International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 24 (March 2025) PP. 357-371
DOI: 10.35631/IJMOE.724025


INTERNATIONAL JOURNAL OF MODERN EDUCATION (IJMOE)
www.ijmoe.com

# ASSESSING ADVANCED GEOTECHNICAL ENGINEERING STUDENTS' PERFORMANCE AND COURSE ASSESSMENT PLANS (CAP) DURING COVID-19 PANDEMIC

Juhaizad Ahmad[1*], Ng Kok Shien[2], Faizah Kamarudin[3], Masyitah Nujid[4], Ng Wen Kuan[5], Anas Ibrahim[6], Badrul Nizam Ismail[7]

[1] Civil Engineering Studies, College of Engineering, Universiti Teknologi MARA Cawangan Pulau Pinang, Permatang Pauh Campus, Pulau Pinang, Malaysia
Email: juhaizad@uitm.edu.my
[2] Civil Engineering Studies, College of Engineering, Universiti Teknologi MARA Cawangan Pulau Pinang, Permatang Pauh Campus, Pulau Pinang, Malaysia
Email: ngkokshien@uitm.edu.my
[3] Civil Engineering Studies, College of Engineering, Universiti Teknologi MARA Cawangan Pulau Pinang, Permatang Pauh Campus, Pulau Pinang, Malaysia
Email: faiza328@uitm.edu.my
[4] Civil Engineering Studies, College of Engineering, Universiti Teknologi MARA Cawangan Pulau Pinang, Permatang Pauh Campus, Pulau Pinang, Malaysia
Email: masyitahmn@uitm.edu.my
[5] Civil Engineering Studies, College of Engineering, Universiti Teknologi MARA Cawangan Pulau Pinang, Permatang Pauh Campus, Pulau Pinang, Malaysia
Email: ngwenkuan321@uitm.edu.my
[6] Civil Engineering Studies, College of Engineering, Universiti Teknologi MARA Cawangan Pulau Pinang, Permatang Pauh Campus, Pulau Pinang, Malaysia
Email: ceanas@uitm.edu.my
[7] Civil Engineering Studies, College of Engineering, Universiti Teknologi MARA Cawangan Pulau Pinang, Permatang Pauh Campus, Pulau Pinang, Malaysia
Email: badrulnizam@uitm.edu.my
[*] Corresponding Author

**Article Info:**

**Article history:**
Received date:31.07.2024
Revised date: 13.10.2024
Accepted date: 26.11.2025
Published date: 11.03.2025

**Abstract:**

The effects of COVID-19 on instruction and learning have been discussed in education. This study evaluates the students' performance before, during, and after the COVID-19 Movement Control Order (MCO) in the Advanced Geotechnical Engineering course. The methodology consists of data analysis of students' grades of Civil Engineering students in UiTM Penang throughout nine semesters, from March 2019 to October 2023. The semesters before COVID-19 are March 2019 and September 2019. When the MCO was announced in March 2020, all Teaching and learning were ordered to be

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 24 (March 2025) PP. 357-371
DOI: 10.35631/IJMOE.724025

**To cite this document:**

Ahmad, J., Ng, K. S., Kamarudin, F., Nujid, M., Ng, W. K., Ibrahim, A., & Ismail, B. N. (2025). Assessing Advanced Geotechnical Engineering Students' Performance And Course Assessment Plans (CAP) During Covid-19 Pandemic. *International Journal of Modern Education, 7* (24), 357-371.

**DOI:** 10.35631/IJMOE.724025



conducted via Online Distance Learning (ODL). There was only one semester involved during the MCO, which was the semester of September 2020, since this course was not offered during the semester of March 2020. The semesters from March 2021 onwards are conducted physically after lifting the MCO. The findings show that the students' performance drastically declined after the MCO. The Course Assessment Plan (CAP) was revised to better represent the computer modelling component. Then, good results were obtained. Many students can improve their CO (Course Outcomes) and PO (Programme Outcomes) attainment by excluding the final exam component in the assessment. The mean scores indicate that, on average, CO1-PO2 has the lowest performance, while CO3-PO12 has the highest average performance. The standard deviation reflects the variability of the scores. CO3-PO12 has the highest variability, indicating a wider range of student scores. In contrast, CO2-PO3 has the lowest variability. Overall, students' performance on project-based learning assignments is better than final exam assessment based on the student's grade in March 2023. It is preferable to practise the final exam assessment for foundational courses rather than the application course, which involves hands-on computer modelling. This will help the students to equip them with essential skills before entering the real working environment.

**Keywords:**

COVID-19, ODL, CAP, MCO, Students' Performance, Grade, Geotechnical Engineering

## Introduction

Every aspect of society has been affected by the COVID-19 pandemic, and higher education institutions are finding it difficult to adjust to the unexpected and unprecedented issues it has brought about. Academics had to navigate the challenging process of switching from traditional in-person instruction to remote and online learning environments. Under these circumstances, assessing student performance and the efficacy of course assessment plans (CAP) became critical, providing insight into the flexibility and durability of educational initiatives. Some changes were made to accept the assessment and evaluation in teaching and learning (T&L).

Education experts have been debating and researching the effects of COVID-19 on teaching and learning (Ibrahim et al., 2022; Kamaruzaman et al., 2022; Mohamed Shuhidan et al., 2022; Wincci et al., 2022). The COVID-19 epidemic has sparked conversations on learning loss, the necessity of rethinking education, and assessing various pedagogical approaches. There are disagreements on recovery tactics and how to diagnose and quantify the COVID-19 learning loss. Academicians debate the importance of prioritising recovery plans and addressing differential learning loss. A chance to reconsider education is provided by COVID-19, emphasising the where, when, and what of learning possibilities. Higher education institutions might also ponder and rethink post-COVID education.

