

# Impact of COVID-19 on the mechanical engineering students' academic performance: A case study of Universiti Teknikal Malaysia Melaka

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**ABSTRACT** – This study analyzes the academic performance of Mechanical Engineering students at Universiti Teknikal Malaysia Melaka (UTeM) before and after coronavirus (COVID-19). The collected data were analyzed using Minitab software, and a survey was conducted to identify the factors that contribute to students' academic performance as a result of the COVID-19. It was discovered that COVID-19 has a significant impact on students' academic performance, with their cumulative grade point average (CGPA) improving modestly when the online environment was implemented. According to multivariate correspondence analysis, the most significant factors that contribute to students' academic performance are lecturers' attitudes toward online learning and online learning course flexibility.

## 1. INTRODUCTION

Since March 2020, the sudden emergence of the coronavirus (COVID-19) pandemic has impacted practically every industry sector, including higher education institutions worldwide [1]. During this vital stage of the COVID-19 pandemic, most countries worldwide moved to online education [2]. Due to the closure of all academic institutions around the country, the Ministry of Higher Education Malaysia opted to compensate for the teaching process through an online teaching system. Since then, public universities across the country have seen online teaching as a new phenomenon during the COVID-19 pandemic.

Hence, one of the COVID-19 outcomes that may be impacted is students' academic performance as they experience their first attempt towards online teaching. To address the significance of online teaching in such emergency situations, the present study examines the effects of COVID-19 on the academic performance of Mechanical Engineering students at Universiti Teknikal Malaysia Melaka (UTeM). Additionally, the factors affecting their academic performance can be quantified by survey data.

## 2. METHODOLOGY

The data for this study was gathered from the database of UTeM. Qualitative and quantitative variables comprise students' data from Semester 2-2018/2019 to Semester 1-2020/2021 cohorts enrolled in the UTeM Bachelor of Mechanical Engineering program. The data were separated into two categories: before COVID-19 (Semester 2-2018/2019 and Semester 1-2019/2020) and

after COVID-19 (Semester 2-2019/2020 and Semester 1-2020/2021). The collected data were analyzed using Minitab software to compute the mean, standard deviation, percentage, and frequency of the respondent's demographic profile.

The survey questions (Table 1), consisting of 10 questions with a 5-point Likert scale, were adapted from [3] to identify the factors that contribute to students' academic performance due to the outbreak of COVID-19. This questionnaire was utilized in the initial reliability test to ensure that the responses acquired via the instrument were consistent and reliable. Cronbach's alpha was used to measure the instrument's reliability, which was found to be extremely reliable with a score of 0.9351. All the respondents (82 lecturers; 240 students) in the survey, including lecturers and students, are from Fakulti Kejuruteraan Mekanikal, UTeM. The data were analyzed using multivariate correspondence analysis from the perspectives of the lecturers and the students.

Table 1 Survey questions for factors that contribute to students' academic performance due to COVID-19.

Q1	Learner/ Student attitude toward computers/ technology.	
Q2	Instructor/ Lecturer response timeliness.	
Q3	Instructor/ Lecturer attitude toward online learning.	
Q4	Online learning course flexibility.	
Q5	Online learning course quality.	Likert scale: (1) Strongly disagree.
Q6	Technology quality (ULearn, Webex and another platform that instructor/ lecturer is using).	(2) Disagree. (3) Neutral. (4) Agree.
Q7	Internet quality.	(5) Strongly agree.
Q8	Perceived ease of use (ULearn, Webex and another platform that instructor/ lecturer is using).	
Q9	Perceived usefulness (ULearn, Webex and another platform that instructor/ lecturer is using).	
Q10	Diversity in assessment.	

