditions that support students' successful completion of research-oriented coursework. In conclusion, this study contributes preliminary evidence on gender differences in academic performance within the Planning Project Paper course. The absence of a statistically significant difference does not establish that male and female students perform identically; rather, it indicates that the study did not find sufficient statistical evidence of a difference within the cohort examined. Further research using larger samples, multiple cohorts and a broader range of explanatory variables is needed to develop a more comprehensive understanding of students' academic achievement. Such evidence may support improvements in research supervision, academic support and teaching strategies in Town and Regional Planning education.

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Ethical Consideration

This study was conducted in accordance with applicable ethical standards for academic research. The analysis involved students' academic performance records. There was no direct interaction with participants undertaken. Ethical approval was not sought, as the study was considered not to require formal ethical review under the applicable institutional requirements. The confidentiality of student data was maintained throughout the research process, and the data were used solely for academic and research purposes.

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