

The Need to Investigate the Five-Year Impact of Covid-19 on Student Online Feedback for Course X

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ABSTRACT

This paper presents the investigation of student online feedback (SUFO) for Course X of the Civil Engineering degree programme over five years in relation to before, during and after Covid-19. Several approaches to student feedback were conducted focusing on the students of semesters 20192, 20194, 20202, 20204, 20212, 20214, 20222, 20224, 20232 and 20234. The study only refers to the specific Course X. The parameters for student feedback were the students' overall impression of course X, the professionalism of the lecturers, the teaching and learning activities and the infrastructure. The study shows that the transition from physical to online courses has led to a decline in all parameters assessed, especially in the 2019 semester 4, indicating a significant negative impact of the switch to online learning on students' perception of Course X in the Civil Engineering programme.

Keywords: Student online feedback; Covid-19; civil engineering degree programme; online class; physical class

INTRODUCTION

Continuous improvement is a hallmark of successful educational programs. In the Civil Engineering degree programme, Course X plays a pivotal role in equipping students with vital knowledge and skills. To ensure this course remains effective in preparing future generations of engineers, it is crucial to gather and analyze student feedback over an extended period.

The students' feedback on the course, the professionalism of the lecturers, the teaching and learning activities and the infrastructure provides crucial insights into various aspects of the learning environment. The overall impression of the course reflects the students' satisfaction with the content, organisation and relevance to their educational goals. It summarises their holistic perceptions, including factors such as engagement, clarity of objectives and the extent to which the course meets their

expectations. Martin et al. (2023) found that student feedback is a valuable tool to improve the overall impression of a course. Bashir et al. (2016) and Williams (2014) found that student feedback is important to improve the learning experience for students and also has a significant impact on the professionalisation of teaching in higher education. Dalipi et al. (2022) investigated students' and teachers' impressions, feedback and experiences of the changes brought about by the Covid-19 pandemic in computer science courses at a Swedish university. Al-Samarraie et al. (2021) used the Fuzzy Decision Making Trial and Evaluation Laboratory (DEMATEL) method to analyse data obtained from interviews with 9 teachers and 38 students. Their findings identified five key factors — information quality, task-technology fit, system quality, utility, and usefulness — that impact user satisfaction with continued e-learning. The study also revealed various causal relationships between

these factors, both from the students' and lecturers' perspectives.

The professionalism of lecturers emphasises the crucial role of educators in promoting a conducive learning atmosphere. It includes qualities such as communication skills, accessibility, fairness in assessment and expertise in the subject matter. Students' feedback in this regard helps teachers to refine their teaching methods and interpersonal skills, which ultimately improves the quality of teaching (Zhan, 2023; Hani et al., 2021).

In addition, feedback on teaching and learning activities provides valuable insights into the effectiveness of the teaching strategies used in the course. This includes the variety and appropriateness of activities designed to facilitate learning, including lectures, discussions, assignments and practical exercises. By understanding students' perspectives on these activities, lecturers can better tailor their teaching methods to the needs and preferences of their students. In addition, feedback on infrastructure provides insight into the adequacy and accessibility of the physical and technological resources that are essential for effective teaching and learning. This includes facilities, equipment and online platforms, with improvements in these areas contributing to a better learning environment.

Over the past two years, the global community has grappled with the unprecedented challenges brought about by the Covid-19 pandemic, which has profoundly affected various facets of daily life and workflows around the world. As a result, people have adapted to working, studying, shopping and interacting socially remotely, emphasising the urgent need for digital transformation in various sectors and activities (Iivari et al., 2020). The education sector, ranging from primary school to university, has changed significantly in response to these challenges (Bogdandy et al., 2020). As physical distancing measures were unavoidable during the pandemic, many universities quickly transitioned to fully remote operations (Schneider and Council, 2021; Mitchell et al., 2025). Against this backdrop, institutions were faced with the need to adapt and innovate their approaches to ensure the maintenance of high-quality teaching and learning experiences in these exceptional circumstances.

According to Jacques et al. (2020) and Jacques et al. (2021), while distance learning during Covid-19 did not have a significant impact on students' overall performance, certain teaching activities, such as the online delivery (Csorba & Dabija, 2024) of practical work and projects, generated less enthusiasm among students. This lower enthusiasm is attributed to the fact that such activities require more interaction between students and more engagement with the lecturer. Therefore, student feedback is a valuable tool for the continuous improvement of

education, guiding teachers and institutions towards excellence in teaching and learning activities.

Understanding the rapid changes in teaching and learning before, during and after Covid-19 is vital, and student feedback is especially important. As universities navigate the challenges of operating remotely, understanding students' perspectives on various aspects of their educational experience, including overall impressions of courses, lecturer professionalism, teaching and learning activities, and infrastructure, is paramount. Student feedback is an important compass that helps institutions adapt their strategies to meet the evolving needs and expectations of learners in this new educational landscape. At a time of unprecedented change and uncertainty, insights from student feedback are an invaluable guide for universities seeking to maintain the quality and effectiveness of their educational provision.

Therefore, this study of online student feedback (SUFO) on Course X over the last five years aims to gain a deeper understanding of the student experience. By examining trends and recurring themes within the feedback, opportunities for improvement can be identified and ensure that Course X continues to provide a high quality learning experience for civil engineering students.