### 3. FINDINGS

Table 2 shows the descriptive statistics for students' cumulative grade point average (CGPA) before and after COVID-19. On average, students' CGPA increases from Year 1 to Year 4 for each semester regardless of the COVID-19 situation. However, as shown in Figure 1, the median CGPA of students in Semesters 2-2019/2020 and 1-2020/2021 has increased slightly. At least 50% of students have a CGPA of 3.00 or above, compared to before COVID-19. In general, the CGPA can be categorized into three groups: I. CGPA < 2.00, II. 2.00 ≤

CGPA ≤ 3.49, III. CGPA ≥ 3.50. As illustrated in Figure 2, there is a significant decrease for the category of students who obtained CGPA < 2 following the COVID-19. Meanwhile, the CGPA of students in categories II and III has increased marginally following the COVID-19. This demonstrates that COVID-19 has a considerable effect on students' academic performance. This effect could be because the online environment creates active learning opportunities for students that help them engage with challenging concepts or provide self-assessment of self-reflection opportunities.

Table 2 Descriptive statistic of students' CGPA based on years of study.

Semester-Session	Year of Study	Minimum	Maximum	Mean	Standard Deviation
2-2018/2019	1 (N = 149)	0.17	3.99	2.65	0.74
	2 (N = 300)	1.31	3.96	2.89	0.49
	3 (N = 263)	2.00	3.93	2.91	0.44
	4 (N = 25)	1.89	3.83	3.11	0.51
1-2019/2020	1 (N = 172)	1.24	3.96	2.82	0.55
	2 (N = 227)	1.70	3.99	2.94	0.54
	3 (N = 291)	1.80	3.95	2.87	0.49
	4 (N = 217)	2.04	3.91	2.90	0.42
2-2019/2020	1 (N = 173)	1.58	3.87	2.93	0.46
	2 (N = 183)	2.00	4.00	3.02	0.47
	3 (N = 297)	1.92	3.95	2.94	0.45
	4 (N = 50)	2.59	3.85	3.27	0.32
1-2020/2021	1 (N = 153)	0	3.82	2.97	0.54
	2 (N = 293)	0	3.91	3.06	0.48
	3 (N = 229)	2.10	3.99	3.04	0.40
	4 (N = 230)	2.03	3.93	2.95	0.41

N = frequency

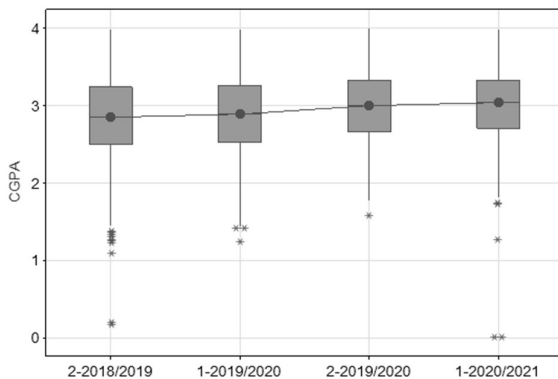


Figure 1 Box plot of students' CGPA for every semester.

Table 3 summarizes a descriptive of respondents' demographic based on the survey research questions for teaching modality and factors contributing to an improvement in the students' academic performance. When it comes to overall preferences, it is clear that both lecturers and students prefer online teaching classes, with a total of 117 respondents, while most respondents (205) prefer face-to-face teaching. According to the plot in Figure 3, from the lecturer's perspective, the most significant factors that contribute to students' academic performance is lecturers' attitudes toward online learning (Q3 tend to be associated with "Agree" and positioned close to each other). However, from the students'

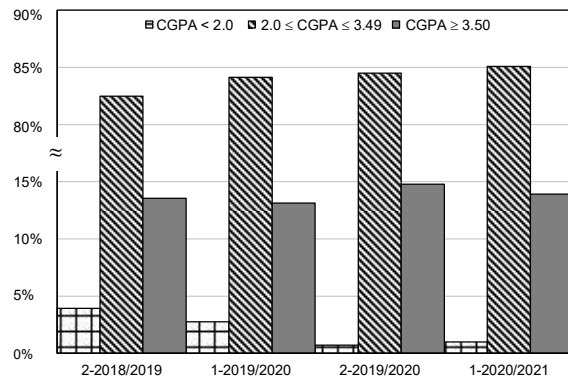


Figure 2 Three groups of CGPA for every semester.

perspective, online learning course flexibility (Q4 tend to be associated with "Strongly agree" and positioned close to each other) are the most significant factors contributing to their academic performance.

