THE NEW FRONTIERS OF E-LEARNING: SHAPING THE FUTURE OF EDUCATION

PERFORMANCE TRENDS IN CONTINUOUS ASSESSMENTS: A CASE STUDY OF ENGINEERING STUDENTS IN A STATISTICS COURSE

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ABSTRACT

This case study describes and compares the academic performance of engineering students enrolled in the Statistics for Science and Engineering course, focusing on three formative assessments: a quiz, a group assignment, and a test. A total of 43 students from Mechanical, Electrical, and Chemical Engineering programs participated, representing academic semesters from Semester 5 to Semester 9. Descriptive statistics were used to analyse score distributions and identify performance patterns across programs and assessment types. The findings show variations in achievement, with Mechanical Engineering students generally outperforming others. These results highlight the need for targeted teaching approaches based on program-specific learning needs. In conclusion, understanding performance trends can help educators enhance assessment design and support student learning more effectively.

Keywords: engineering students, academic performance, quiz, test, descriptive statistics

Introduction

Assessment plays a crucial role in higher education as it provides feedback on student learning and reflects the effectiveness of teaching strategies. In engineering programmes, where conceptual understanding and analytical skills are vital, the use of continuous assessment such as quizzes, tests, and group assignments is increasingly adopted to track student progress before the final examination. Continuous assessment not only encourages consistent learning but also helps to identify students who may require additional support throughout the semester.

This study focuses on the performance of undergraduate students enrolled in the *Statistics for Science and Engineering* course. The course comprises 50% coursework (quizzes, tests, and group assignments) and 50% summative assessment (final examination). While final exams are designed to test cumulative understanding, coursework allows for ongoing engagement with core topics including probability distributions, hypothesis testing, estimation, analysis of variance (ANOVA) and regression. The present study analyses the performance of 43 students from three different engineering programmes; Mechanical, Electrical, and Chemical Engineering enrolled across several academic semesters. By comparing student achievement in both coursework and final examinations, this study aims to examine the relationship between programme enrolment, semester grouping, and student performance. Such comparison is important to identify whether performance patterns vary across

academic progression and discipline background. This study also provides a descriptive analysis to explore the distribution of marks and possible performance gaps between coursework and examination results. The findings may help academic coordinators and instructors to improve assessment practices, support struggling students, and enhance instructional alignment across programmes and levels of study.

Recent studies have explored the impact of continuous assessment on student performance in engineering programmes and statistics courses. Shifting from final exams to continuous assessment methods, such as weekly homework, has been shown to improve student performance and learning experiences (Paloposki et al., 2024). Field-based continuous assessments have been found to better evaluate key learning outcomes and foster student engagement compared to traditional end-of-year examinations (McNabola & O'Farrell, 2015). Educational data mining techniques have been used to identify factors affecting student performance in engineering statistics courses, allowing for targeted support and interventions (Zakaria et al., 2018). Additionally, continuous assessment has been demonstrated to act as a mediating variable between class attendance and final examination performance, highlighting the importance of consistent participation throughout the semester (Noh et al., 2019). These findings suggest that incorporating continuous assessment methods can positively impact student learning and performance in engineering and statistics courses.

Assignments, often more comprehensive and problem-based, require students to apply theoretical knowledge to practical scenarios. These can encompass homework problems, data analysis projects, or short reports. In a statistics course for engineering students, such assignments would likely involve applying statistical methods to engineering-specific problems, utilizing statistical software, or interpreting complex data outputs. While essential for cultivating deeper understanding and practical application skills, the direct predictive power of graded homework for test or final examination performance has been a subject of varying findings, with some studies suggesting a weaker correlation compared to in-class tests (Latif & Miles, 2020). Nevertheless, assignments remain invaluable for fostering the nuanced problem-solving abilities crucial for engineering disciplines.

Studies have examined the performance of engineering students in statistics courses, employing various analytical methods. N. Lohgheswary et al. (2022) applied the Rasch model to evaluate exam performance, categorizing students into high and low performers and questions into difficulty levels. Both studies aimed to improve student outcomes by identifying areas for targeted support. In other field, Rivera et al. (2013) investigated poor performance in a Statics course, which led to high dropout rates in engineering programs. These studies highlight the importance of understanding and addressing factors influencing student performance in engineering courses to enhance academic success and retention rates in engineering programs.