The impact of COVID-19 on learning abilities varies among students. Studies have shown that university students may face challenges such as decreased academic performance, motivation, and engagement due to the pandemic (Lei, 2022). Additionally, research on students in SMPN 1 Anyar revealed that post-COVID-19, mathematical understanding abilities were relatively low (Bahadur, 2023). Furthermore, cognitive dysfunction has been linked to SARS-CoV-2 infection, affecting executive function, memory, and mood in patients. In the context of digital

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 24 (March 2025) PP. 357-371
DOI: 10.35631/IJMOE.724025

literacy, students at SMKN 4 Singkawang demonstrated high digital literacy skills during the pandemic, correlating positively with learning achievement in physics (Peskar et al., 2023). Lastly, a study on tertiary students in Bangladesh highlighted learning losses in the cognitive domain during online classes, while affective and psychomotor skills showed improvement (Rzepka et al., 2022).

A literature search using the string "student AND performance AND COVID-19 AND pandemic" showed more than 3000 Scopus papers related to this research. UiTM is at the top of the paper contribution, as depicted in Figure 1. So, there is a need to study the impact of the pandemic on engineering education due to the COVID-19 pandemic, especially in the Advanced Geotechnical Engineering courses.

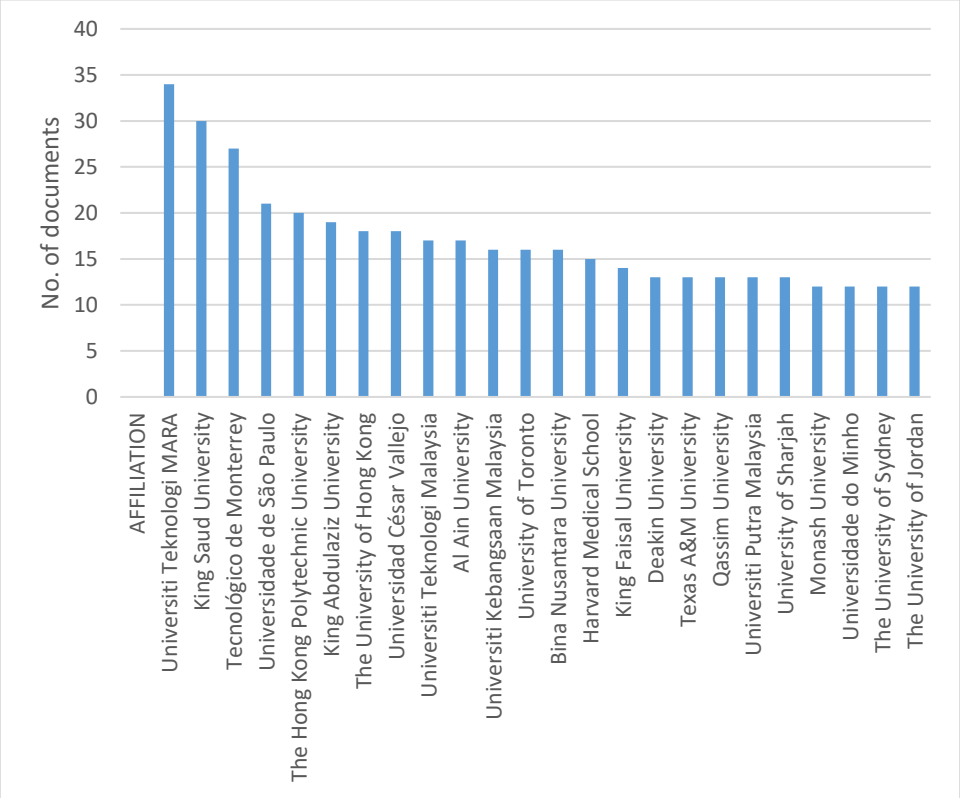


**Figure 1: University And Number Of Documents Related To This Research**
Source: SCOPUS

This study examines student performance in Advanced Geotechnical Engineering courses before, during, and after Covid-19. Like other courses, this course had to overcome the pandemic's uncertainty. After Malaysia imposed the Movement Control Orders (MCO) on March 18, 2020, as a containment measure, educational institutions in Malaysia were struck into new implementation. They had to adapt their methods for delivering courses and evaluating students swiftly.

Student performance before and after the COVID-19 pandemic has varied across different studies. The pandemic has heightened the academic deficiencies among some undergraduate engineering students, particularly those who were already struggling before the crisis. (Fontenelle-Tereshchuk, 2024). However, Vautier et al. 2023 found that student performance

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 7 Issue 24 (March 2025) PP. 357-371
DOI: 10.35631/IJMOE.724025
in animal genetics and large animal physiology courses was not negatively affected by the transition to online learning, with scores either increasing or being maintained during the pandemic. Shin et al. 2023 observed that reduced in-person learning during COVID-19 led to disparities in student performance between urban and rural regions, with more in-person learning associated with higher grades. Burkholder and Salehi (2023) noted that demographic gaps in high school preparation remained consistent during the pandemic, with first-generation students in STEM fields experiencing increased gaps in preparation compared to continuing-generation students. Additionally, a study by Isabel (2023), using the IPWRA methodology, found that students in higher education programs underperformed in mathematics during the pandemic compared to previous years.

Changing the assessment mode from final exams to project-based assignments in engineering students has shown positive outcomes. Studies have indicated that project-based learning improves student performance, engagement, and long-term learning effectiveness compared to traditional examinations (Gratchev, 2023; Zhang, 2023). Implementing project tracks like industry internships and projects (IIP) has enhanced students' skills, employability, and critical thinking, resulting in increased placement percentages and average packages (Ajinkya et al., 2023). Additionally, project evaluation processes have been used to assess personality development alongside academic performance, showing significant improvements in personality traits and learning skills over time (Nilima et al., 2023). Despite challenges posed by the COVID-19 pandemic, adapting to virtual supervision and management of final-year engineering projects has been well-received by students, leading to increased engagement and satisfaction with online presentation formats (Rasul et al., 2021).