METHODOLOGY

SELECTION OF SEMESTER

In five years, a total of 10 semesters were included in this study, namely 20192, 20194, 20202, 20204, 20212, 20214, 20222, 20224, 20232 and 20234. Table 1 shows the implementation of teaching and learning in the different semesters. The method of implementation is based on the Covid-19 pandemic outbreak. The implementation changed from physical before Covid-19 to virtual during Covid-19. After Covid-19, the implementation of teaching and learning returned to physical form.

STUDENT'S FEEDBACK ONLINE (SUFO)

In this context, student feedback (SUFO) was based on the four specific items (A, B, C, and D) detailed in Table 2. Each item included several questions, and students responded on a scale from 1 to 4, ranging from strongly disagree to strongly agree. This structured approach allowed for the systematic collection of feedback from students at various stages of their education. It enabled faculty to evaluate perceptions of teaching effectiveness, course content relevance, lecturer professionalism, teaching and learning activities, and infrastructure each semester.

The focus on SUFO analysis aims to provide insights into students' perceptions and experiences of specific aspects of the educational program before Covid-19, during Covid-19 and after Covid-19, thereby aiding in the evaluation and enhancement of teaching methods and curriculum design.

SECTION A: OVERALL IMPRESSION FROM STUDENTS ABOUT THE COURSE X

By collecting feedback on specific questions, as shown in Table 3, the SUFO analysis provides a detailed understanding of students' perceptions of their educational experience.

This feedback is critical for faculty and administration to identify strengths and areas for improvement in teaching methods, course content, and overall educational strategies, and ultimately improve the quality of education before, during, and after Covid-19 in 5 years.

Table 3 shows that question 1 aimed to assess whether students feel that they have gained essential knowledge and understanding through Course X. Question 2 aimed to assess the relevance of the material of Course X to the student's chosen field of study. Question 3 aimed to assess the effectiveness of the course's assessment methods in promoting student learning. Question 4 aimed to measure the impact of the course on students' confidence in the subject matter.

TABLE 1. Selection of the semester based on the outbreak of a pandemic or non-pandemic and the implementation of teaching and learning



	Before Covid-19		During Covid-19					After Covid-19		
	Transition period							Transition period		
										
Semester	20192	20194	20202	20204	20212	20214	20222	20224	20232	20234
Implementation of teaching and learning	Physical		Virtual					Physical		
	End of physical teaching and learning	Starting of virtual teaching and learning						End of virtual teaching and learning	Starting of physical teaching and learning	

TABLE 2. The relevant section in the SUFO for Course X

Section	Main criteria on each section
A	Overall Impression about the Course X
B	Lecturer Professionalism
C	Teaching and Learning Activities
D	Infrastructure

TABLE 3. The questions need to be answered by the students related to the overall impression of the Course X

Question No.	The questions on the following remarks
1	I have increased my knowledge from taking the course.
2	The course content is related to my field of study.
3	The method of assessments in this course has enhanced my learning ability.
4	My confidence level in this course has increased.

SECTION B: LECTURER PROFESSIONALISM SUBJECT TO COURSE X

Collecting feedback on these questions, as shown in Table 4, allows educational institutions to evaluate and improve lecturers' performance, especially in Course X. It helps to ensure that lecturers fulfil their responsibilities and maintain a high standard of professionalism, which is crucial for student satisfaction, learning outcomes and the overall reputation of the educational programme especially during and after Covid-19.

Table 4 shows that question 5 was aimed at assessing whether lecturers fulfilled their obligations to make all teaching time available. Question 6 addressed the

availability and willingness of lecturers to provide academic support outside of regular teaching hours. Question 7 aimed to check the consistency and clarity of the language used during lessons. Question 8 aimed to determine students' comfort level in interacting with their lecturer. Question 9 was designed to complement the previous question by focussing on the lecturer's availability for more in-depth discussions.

Question 10 aims to determine whether lecturers actively monitor and encourage class attendance. The overarching question 11 aimed to capture the lecturer's general behaviour and demeanour, including adherence to academic and ethical standards, preparation and delivery of course material, and interaction with student's comfort level in interacting with their lecturer. Question 9 was designed to complement the previous question by focussing on the lecturer's availability for more in-depth discussions.

TABLE 4. The questions lecturer professionalism

Question No.	The questions on the following remarks
5	The lecturer completes the scheduled hours of instruction.
6	The lecturer is ever ready to provide academic guidance to students.
7	The lecturer uses English as a medium of instruction during the lectures.
8	The lecturer is approachable.
9	The lecturer is accessible for discussion
10	The lecturer monitors student attendance.
11	The lecturer exhibits high professionalism.

SECTION C: TEACHING AND LEARNING ACTIVITIES FOR COURSE X

The questions listed in Table 5 aimed to assess different dimensions of the instructor's effectiveness and teaching experience from the students' perspective before, during and after Covid-19. Each question targets a specific aspect of teaching quality and student engagement. Gathering feedback on these questions provides valuable insight into the effectiveness of teaching methods, clarity of communication and the overall learning environment.