### 4. SUMMARY

COVID-19 impacted the improving academic performance of Mechanical Engineering students at UTeM when the online environment was implemented. According to the survey analysis, the most significant factors that contribute to students' academic performance are lecturers' attitudes toward online learning and online learning course flexibility.

Table 3 Descriptive statistic of respondents' demographic based on the survey research questions.

Lecturer		Teaching Experience	Preference	Male	Female	Total
Lecturer	5 - 10		Online teaching	2	3	5
			Face-to-face teaching	10	7	17
			Total	12	10	22
	11 - 15		Online teaching	4	5	9
			Face-to-face teaching	12	1	13
			Total	16	6	22
	> 15		Online teaching	8	4	12
			Face-to-face teaching	24	2	26
			Total	32	6	38
Total		Online teaching	14	12	26	
		Face-to-face teaching	46	10	56	
		Total	60	22	82	
Student		Year of Study	Preference	Male	Female	Total
Student	1		Online teaching	20	4	24
			Face-to-face teaching	36	11	47
			Total	56	15	71
	2		Online teaching	18	2	20
			Face-to-face teaching	26	10	36
			Total	44	12	56
	3		Online teaching	13	11	24
			Face-to-face teaching	15	5	20
			Total	28	16	44
	4		Online teaching	17	6	23
			Face-to-face teaching	31	15	46
			Total	48	21	69
Total		Online teaching	68	23	91	
		Face-to-face teaching	108	41	149	
		Total	176	64	240	

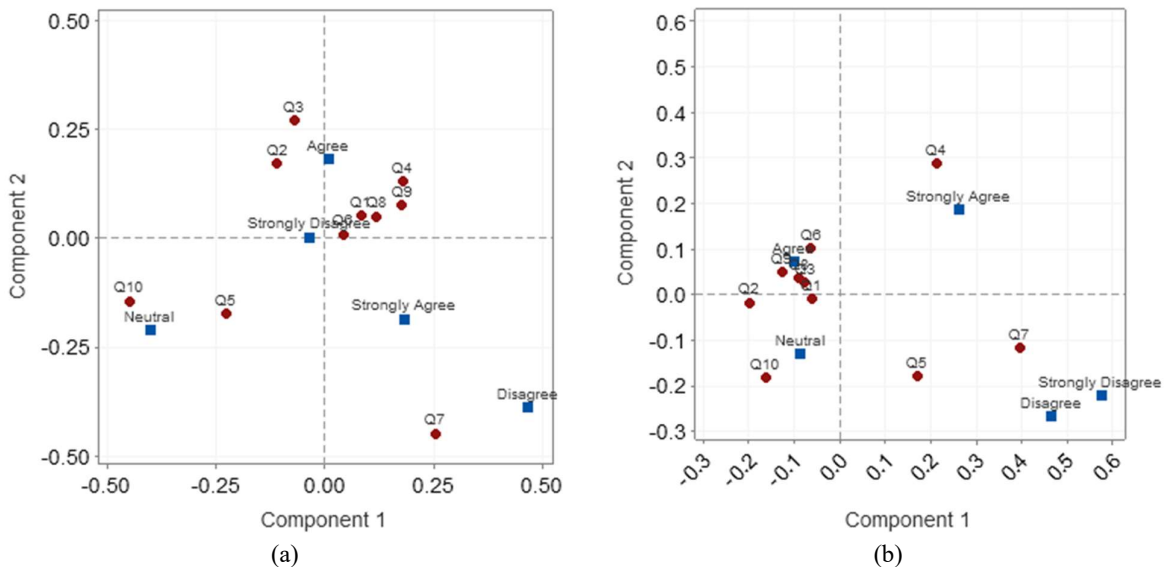


Figure 3 Symmetric plot of multivariate correspondence analysis for factors that contribute to students' academic performance from the perspectives of (a) lecturers and (b) students. "Q" is the survey questions from Table 1.

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