Most existing research aims to provide insightful information on how to modify course assessment strategies within the curriculum and their impact on student performance. Through an analysis of data gathered before, during, and after the COVID-19 MCO period, this study seeks to clarify how these exceptional circumstances affected students' academic performance and the effectiveness of the Course Assessment Plan (CAP).

However, these changes are important not just for instructors and educational establishments seeking to enhance their online and hybrid learning approaches but also for the wider academic community since they add to the current conversation about the revolutionising impacts of the web on postsecondary education. This study has the potential to influence educational policies and practices in the future, promoting academic resiliency and flexibility as it continues to change in response to unanticipated obstacles. This study aims to evaluate the student's performance before, during, and after the COVID-19 Movement Control Order (MCO) in the Advanced Geotechnical Engineering course.

**Methodology**

The study's methodology consists of metadata analysis. The analysis is carried out on students' performance in 9 semesters. Descriptive statistics for grade achievement across all semesters were conducted using JASP software. JASP is a free and open-source tool for statistical analysis supported by the University of Amsterdam.

The semesters before COVID-19 are March 2019 and September 2019. The MCO was announced in March 2020, and following the announcement of MCO, all T&L were ordered to be conducted via Online Distance Learning (ODL). There were only two semesters involved,

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 24 (March 2025) PP. 357-371
DOI: 10.35631/IJMOE.724025

which are March 2020 and September 2020. Since this course was not offered during March 2020, only one semester can be analysed during MCO. From March 2021 onwards, the T&L was conducted physically (face-to-face) throughout the semesters because the Malaysian government lifted the MCO. Figure 2 illustrates the methodology of the study.

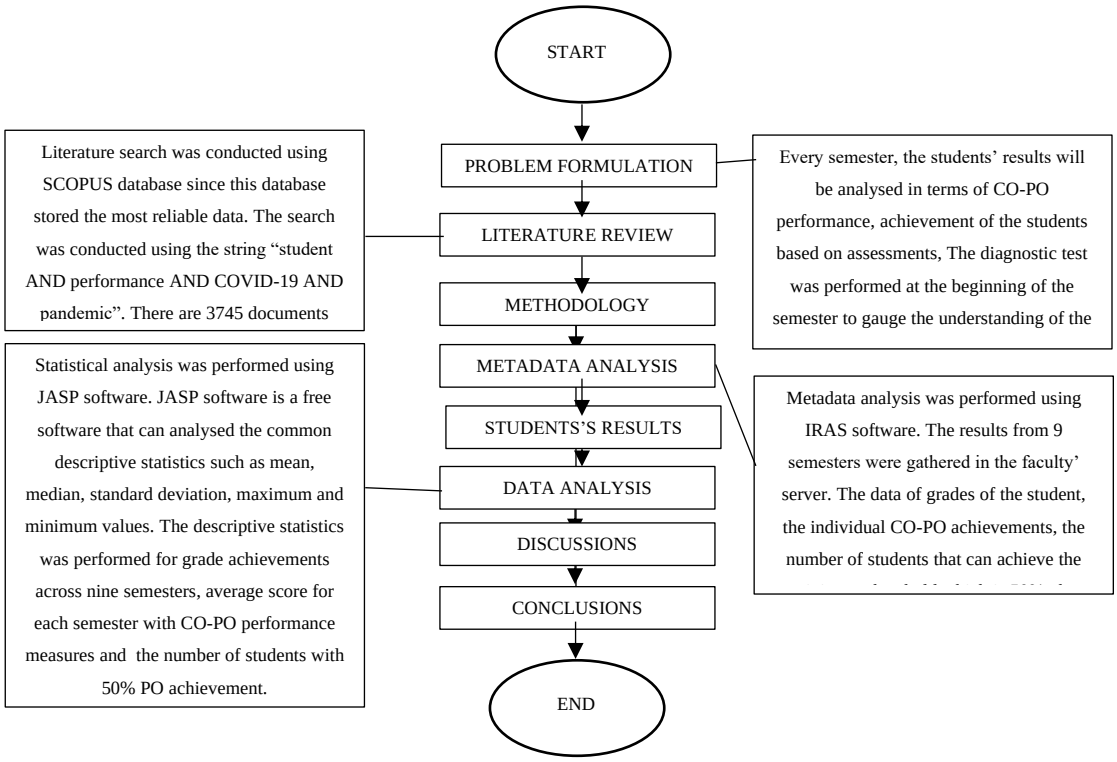


**Figure 2: The Methodology Of The Study**

The CAP is designed to assess students' attainment based on their CO-PO achievements. The CAP was changed twice in the last five years. The original CAP used before the MCO was implemented in both the March 2019 and September 2019 semesters. Owning to the MCO, the CAP was modified to accommodate the shift in teaching and learning (T&L) from a physical classroom setting to Online Distance Learning (ODL). The original CAP was reinstated during the March 2021 semester, after the MCO. Due to the high failure rate after the original CAP reintroduction, the CAP was changed again. This time, the final exam component was replaced with a project-based assessment. The changes were presented in front of the top management, and they agreed since UiTM's policy at that time was to reduce the number of final exam courses to 50% only.