Table 5 shows that question 12 assessed the clarity and comprehensiveness of the lecturer's explanations of the course material. Question 13 focussed on whether the lecturer clearly communicated the expected learning outcomes and objectives of the course. Question 14 assessed how well the lecturer informed students about the

assessment methods used in the course, such as exams, projects or assignments. Question 15 examined whether the lecturer adheres to the course plan or syllabus. Question 16 assessed the lecturer's efforts to actively involve students in learning, e.g. through discussions, group work or interactive activities. Question 17 assessed the instructor's ability to create a supportive atmosphere in the classroom where students feel comfortable asking questions and expressing their opinions. Question 18 assessed the instructor's ability to make the course material engaging and stimulating. Question 19 focused on whether the instructor's teaching style stimulates critical thinking and intellectual engagement. Question 20 assessed the timeliness and usefulness of feedback provided by the instructor on various assessments. Question 21 assessed the lecturer's effectiveness in helping students understand the course material well. Question 22 captured the students' overall satisfaction with the lecturer's teaching style.

TABLE 5. The questions lecturer professionalism

Question No.	The questions on the following remarks
12	The lecturer explains the course content.
13	The lecturer explains the outcomes of the course.
14	The lecturer explains the methods of assessment for the course.
15	The lecturer teaches according to plan.
16	The lecturer actively involves students in the learning process.
17	The lecturer creates an environment for students to ask questions and offer opinions.
18	The lecturer delivers the content interestingly.
19	The lecturer's delivery style challenges the mind.
20	The lecturer provides feedback for each assessment/assignments/tests/projects.
21	The lecturer helps students master the learning content.
22	Overall, I enjoyed the teaching style of this lecturer.

SECTION D: INFRASTRUCTURE

The questions on infrastructure are presented in Table 6. In general, the questions were aimed to evaluate the adequacy and functionality of the physical resources available for teaching and learning.

TABLE 6. The questions on infrastructure

Question No.	The questions on the following remarks
23	The equipment space for teaching and learning is conducive.
24	The teaching and learning equipment's are adequate and functioning.

Gathering feedback on these questions under Infrastructure provides important insights into the physical and technological infrastructure that supports the educational programme. Ensuring a conducive and appropriate learning environment and facilities is critical to improving the overall quality of education and increasing student satisfaction and learning outcomes.

In this section, question 23 assessed whether the physical environment in which teaching and learning takes place is suitable and conducive to effective educational activities. Question 24 assessed the availability and operational status of equipment used in the educational process, such as projectors, computers, laboratory

instruments and other technical aids. The SUFO analysis for questions 23 and 24 for each semester was then compared and discussed.

RESULTS AND DISCUSSION

OVERALL IMPRESSION OF STUDENTS ABOUT COURSE X

Table 7 shows the SUFO analysis based on the overall impression of course X. The students' agreement with the statements *strongly agree* or *agree* is very high in all semesters. The percentage of students who responded with *strongly agree* or *agree* ranged from a low of 84.95% (semester 20194) to a high of 97.32% (semester 20224). This indicates a very high level of agreement with this statement in all semesters.

Figure 1 shows the entire SUFO analysis based on the students' impressions of Course X. It shows students' impressions of Course X over ten semesters, from 20192 to 20234, and reveals significant insights when correlated with transition times due to Covid-19. Firstly, the transition from physical to online teaching takes place between semesters 20192 and 20194. During this period, student impressions drop slightly from 89.41% in 20192 to 84.95% in 20194, indicating a possible initial struggle or adjustment period in transitioning the course to an online format. Hodges et al. (2020) found that online learning has the stigma of being of lower quality than face-to-face learning.

The transition back from online to face-to-face teaching spans the 20214 to 20222 semesters. Interestingly, students' impressions show a slight decrease at the beginning of this transition, with 89.76% in 20214 and 89.51% in 20222. This could be due to the challenge of getting used to physical classes again after an extended period of online learning. However, a noticeable recovery can be observed after the changeover, with impressions increasing significantly in the final semesters. The peak scores in 20224 (97.32%) and subsequent high scores in 20232 (95.31%) and 20234 (94.44%) indicate that Course X has successfully navigated these transitions, which has ultimately translated into higher student satisfaction. Overall, despite the challenges posed by the transitions, Course X demonstrated resilience and adaptability and maintained high student impressions throughout.

The peaks in impressions in the final semesters (20224, 20232, and 20234) indicate that course X successfully managed these transitions and ultimately increased student confidence and satisfaction. This suggests that despite the challenges that the transitions presented, the course demonstrated resilience and adaptability and maintained

a high standard of student impressions throughout the period analysed.

In the period after Covid-19, student feedback on course X shows a significant increase in satisfaction, especially in the *strongly agree* category, with semesters 20232 and 20224 reaching 90% and 87% respectively as shown in Figure 2. This jump in satisfaction can likely be attributed to the course adjustments that were made after the pandemic when institutions returned to face-to-face teaching. Changes may have included improved resources, new teaching tools and refined teaching methods that combine the best elements of both online and face-to-face teaching. These updates helped to create a more engaging and supportive learning environment and improve the overall student experience of Course X.

During the Covid-19 period (20194 to 20214), satisfaction was more variable due to the sudden shift to online and hybrid formats, which presented challenges for both students and lecturers. For example, in the 20212 semester, only 29% of students *strongly agreed*, while most students selected *agree*. This pattern reflects the difficulties

in adapting to distance learning, where limitations in digital infrastructure, fewer face-to-face interactions and potential technical issues impacted the effectiveness of the course. Despite efforts to adapt, students may have felt that online learning did not fully meet their needs for engagement and support, resulting in a rather moderate level of satisfaction during this period.