Understanding the interplay between different continuous assessment components and student demographics is vital for optimizing pedagogical practices in statistics courses for engineering students. The distinct roles of quizzes (formative, frequent checks), assignments (deep application, problem-solving), and tests (summative, comprehensive evaluation) each contribute uniquely to student learning and assessment outcomes. Furthermore, acknowledging the varying academic maturity of students across semesters and the disciplinary context of their specific engineering programs allows educators to tailor assessment strategies, provide targeted support, and ultimately enhance student success in mastering statistical concepts crucial for their engineering careers. This nuanced understanding supports the development of effective learning environments tailored to the diverse needs of engineering cohorts.

Methodology

This study adopted a quantitative case study approach involving a small, purposive sample of 43 engineering students enrolled in a Statistics course at a public university. The participants consisted of both male and female students from three engineering programs: Mechanical Engineering, Chemical Engineering, and Electrical Engineering. The students were from various semesters, ranging from Semester 5 to Semester 9. This study involved a total of 43 students enrolled in the Statistics for Science and Engineering course. As shown in Figure 1, students were from three academic programs: Mechanical Engineering (34.8%), Chemical Engineering (14.0%), and Electrical Engineering (51.2%).
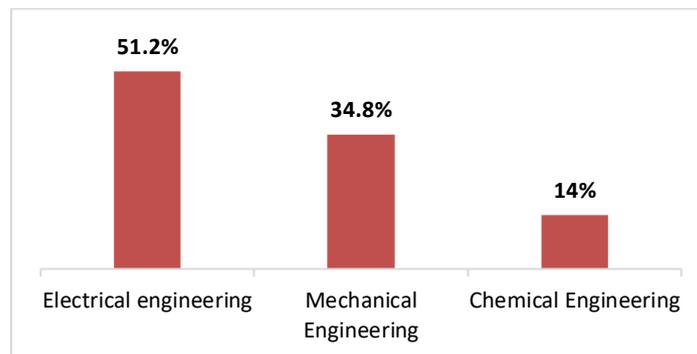

Figure 1: Percentage of Students by Programme

Figure 2 further illustrates the semester distribution of the students. The majority were from Part 5 (65.1%), while the rest were from Part 8 (14%), Part 7 (11.6%), Part 6 (7%), and Part 9 (2.3%). This diverse composition across programs and semesters helped ensure the representation of varying academic backgrounds and levels of experience in the analysis.
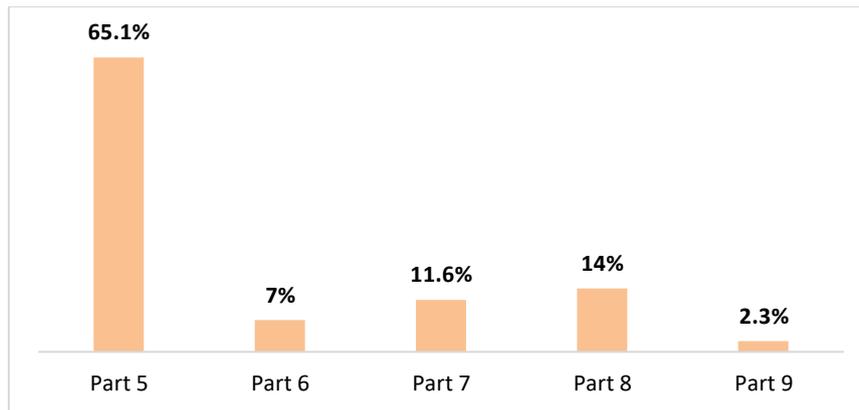
Figure 2: Percentage of Students by Student Semester

Data for this study comprised students' marks from three types of continuous assessments: quiz (10%), test (20%), and group assignment (20%), forming the overall coursework component (50%). The scores were compiled from two different lecturers who taught separate groups within the same course and coordinated the assessments together to ensure consistency. The data were analyzed using descriptive statistics, specifically means to identify general trends in student performance across the three programs and the three types of assessments. Each assessment type was compared across the programs to examine which program performed better or worse in each component. Additionally, the highest and lowest mean scores across the three assessments were identified to determine which type of assessment posed more challenges to students. The comparison was visualized using tables. This provides a clearer view of the student distribution within the sample, helping to contextualize the performance results. All analyses were conducted using Microsoft Excel and IBM SPSS Statistics software.