The CAP mapping for CO-PO achievement before COVID-19 is displayed in Table 1. For this course, there are three Course Outcomes (CO). Every CO deal with a single Program Outcome (PO). CO 1 is about evaluating structural and infrastructural failure claims/events using the principles of science and engineering knowledge. CO1 addresses PO2, which is the ability to identify, formulate, research literature, and analyse complex civil engineering problems in reaching substantiated conclusions using principles of mathematics, natural sciences and engineering knowledge. The level of taxonomy cognitive domain is C1-C6. The teaching and learning activities involve face-to-face lectures and blended learning. CO1 is measured in tests (15%) and final exams (30%). Next, CO2 is concerned with developing solutions for

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 24 (March 2025) PP. 357-371
DOI: 10.35631/IJMOE.724025

geotechnical problems that meet specified needs. CO2 addresses PO3, which is the ability to design systems, components or processes for solving complex civil engineering problems that meet specified needs with appropriate consideration for public health and safety and cultural, societal, and environmental considerations. The level of taxonomy cognitive domain is C1-C6. The teaching and learning activities involve face-to-face lectures, blended learning, and technical talks by industrial panels. CO2 is measured in tests (15%) and final exams (30%). Both CO1 and CO2 are cognitive domains. On the other hand, CO3 is about performing calculations and numerical analyses on geotechnical problems. CO3 addresses PO12, which is the ability to recognise the need to undertake life-long learning and acquire the capacity to do so independently. The level of taxonomy affective domain is A1-A4. CO3 is measured in quizzes (10%),, which requires students to undertake an online course from Udemy.

**Table 1: CAP Mapping For CO-PO Attainment Before, During And After MCO**

| | | | BEFORE ASSESSMENT | | | DURING ASSESSMENT | | | | AFTER ASSESSMENT | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | PO | TAXONOMY DOMAIN | T&L | | | T&L | | | | T&L | | | |
| | | | | T | ASG | FE | | T | QUIZ | PRO | FE | | T | QUIZ | PRO | ASG |
| 1 | 2 | C1-C6 | L | 9 | | 36 | ODL | 9 | | 24 | 12 | L | 9 | | 24 | 12 |
| 2 | 3 | C1-C6 | L | 21 | | 24 | ODL | 21 | | | 24 | L | 21 | | | 24 |
| 3 | 12 | A1-A4 | L | | 10 | | ODL | | 10 | | | L | | 10 | | |

Note: L: Lecture, ODL: Online Distance Learning, T&L: Teaching and Learning, T: Test, ASG: Assignment, FE: Final Exam, PRO: Project

Table 2 shows the Student Learning Time (SLT) which include student preparation time (SPT) for Advanced Geotechnical Engineering course. It illustrates how the SLT is distributed across different topics in the course, highlighting the varying levels of time commitment required for each area of study. It also shows the distribution of time for face-2-face (F2F) and non-face-2-face (NF2F) of the T&L and SPT. This information enables students to effectively manage their time and prioritize their learning activities to meet the demands of the course. Topics such as stress strain relationship and stress path, and geotechnical modelling using numerical approach often form the backbone of geotechnical engineering education, providing fundamental principles and practical skills essential for the field. Furthermore, Eurocode 7 – Geotechnical Design is also crucial for understanding design standards and regulations governing geotechnical engineering projects.

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 24 (March 2025) PP. 357-371
DOI: 10.35631/IJMOE.724025

**Table 2: SLT for Advanced Geotechnical Engineering Course**

| No | Topics | Teaching and Learning Activity | | Student Preparation Time | Total | | | |
|---|---|---|---|---|---|---|---|---|
| | | Lecture | | Lecture | | | | |
| | | F2F | NF2F | SPT (NF2F) | SLT | F2F | NF2F | SPT (NF2F) |
| 1 | Stress strain relationship and stress path | 12 | 0 | 12 | 24 | 12 | 0 | 12 |
| 2 | Flexible retaining structure | 9 | 0 | 14 | 23 | 9 | 0 | 14 |
| 3 | Eurocode 7 – Geotechnical Design | 9 | 0 | 14 | 23 | 9 | 0 | 14 |
| 4 | Geotechnical modelling using numerical approach | 12 | 0 | 12 | 24 | 12 | 0 | 12 |
| | Total | 42 | 0 | 52 | 94 | 42 | 0 | 52 |
| Student Learning Time per week | | 3 | 0 | 3.7 | 6.7 | 3 | 0 | 3.7 |

## Results and Discussion

This study assessed student achievement using ultimate academic standings, calculated based on evaluations from final examinations, tests, projects, and quizzes. The evaluations demonstrated credibility and significance, as they facilitated the assessment of student aptitude and the establishment of impartial performance criteria.

The 497 student grades used in this study were collected from the iRAS systems established by Md Nor in 2000. Upon retrieval, the iRAS system transmitted the grades to the educator, assuming confidentiality would be upheld and barring sharing this data with external entities. After acquiring the data, the educator examined and processed it through the JASP software to compute specific metrics. These transformed metrics were then applied to draw inferences and corroborate the research hypothesis.

Table 3 shows the grade achievement for each semester. Before the MCO in the March 2020 semester, student performance was above average, and the failure rate was under 5%. The student's performance during the MCO is impressive, with more than 50% receiving an A- and above. However, the results fell dramatically when a face-to-face cognitive evaluation was conducted after the MCO. Only one student scored an A, and the failure rate rose steeply to

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 7 Issue 24 (March 2025) PP. 357-371
DOI: 10.35631/IJMOE.724025

21%. At this point, student performance is found to be controlled by the CAP. Thus, there has been a notable improvement in student performance since the CAP was modified in October 2021 and the project-based evaluation was introduced. The number of students achieving an A increased by nearly 50%, and the failure rate was below 1%. The student's performance is generally better when project-based assessment is introduced. Real project programming is better equipped for the students to face the challenging working environment these days, which requires the students to model real geotechnical engineering problems to forecast the behaviour of the soil.