Prior to Covid-19, in the 20192 semester, satisfaction with Course X was positive, but not as high as in the post-pandemic semesters, with 62% *strongly agree* and 38% *agree*, suggesting that while Course X was well received in its traditional format, the adjustments made in response to the pandemic brought positive changes that further improved the course. The post-pandemic improvements — such as better integration of digital tools, more flexibility or refined course content — seem to have provided a well-rounded learning experience that meets the changing expectations of students. This change underlines how the challenges of Covid-19 acted as a catalyst for positive, long-term improvements in teaching and learning practises.

TABLE 7. SUFO analysis based on overall impression about the Course X

Semester	Strongly disagree (1)	Disagree (2)	Agree (3)	Strongly agree (4)	Average (%)	Average point
20234	0	0	8	28	94.44	3.78
20232	0	0	9	39	95.31	3.81
20224	0	0	3	25	97.32	3.89
20222	0	0	47	65	89.51	3.58
20214	0	3	148	225	89.76	3.59
20212	0	0	66	154	92.5	3.7
20204	0	3	322	343	87.72	3.51
20202	0	5	173	162	86.55	3.46
20194	1	1	597	401	84.95	3.4
20192	0	0	171	233	89.41	3.57

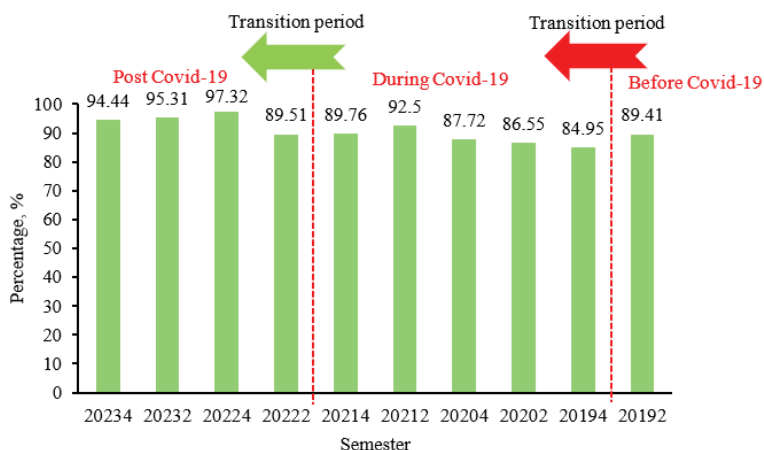


FIGURE 1. SUFO analysis based on students' overall impression of Course X in relation to Covid-19

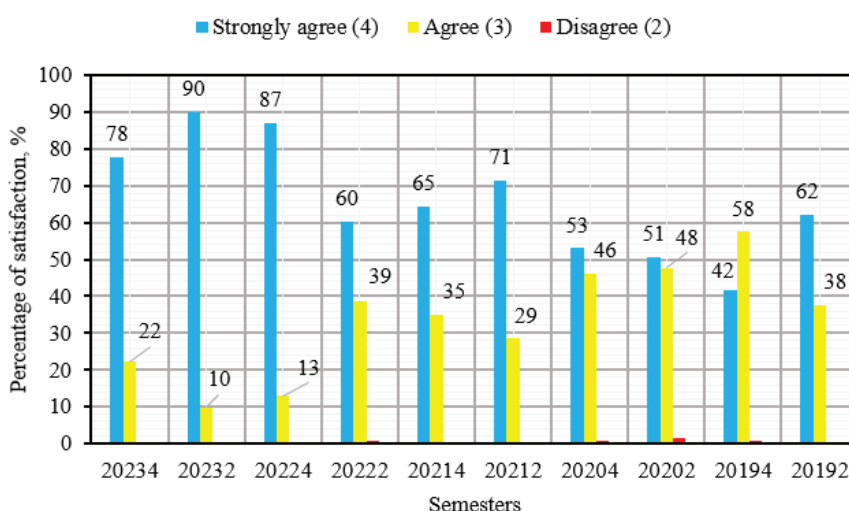


FIGURE 2. Percentage of student feedback on strongly agree, agree and disagree for overall impression of Course X

LECTURER PROFESSIONALISM SUBJECT TO COURSE X

Table 8 and Figure 3 show the percentage of student feedback on the professionalism of the lecturers involved in Course X. It illustrates student feedback on the professionalism of lecturers teaching Course X over several semesters, with consistently high ratings all above 85%. The highest scores are achieved in semesters 20232 (97.62%) and 20224 (97.96%), indicating top performance. Of note is a significant drop in scores in semesters 20192 (90.7%) to 20194 (85.13%), which coincides with the transition from face-to-face to online teaching due to the Covid-19 pandemic. This transition was likely a challenge for both lecturers and students, which impacted perceptions of professionalism.

From semester 20214 (91.87%) to 20222 (91.58%) there is a further transition from online back to face-to-face teaching. During this period, ratings remain relatively stable, albeit slightly lower than the pre-pandemic peaks. This stability is due to the lecturers have adapted better over time and have managed to maintain a high level despite the disruptions. Overall, while the Covid-19 pandemic has led to noticeable fluctuations in feedback, the scores indicate a robust and professional response from lecturers in adapting to these unprecedented changes. The study is important to ensure continuous excellence in teaching and learning as a support system and professional development for lecturers.