Results and Discussion

Table 1 presents descriptive statistics of quiz, assignment, and test scores for students from three engineering programmes: Electrical, Mechanical, and Chemical Engineering. The data were collected from **43 students** enrolled in the course and analysed using descriptive measures including minimum, maximum, and mean values. This approach enables comparison of student performance across different types of assessments. Electrical engineering students obtained a mean score of 63.1 in the quiz, with scores ranging from 25.0 to 100.0. For the assignment, their mean score was 68.3, with a minimum of 56.0 and a maximum of 84.0. The test results showed a lower mean score of 52.2, ranging from 24.0 to 96.0. Mechanical engineering students achieved the highest overall performance among the three groups. Their quiz mean score was 78.0 (min: 48.3, max: 100.0), assignment mean was 83.4 (min: 71.0, max: 93.0), and test mean was 75.0 (min: 37.0, max: 99.0). Chemical engineering students recorded the

lowest performance across all assessments, with a quiz mean of 38.6 (min: 20.0, max: 70.0), assignment mean of 66.8 (min: 60.0, max: 80.0), and test mean of 40.7 (min: 32.0, max: 55.0).

Table 1: Descriptive Statistics of Assessment Results by Engineering Programme

Programme	Assessment	Minimum	Maximum	Mean
Electrical Engineering	Quiz	25.0	100.0	63.1
	Assignment	56.0	84.0	68.3
	Test	24.0	96.0	52.2
Mechanical Engineering	Quiz	48.3	100.0	78.0
	Assignment	71.0	93.0	83.4
	Test	37.0	99.0	75.0
Chemical Engineering	Quiz	20.0	70.0	38.6
	Assignment	60.0	80.0	66.8
	Test	32.0	55.0	40.7

Table 2 shows the mean marks of quiz, assignment, and test results according to student semester. Students from Part 5 showed the highest overall mean scores across all assessments, with 72.6 in the quiz, 76.1 in the assignment, and 67.5 in the test. These results suggest that Part 5 students were the most consistent performers, possibly due to being in their core academic phase with strong engagement. Part 6 students had high assignment marks (78.0) but lower performance in quizzes (63.9) and particularly in the test (43.3), indicating challenges in time-pressured assessments. Part 7 students recorded even lower mean scores, with 52.3 in quiz, 61.6 in assignment, and 44.0 in test. Interestingly, Part 8 students, although small in number, scored similarly to Part 7, with relatively low means in all assessments. Part 9 students showed a mixed pattern, achieving high quiz (71.7) and assignment (80.0) scores, but their test mean was the lowest among all groups (32.0). This might be due to reduced academic focus nearing the end of their programme or low test-taking motivation. Overall, the trend highlights that middle-semester students (especially Part 5) tend to perform better across all types of assessments compared to students in early or late semesters.

Table 2: Mean Marks of Assessment Results by Student Semester

Semester	Quiz	Assignment	Test
Part 5	72.6	76.1	67.5
Part 6	63.9	78	43.3
Part 7	52.3	61.6	44.0
Part 8	38.6	66.8	40.7
Part 9	71.7	80.0	32.0

Conclusion

This study analysed the performance of 43 engineering students in a Statistics course. The students came from three programmes and different semesters. Mechanical engineering students scored the highest in all components; quiz, assignment, and test. Electrical and chemical engineering students had lower scores, especially in the test. Part 5 students performed the best overall. Part 8 and Part 9 students, mostly from chemical and electrical programmes, had lower test scores. This may be due to final-year workload or lower focus. Assignments gave better scores than tests. This may be because students had more time to complete them. Test scores were lower, possibly due to time limits or poor preparation. Programme and semester level may affect student performance. Educators can use this information to support weaker groups. Future studies should explore other factors such as learning methods, workload, and student motivation.

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