**Table 3. Student Grade Achievement across 9 Semesters during Pre-COVID-19, MCO, and Post-MCO Periods**

| Sem | Period | Grade achievement | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | A+, A, A- | B+, B, B- | C+, C | C-, D+, D | E | F | Total | % Fail |
| March '19 | Pre-COVID-19 (CAP with Final Exam) | | 1 | 2 | | 1 | 1 | 5 | 40% |
| Sept '19 | Pre-COVID-19 (CAP with Final Exam) | 1 | 7 | 12 | | | 1 | 21 | 5% |
| March '20 | COVID-19 (Course not offered) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sept '20 | COVID-19 (CAP changed, Quiz was introduced, Project marks increased) | 71 | 50 | 12 | | 1 | 1 | 135 | 1% |
| March '21 | Post COVID-19 (CAP with Final Exam) | 1 | 12 | 25 | 6 | 4 | | 48 | 21% |
| Oct '21 | Post COVID-19 (CAP changed, without Final Exam) | 49 | 54 | 5 | | 1 | | 109 | 1% |
| March '22 | Post COVID-19 (CAP with Final Exam) | 1 | 1 | 3 | | 1 | | 6 | 17% |
| Oct '22 | Post COVID-19 (CAP with Final Exam) | 2 | 12 | 40 | 7 | 5 | 3 | 69 | 22% |
| March '23 | Post COVID-19 (CAP changed, without Final Exam) | 23 | 28 | 2 | | | | 53 | 0% |
| Oct'23 | Post COVID-19 (CAP without Final Exam) | 1 | 26 | 23 | 1 | | | 51 | 2% |

Descriptive statistics for grade achievement across all semesters are given in Table 4. The provided table represents the descriptive statistics for grade achievement across all semesters. A+, A, and A- have a high total number of students (149) with a mean of 14.9 and the highest variability (Std. dev. = 25.30). The scores range from 1 to 71, with a median of 1. B+, B, B- has the highest total number of students (191) with a mean of 19.1 and relatively high

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 24 (March 2025) PP. 357-371
DOI: 10.35631/IJMOE.724025

variability (Std. dev. = 19.91). The scores range from 1 to 54, with a median of 12. C+, C has a total of 124 students with a mean of 12.4 and moderate variability (Std. dev. = 13.11). The scores range from 2 to 40, with a median of 8.5. C-, D+, D has a low total number of students (14) with a mean of 1.4 and high variability (Std. dev. = 2.72). The scores range from 1 to 7, with a median of 0. E has a very low total number of students (13) with a mean of 1.3 and moderate variability (Std. dev. = 1.77). The scores range from 1 to 5, with a median of 1. F has the lowest total number of students (6) with a mean of 0.6 and low variability (Std. dev. = 0.97). The scores range from 1 to 3, with a median of 0. The data shows that most students fall into the B and A grade categories, with fewer students achieving lower grades. The variability in the number of students per grade category is highest for the top grades (A+, A, A-) and lowest for the failing grade (F).

**Table 4: The Descriptive Statistics For Grade Achievements Across Nine Semesters**

| Item | A+, A, A- | B+, B, B- | C+, C | C-, D+, D | E | F |
|---|---|---|---|---|---|---|
| Total student | 149 | 191 | 124 | 14 | 13 | 6 |
| Mean | 14.9 | 19.1 | 12.4 | 1.4 | 1.3 | 0.6 |
| Std. dev. | 25.30 | 19.91 | 13.11 | 2.72 | 1.77 | 0.97 |
| Min | 1 | 1 | 2 | 1 | 1 | 1 |
| Max | 71 | 54 | 40 | 7 | 5 | 3 |
| Median (50%) | 1 | 12 | 8.5 | 0 | 1 | 0 |

Figure 3 illustrates the average score for each semester. The bar chart compares the average scores (%) of three different performance measures (CO1-PO2, CO2-PO3, CO3-PO12) over 9 semesters (March '19, Sept '19, Sept '20, March '21, Oct '21, March '22, Oct '22, March '23, Oct '23). CO1-PO2 shows a fluctuating trend. Starting at a low point in March '19, it peaks in Sept '20 and Oct '21 and shows variability in other periods. CO2-PO3 demonstrates more stability with generally high scores compared to CO1-PO2. It has peaks in Sept '19 and Oct '22. CO3-PO12 consistently scores high, peaking in Oct '21 and maintaining a high level in March '23 and Oct '23. Overall, each CO-PO shows unique trends, with CO3-PO12 generally achieving the highest scores, CO2-PO3 showing consistent performance, and CO1-PO2 displaying more variability.

International Journal of Modern Education
EISSN: 2637-0905
Volume 7 Issue 24 (March 2025) PP. 357-371
DOI: 10.35631/IJMOE.724025