Figure 4 shows student feedback on the professionalism of lecturers, with the ratings divided into *strongly agree*, *agree* and *disagree* across several semesters. In the semesters after Covid-19 (20222 to 20234), the percentage

of students who *strongly agree* with the professionalism of their lecturers increases significantly, reaching 92% in semester 20224 and 90% in semester 20232. This overwhelmingly positive feedback suggests that the post-pandemic adjustments to teaching approaches or interpersonal skills have been well received by students. The fact that there are virtually no *agree* or *disagree* responses emphasises a high level of professionalism that consistently meets or exceeds student expectations.

During the pandemic (20194 to 20214), students' perceptions of faculty professionalism were more mixed. For example, in the 20212 semester, only 29% of students chose *strongly agree* while the majority (71%) chose *agree*. This shift may reflect the difficulties lecturers faced in maintaining the same level of professionalism in a remote environment where technical issues, limited face-to-face interaction and the general change in teaching dynamics made it difficult to maintain their usual standards. Nonetheless, the lecturers' efforts were appreciated, as indicated by the overwhelming number of *agree* responses, suggesting that professionalism was maintained to a reasonable extent even under difficult conditions. As Shahzad et al. (2021) and Adebayo et al. (2023) stated, lecturing has proven to be an important means of ensuring that students can continue to be taught during the Covid-19 pandemic, emphasising the crucial role of professional and adaptable lecturers in such difficult times.

This analysis is crucial because the professionalism of lecturers has a direct impact on the learning environment and influences student motivation, engagement and respect. High professionalism contributes to a positive academic experience and shows students that their education is taken seriously and that they are supported by capable faculty. Understanding these trends helps institutions recognise the

successes of faculty who have maintained high standards post-pandemic while identifying potential areas for improvement, particularly in online teaching environments. This feedback can guide faculty development programmes

and encourage practises that improve faculty-student relationships and promote professionalism in any teaching format.

TABLE 8. SUFO analysis based on the lecturer professionalism for Course X

Semester	Strongly disagree (1)	Disagree (2)	Agree (3)	Strongly agree (4)	Average (%)	Average point
20234	0	0	14	49	94.44	3.78
20232	0	0	8	76	97.62	3.91
20224	0	0	4	45	97.96	3.92
20222	0	0	66	130	91.58	3.66
20214	0	3	208	447	91.87	3.67
20212	0	0	112	273	92.73	3.71
20204	0	6	538	625	88.24	3.53
20202	0	11	282	302	87.23	3.49
20194	5	16	994	735	85.13	3.41
20192	0	3	257	447	90.7	3.62

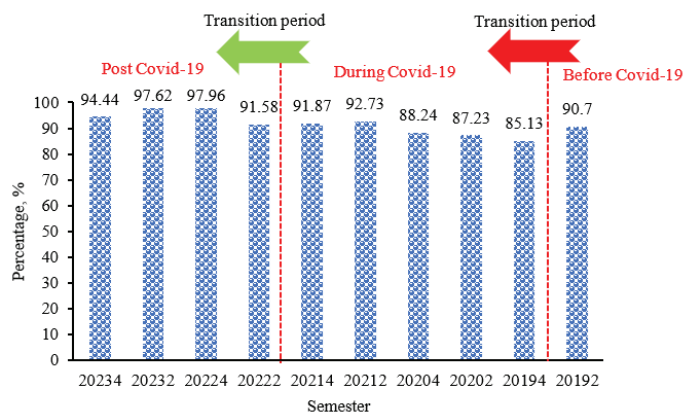


FIGURE 3 Percentage of student feedback on the professionalism of lecturers involved in teaching Course X

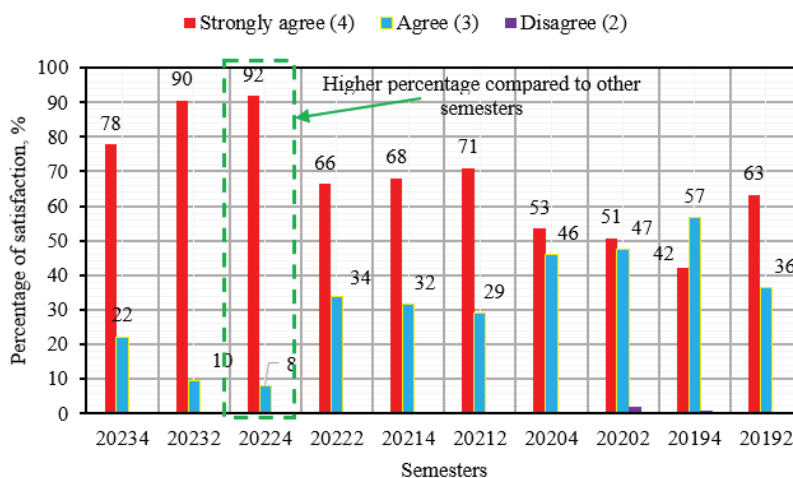


FIGURE 4. Percentage of student feedback on strongly agree, agree and disagree for professionalism of lecturers

TEACHING AND LEARNING ACTIVITIES FOR COURSE X

Table 9 shows the SUFO analysis based on the teaching and learning activities for Course X in the Civil Engineering programme. The data shows the distribution of student feedback over several semesters, with responses categorised into four levels: *strongly disagree*, *disagree*, *agree* and *strongly agree*. A similar five-scale approach was utilized by Zainal et al. (2023). There is a notable trend towards higher agreement with the statements across the semesters,

indicating a generally positive perception of the aspects assessed. For example, in semester 20234 as shown in Figure 5, a significant majority of students strongly agreed with the statement, reflecting a high level of satisfaction with the physical learning activities.