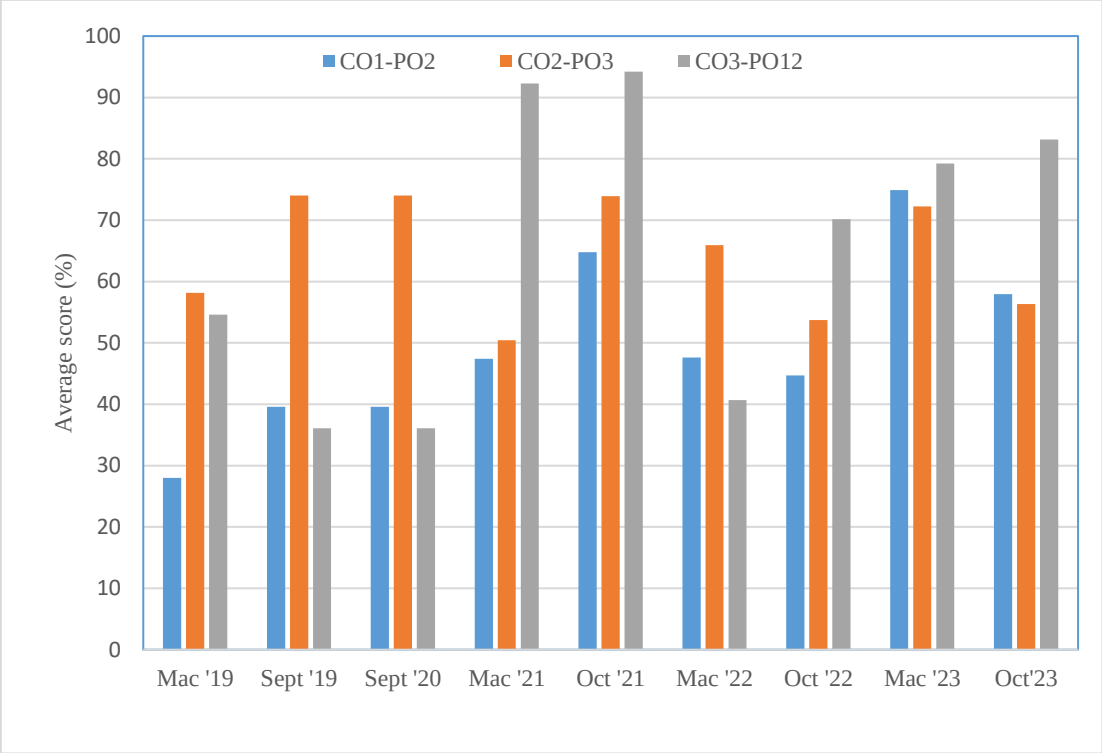


**Figure 3: The Average Scores for Three Performance Measures (CO1-PO2, CO2-PO3, CO3-PO12) over 9 semesters**

Table 5 shows the descriptive statistics for average score for each semester. It provides statistical summary represents key descriptive statistics (mean, standard deviation, minimum, maximum, and median) for three different performance measures. The mean scores indicate that, on average, CO1-PO2 has the lowest performance, while CO3-PO12 has the highest average performance. The standard deviation reflects the variability of the scores. CO3-PO12 has the highest variability, indicating a wider range of student scores. In contrast, CO2-PO3 has the lowest variability. The minimum scores show the lowest performance recorded for each measure. CO3-PO12 has the lowest minimum score. The maximum scores highlight the highest performance recorded for each measure. CO3-PO12 has the highest maximum score, showing that some students performed very well in this measure. The median represents the middle value when the scores are ordered from lowest to highest. CO1-PO2 has the lowest median, while CO3-PO12 has the highest, indicating that more than half of the students scored at least 70 in CO3-PO12. All in all, CO1-PO2 shows moderate average performance with moderate variability. CO2-PO3 exhibits higher average performance with lower variability while CO3-PO12 demonstrates the highest average performance and the greatest score variability.

International Journal of Modern Education
EISSN: 2637-0905
Volume 7 Issue 24 (March 2025) PP. 357-371
DOI: 10.35631/IJMOE.724025

**Table 5: The Descriptive Statistics For Average Score For Each Semester With CO-PO Performance Measures**

| Descriptive statistics | CO1-PO2 | CO2-PO3 | CO3-PO12 |
|---|---|---|---|
| Mean | 49.39 | 64.30 | 65.17 |
| Std dev. | 13.50 | 9.14 | 22.43 |
| Min | 40 | 50 | 36 |
| Max | 75 | 74 | 94 |
| Median (50%) | 47 | 66 | 70 |

Figure 4 shows the number of students with 50% PO achievement. It illustrates the number of students achieving more than 50% in three performance measures (CO1-PO2, CO2-PO3, CO3-PO12) across various semesters. For CO1-PO2, the number of students surpassing 50% starts very low in March '19, gradually increases, and peaks significantly in Oct '21. There's a noticeable drop in subsequent periods, with slight fluctuations. On the other hand, CO2-PO3 also starts low in early periods but sees a dramatic increase in March '21, peaking in Oct '21, followed by a sharp decline and minor fluctuations in later periods. Meanwhile, for CO3-PO12, similarly, the number of students achieving over 50% starts low, rises notably in March '21, peaks in Oct '21, and then stabilizes at a relatively higher level compared to the other two measures in later periods. Overall, all three performance measures show a significant increase in students achieving over 50% around March '21 and Oct '21, followed by a decline and stabilization in later periods. The CO3-PO12 measure generally maintains higher numbers of students above the 50% threshold compared to CO1-PO2 and CO2-PO3.