In semester 20222, on the other hand, while agreement was still high, it was comparatively lower, suggesting a slightly less positive response from students. These varying approval rates offer valuable insights into the evolving dynamics of student perceptions over time, which influenced by factors such as the transition from online to physical teaching methods.

TABLE 9. SUFO analysis based on the teaching and learning activities for Course X

Semester	Strongly disagree (1)	Disagree (2)	Agree (3)	Strongly agree (4)	Average (%)	Average point
20234	0	0	22	77	94.44	3.78
20232	0	0	13	119	97.54	3.9
20224	0	0	10	67	96.75	3.87
20222	1	2	119	186	89.77	3.59
20214	0	4	363	667	91.03	3.64
20212	0	0	173	432	92.85	3.71
20204	1	14	847	975	88.05	3.52
20202	0	15	446	474	87.27	3.49
20194	7	18	1583	1142	85.09	3.4
20192	0	2	418	691	90.5	3.62

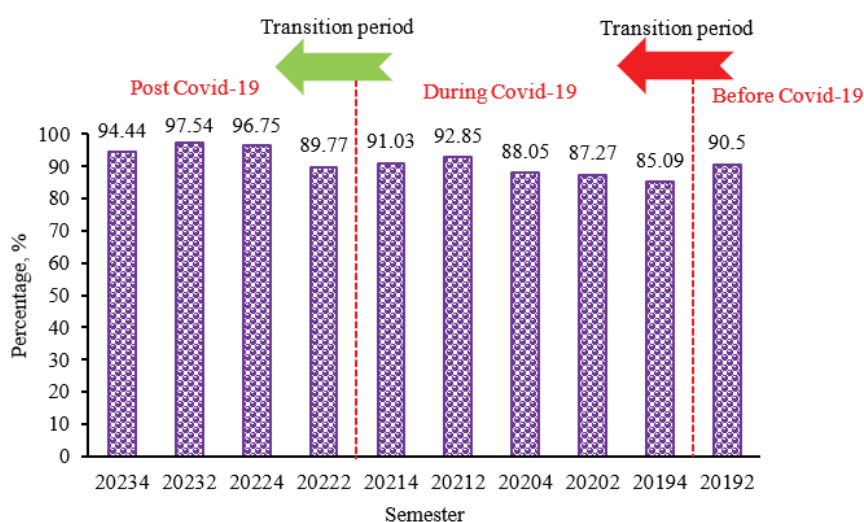


FIGURE 5. Percentage of student feedback on the teaching and learning for Course X

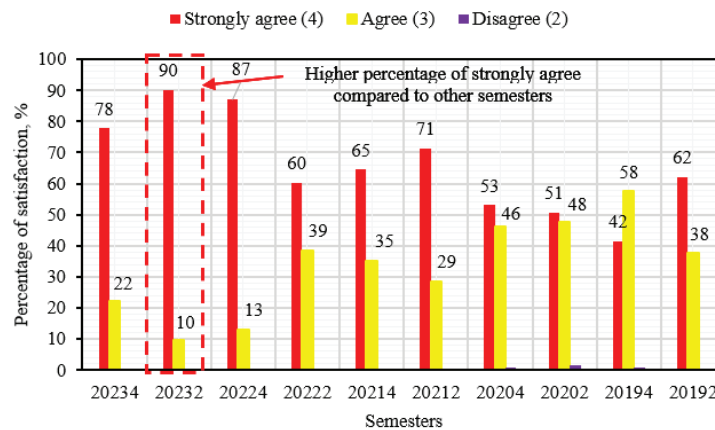


FIGURE 6. Percentage of student feedback on strongly agree, agree and disagree for teaching and learning

Analysing data across different semesters provides institutions with a nuanced understanding of students' feelings and enables targeted interventions to address areas of concern and further develop areas of strength, particularly in the area of teaching and learning activities. By identifying trends and patterns in student feedback, universities can better align their strategies with student expectations and needs, ultimately creating a supportive and enriching learning environment. In addition, consistent monitoring of feedback trends allows for continuous evaluation and refinement of teaching methods and institutional policies to ensure a smooth transition to physical learning methods while maintaining the positive aspects of distance learning experiences.

Figure 6 shows the percentage of student satisfaction counted based on the percentage for each semester. In the semesters following Covid-19 (20222 to 20234), student satisfaction with teaching and learning increased significantly. The *strongly agree* category reached 90% in semester 20232 and 87% in semester 20224, with very few students only agreeing or disagreeing. This suggests that the changes or improvements made to the teaching approach post-pandemic have been well received, resulting in a significant increase in student satisfaction. These results suggest that students appreciated the post-pandemic adjustments, which may have included a return to face-to-face teaching or improved hybrid methods that effectively met their needs.

During the Covid-19 period (20194 to 20214), student satisfaction was lower and showed greater fluctuations. For example, in semester 20212, the percentage of *strongly agree* responses was only 29%, while the *agree* category was 71%, suggesting that while students managed to adapt to online learning, many were not entirely satisfied. In other semesters during the pandemic, such as 20204, the ratio between *strongly agree* and *agree* was more balanced, indicating a more mixed experience with distance learning.