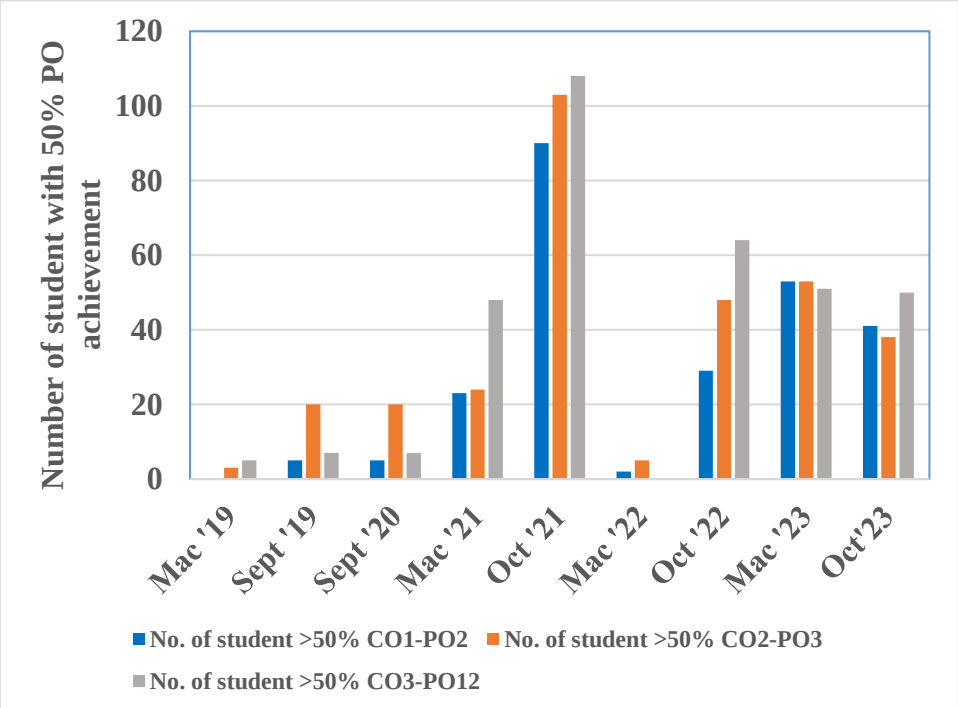


**Figure 4: The Number Of Students With 50% PO Achievement**

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 24 (March 2025) PP. 357-371
DOI: 10.35631/IJMOE.724025

Table 6 shows the descriptive statistics for the number of students with 50% PO achievement. The mean scores indicate that, on average, CO3-PO12 has the highest performance, while CO1-PO2 has the lowest. The standard deviation reflects the variability of the scores. CO3-PO12 has the highest variability, indicating a wider range of student scores. In contrast, CO1-PO2 has the lowest variability, though all measures show considerable spread in their scores. The minimum scores show the lowest performance recorded for each measure. CO3-PO12 has the lowest minimum score, indicating that some students scored poorly in this measure. The maximum scores highlight the highest performance recorded for each measure. CO3-PO12 has the highest maximum score, showing that some students performed very well in this measure. The median represents the middle value when the scores are ordered from lowest to highest. CO3-PO12 has the highest median, indicating that more than half of the students scored at least 48. In contrast, CO1-PO2 and CO2-PO3 have lower medians, showing that more than half of their students scored below 25. In summary, CO1-PO2 shows the lowest average performance with moderate variability and a low median. CO2-PO3 exhibits higher average performance compared to CO1-PO2 with similar variability and a slightly higher median. CO3-PO12 demonstrates the highest average performance but also the greatest variability in scores. It has the widest range of scores from 0 to 108 and a significantly higher median.

Table 7 shows the student failure rate comparison between the Forensic Engineering and Advanced Geotechnical Engineering courses in UiTM Permatang Pauh. A forensic engineering course was chosen for comparison purposes because the changes in CAP of these courses are conducted at the same time. From this table, the Pre-COVID-19 (Sept '19) showed that the students performed at a moderate level for both courses, with the CAP including a final exam. During the COVID-19 semester in September 2020, changes were introduced to the CAP, including quizzes and increased project marks. Here, the failure rate remained very low (1%). Post COVID-19 semester in March '21, the CAP still included final exams, and the percentage was notably higher (21% for the Advanced Geotechnical Engineering course, but no failure recorded for the Forensic Engineering course). This is because the Forensic Engineering course is a theoretical course that does not involve any calculation. The Advanced Geotechnical Engineering course is tougher than the Forensic Engineering course because students need to memorise the theoretical parts and master the design of geotechnical engineering structures. Therefore, the is a mark different for both courses. However, in the semester of October 2021, after CAP changes and the removal of final exams, the failure rate dropped to just 1% for the Advanced Geotechnical Engineering course, while the Forensic Engineering course maintained a zero-failure rate. In the semester of October 2022, the students' performance dropped significantly for both courses (17% and 22%) due to the reintroduction of the final exam component. This indicate that the students are not ready for the final exam after the face-to-face class. The trend is almost the same in other engineering courses as well.

**Table 6: Descriptive Statistics For The Number Of Students With 50% PO Achievement**

| Descriptive statistics | **CO1-PO2** | **CO2-PO3** | **CO3-PO12** |
|---|---|---|---|
| Mean | 27.56 | 34.89 | 37.78 |
| Std dev. | 28.25 | 29.10 | 34.06 |
| Min | 2 | 5 | 0 |
| Max | 90 | 103 | 108 |
| Median (50%) | 23 | 24 | 48 |

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 7 Issue 24 (March 2025) PP. 357-371
DOI: 10.35631/IJMOE.724025

**Table 7: Comparison On Student Failure Rate Between Forensic Engineering And Advanced Geotechnical Engineering Courses**

| Period | Semester | Forensic Eng. (Ahmad et al. 2024) | Advanced Geo. Eng. |
|---|---|---|---|
| Post COVID-19 (CAP with Final Exam) | Oct '22 | 15% | 22% |
| Post COVID-19 (CAP with Final Exam) | March '22 | 1% | 17% |
| Post COVID-19 (CAP changed, without Final Exam) | Oct '21 | 0% | 1% |
| Post COVID-19 (CAP with Final Exam) | March '21 | 0% | 21% |
| COVID-19 (CAP changed, Quiz was introduced, Project marks increased) | Sept '20 | 1% | 1% |
| Pre-COVID-19 (CAP with Final Exam) | Sept '19 | 2% | 5% |

## Conclusion

The objectives are to assess student performance before, during, and after the MCO period. Each semester, the CAP adjustments based on CQI implementation was evaluated. Results show that the lowest percentage failure grade for semester March 2023 when the new CAP was implemented, which had no final exam, with 43.3% of students scoring a minimum of A-. The final assessment for the semester was evaluated with a project instead of the final exam. The course's emphasis on project-based assessment makes it more suitable for advanced geotechnical engineering courses. Final exams are better suited for foundational courses. This approach produces positive results and encourages students to study more effectively. Since engineers often deal with complex geotechnical engineering problems, project-based evaluation is valuable for developing competent future engineers.

## Acknowledgment

The authors would like to express their gratitude and thanks to UiTM Cawangan Permatang Pauh for funding this research.

## Conflict Of Interest Statement

The authors agree that this research was conducted without any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 7 Issue 24 (March 2025) PP. 357-371
DOI: 10.35631/IJMOE.724025

**Authors' contributions**

**Juhaizad Ahmad:** Ideas; formulation or evolution of overarching research goals and aims. **Ng Kok Shien:** Provision of study materials. **Faizah Kamarudin:** Proofreading and Synthesis of data. **Masyitah Nujid:** Application of statistical analysis. **Ng Wen Kuan:** Synthesize study data. **Anas Ibrahim:** Management activities to present at the Academic Meeting on the change of CAP. **Badrul Nizam Ismail:** Data analysis.

**References**

Ahmad, J., Abdul-Aziz, N., Ibrahim, A. & Kusumawardani, R. (2024). Assessing Student Performance and Course Assessment Plans (CAP) in Forensic Engineering Before, During, and After the COVID-19, *Navigating Shared Futures In Social Innovations, Management, Economics and Engineering 2024 (SIME 2024),* ISBN pending

Ajinkya, K., Patil, K., Pruthviraj, C., Chavan, S.V., Chatanya. C., Sharad, D. & Patil, D. (2023). Enhancement in Student Employability by Providing Internship and Project Track, *Journal of Engineering Education Transformations*, doi: 10.16920/jeet/2023/v36is2/23008

Bahadur, K. (2023). The Effect of The Corona Virus Disease of 2019 (COVID-19) Pandemic on The Learning Situation, *Education Journal*, doi: 10.3126/tej.v11i1.54457

Burkholder, E. & Salehi. S. (2023). Effects of the COVID-19 pandemic on academic preparation and performance: a complex picture of equity, *Frontiers in Education*, doi: 10.3389/feduc.2023.1126441

Fontenelle-Tereshchuk, D. (2024). Academic writing and ChatGPT: Students transitioning into college in the shadow of the COVID-19 pandemic, *Discover Education, Springer Nature*, 3:6, https://doi.org/10.1007/s44217-023-00076-5

Gratchev, I. (2023). Replacing Exams with Project-Based Assessment: Analysis of Students' Performance and Experience" *Education Sciences,* doi: 10.3390/educsci13040408

Ibrahim, Z., Hussin, N., Wan Mokhtar, W.N.H. & Hashim, H. (2022). Assessing the Effect of Digital Social Media Towards Face-to-Face Communication during Pandemic COVID-19 in Higher Educational Institutions, *Environment-Behaviour Proceedings Journal*, 7(SI10), 41–46, https://doi.org/10.21834/ebpj.v7iSI10.4099

Isabel T. A. (2023). Influence of COVID-19 Confinement and Pandemic on the Academic Performance of Students, *Proceedings in Engineering Mechanics*, doi: 10.1007/978-3-031-25401-7_1

Kamaruzaman, M.F., Abdul Majid, F., Md Shamsudin, N. & Khalid, F. (2022). Exploring Home-Based Learning by Using Mobile for Children with Autism During Covid-19 Pandemic, *Environment-Behaviour Proceedings Journal*, 7(SI7), 9–14. 2022 https://doi.org/10.21834/ebpj.v7iSI7.3758

Lei, X. (2022). The impact of emotion management ability on learning engagement of college students during COVID-19, *Frontiers in Psychology*, doi: 10.3389/fpsyg.2022.967666

Mohamed Shuhidan, S., Wan Yahaya, W.A., Hashim H. & Baharudin M.F. (2022). Influence of Digital Literacy on Learning Engagement among Secondary Students in Malaysia, *Environment-Behaviour Proceedings Journal*, 7(SI10), 135–139. 2022https://doi.org/10.21834/ebpj.v7iSI10.4114

Nilima, S., Deepika, K. & Hu, Y. C. (2021). Impact on the personality of engineering students based on project-based learning. *Computer Applications in Engineering Education*, doi: 10.1002/CAE.22412

Peskar, M., Šimunič, B., Šlosar., L., Pišot., S., Teraž., K., Gasparini., M., Pišot., R. & Marusic, U. (2023). Effects of COVID-19 on cognition and mood after

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
**Volume 7 Issue 24 (March 2025) PP. 357-371**
**DOI: 10.35631/IJMOE.724025**

hospitalization and at 2-month follow-up, *Frontiers in Psychology*, doi: 10.3389/fpsyg.2023.1141809

Rasul, M., Nirmal, K. & Mandal, K. (2021). Supervision and management practices of Final Year Engineering Projects: Impacts of COVID-19 Pandemic. *Research in Engineering Education Symposium*, doi: 10.52202/066488-0058

Rzepka., N., Simbeck., K. & Müller H. (2022). Impact of the Covid-19 pandemic on students' spelling ability, *Research on Education and Media*, doi: 10.2478/rem-2022-0022

Shin., C. K., An., Y.U. & Oh, S. Y. (2023). Reduced in-person learning in COVID-19 widens student achievement gaps in schools, *Asia Pacific Education Review*, doi: 10.1007/s12564-023-09862-0

Vautier., A., Kellie, E., Caitlin, N. & Cadaret N. (2023). Impacts of the COVID-19 Pandemic on Student Performance and Perceptions of Learning, *NACTA Journal*, doi: 10.56103/nactaj.v67i1.94

Wincci, S., Sim, Y.E., Saiful Bahar, A.A. & Jamalludin, N. I. (2022). Practice Based Research on Music Artist Brand Online Music Video Production, *Environment-Behaviour Proceedings Journal*, 7(SI9),559–561, https://doi.org/10.21834/ebpj.v7iSI9.3956

Zhang, D. (2023). Open-Topic Project-Based Learning and Its Gender-Related Effect on Students' Exam Performance in Engineering Mechanics, *Journal of Civil Engineering Education*, doi: 10.1061/jceecd.eieng-1919