This fluctuation during the pandemic likely reflects the challenges students faced in adapting to online instruction and the adjustments faculty had to make to meet student expectations.

Prior to Covid-19, in the 20192 semester, satisfaction levels were moderate, with 62% of students selecting *strongly agree* and 38% selecting *agree*. This baseline indicates that students were somewhat satisfied with the traditional face-to-face learning environment, although not to the same degree as in the post Covid-19 semesters. The pre-pandemic satisfaction rates suggest that while conventional methods were effective, they may have lacked certain improvements or innovations that were later introduced. The data suggests that the adjustments made in response to Covid-19 have led to more effective teaching practises, which increased student satisfaction when face-to-face teaching resumed.

Examining student responses in terms of satisfaction percentages provides valuable insights for improving the quality of teaching and learning. First, faculty and institutions can identify trends and gaps in student satisfaction across different delivery modes such as face-to-face, distance, and hybrid instruction. By understanding how satisfaction has changed during and after Covid-19, institutions can identify which aspects of teaching methods or resources were less effective during distance learning and what improvements have led to the post-pandemic increase in satisfaction.

Secondly, analysing this data helps to refine teaching strategies and implement best practises that are well received by students. For example, if students showed high levels of satisfaction after Covid-19, certain methods or tools used during this time could be retained or further developed. Institutions can use this feedback to create a more engaging learning environment by adapting the things students found beneficial, such as interactive materials, flexible timetables or improved digital resources.

Finally, monitoring student satisfaction over time fosters a culture of continuous improvement where feedback becomes an integral part of the teaching process. By regularly evaluating satisfaction levels, teachers can proactively address issues, respond to student needs and maintain high levels of engagement and motivation. This continuous feedback loop helps to ensure that teaching methods are aligned with evolving student expectations, ultimately leading to better educational outcomes and a conducive learning environment.

INFRASTRUCTURE

Table 10, Figure 5 and Figure 6 show that the students' feedback on the infrastructure in the different semesters reflects their perception of the teaching and learning environment, especially with regard to the statements *The physical facilities for teaching and learning are conducive* and *The teaching and learning resources are adequate and functional*. During the transition period from physical courses to online courses (semesters 20192 to 20194) due to Covid-19, the feedback shows a decrease in satisfaction, with the percentages dropping to 87.38%, 83.25% and 85.15% respectively. This decrease can be attributed to the challenges and initial shortcomings in adapting to online learning environments, such as inadequate or malfunctioning equipment and less conducive spaces for effective teaching and learning. Jili et al. (2021), in the research on Emergency Remote Teaching in Higher Education During Covid-19: Challenges and Opportunities, found that the results suggest that some staff and students are experiencing challenges related to the lack of resources and the use of information and communication technology remotely.

As the situation evolved and institutions adapted to the new normal, there was a gradual improvement in feedback in the period from semester 20214 to 20222, which marks the transition back from online to physical classes. The feedback percentages during this period were 88.96%, 89.74% and 90.22%, indicating a recovery and improvement in infrastructure. This indicates that action has been taken to improve the appropriateness and functionality of teaching resources and to ensure that learning spaces are once again suitable for effective teaching. The steady increase in satisfaction indicates successful adjustments and improvements to the infrastructure that have addressed concerns raised during the initial online transition.

By the time semesters 20232 and 20234 are reached, feedback has improved significantly to 97.92% and 94.44% respectively, peaking at 100% in 20224. This reflects a period in which the infrastructure was highly praised as supportive and equipped with appropriate and functioning

teaching resources. The high level of satisfaction suggests that institutions have not only successfully returned to physical teaching but have also improved the overall learning environment so that it is more conducive and better equipped than before. This period marks a strong recovery and probably even surpasses the quality of the pre-Covid infrastructure. This emphasises the effectiveness of the measures taken to respond to student feedback and improve the educational infrastructure.

In the semesters post Covid-19, student satisfaction with the infrastructure has improved significantly, especially in semesters 20232 and 20224 as shown in Figure 6, where satisfaction reached 92% and 100% respectively in the *strongly agree* category. This increase in satisfaction is likely due to the extensive investment and modernisation that has been made to infrastructure post-pandemic as institutions sought to create more adaptable and technologically advanced learning environments. Many universities and colleges used the lessons learnt from remote learning to improve physical facilities by adding advanced digital tools and support systems, which could explain the high levels of student satisfaction on their return to the improved premises.

During the Covid-19 period, satisfaction with infrastructure was more variable, reflecting the challenges during this transition period. In the 20204 and 20212 semesters, 53% and 61% of respondents respectively agreed with *strongly agree*, suggesting that while institutions have made efforts to support distance and hybrid learning, the infrastructure was not always sufficient to meet the needs of all students. This could be due to limitations in existing technology and resources, as many institutions were not prepared for the abrupt shift to online learning. The mixed satisfaction highlights how difficult it is to adapt quickly to virtual learning when the necessary infrastructure is not yet in place. Hettiarachchi et al. (2021) added that student satisfaction with online teaching and learning is of great importance, especially in the context of a pandemic such as Covid-19.

Before Covid-19, in semester 20192, satisfaction with the infrastructure was moderate, with an even split between *strongly agree* and *agree* responses. This baseline suggests that the pre-pandemic infrastructure met the general requirements for face-to-face learning, but did not provide the flexibility and technological integration that students later found beneficial. The rapid upgrade of infrastructure after the pandemic not only addressed these gaps, but also introduced improvements that aligned with evolving educational needs. The improvements in digital tools, hybrid learning opportunities and physical improvements in classrooms made the post-pandemic learning experience significantly more satisfying for students, reflecting the positive impact of these adjustments.

Analysing student feedback on the infrastructure is crucial as it provides direct insights into how well the learning environment meets students’ needs and supports their academic success. Students are the primary users of educational facilities, so their satisfaction can highlight specific problems or areas for improvement that may not

be as obvious to administration or faculty. By understanding the student experience and feedback, institutions can identify gaps in infrastructure — such as inadequate technology, uncomfortable spaces or a lack of necessary resources — and prioritise the improvements that will have the greatest impact on the student experience.

TABLE 10. SUFO analysis based on the infrastructure

Semester	Strongly disagree (1)	Disagree (2)	Agree (3)	Strongly agree (4)	Average (%)	Average point
20234	0	0	4	14	94.44	3.78
20232	0	0	2	22	97.92	3.92
20224	0	0	0	14	100	4
20222	0	0	23	33	89.74	3.59
20214	0	0	83	105	88.96	3.55
20212	0	0	43	67	90.22	3.61
20204	2	1	177	154	86.16	3.45
20202	0	4	93	73	85.15	3.41
20194	7	7	300	186	83.25	3.33
20192	0	2	98	102	87.38	3.5

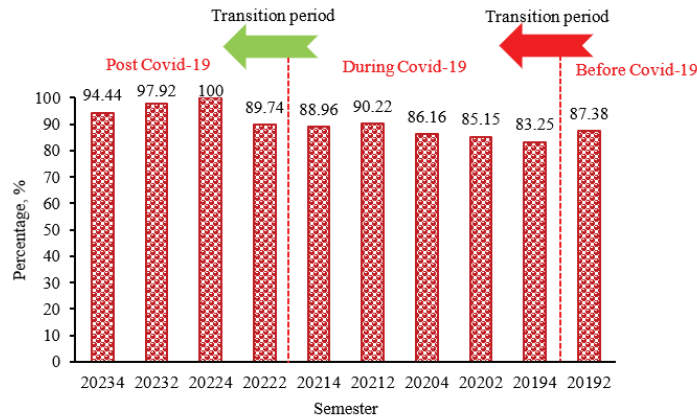


FIGURE 7. Percentage of student feedback on the infrastructure

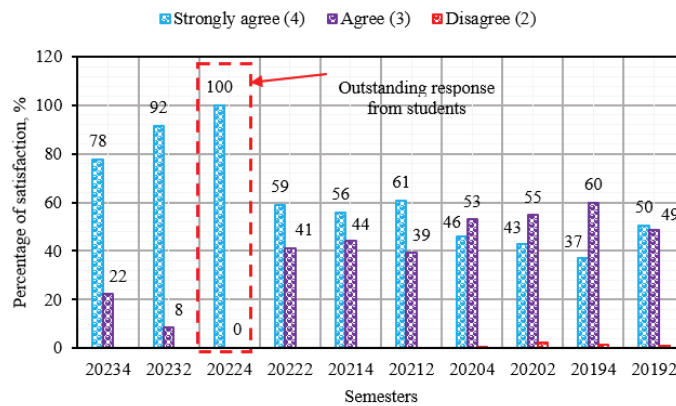


FIGURE 8. Percentage of student feedback on strongly agree, agree and disagree for infrastructure

Furthermore, this analysis is crucial as infrastructure plays a central role in supporting modern teaching methods, especially following the shift to distance and hybrid learning during the Covid-19 pandemic. As educational models evolve to include more digital and flexible learning opportunities, infrastructure needs to adapt to support these changes. Student feedback helps institutions assess whether current facilities, technology and resources are adequate for these new approaches to learning. For example, if students report dissatisfaction with online learning resources or digital tools, this may be an indication that technology needs to be upgraded to enhance distance or hybrid learning environments.

Finally, incorporating student feedback into infrastructure planning ensures that institutions remain responsive and proactive in creating a supportive academic environment. A positive, well-resourced infrastructure not only enhances students' learning experiences, but also increases their overall satisfaction, which can impact retention rates and attract future students. This student-centred approach to infrastructure development fosters a culture of continuous improvement and adaptability, helping institutions remain competitive and committed to quality education. As stated by Hani et al. (2021) emphasised how the Covid-19 pandemic has transformed e-learning and turned a difficult crisis into an opportunity for growth and innovation in education.

CONCLUSION

The following conclusions are addressed:

1. The consistently high level of student satisfaction with Course X, as reflected in the SUFO analysis, demonstrates the resilience and adaptability of the course. Despite minor fluctuations during transitions to and from online classes due to Covid-19, student agreement with positive statements about the course remained stable and never dropped below 84.95%. The significant recovery and peak satisfaction rates of up to 97.32% in recent semesters underline the course's effective handling of pandemic-related challenges and its continued positive impression on students.
2. Student feedback on the professionalism of lecturers in Course X is consistently high, with scores of over 85%, even in times of the Covid-19 pandemic shifting to online teaching. Despite a drop to 85.13% during the transition period, ratings rose again in subsequent semesters to peaks of 97.62% and 97.96%. These results emphasise the resilience and adaptability of lecturers and highlight the need for ongoing support and professional development to maintain the quality of teaching.
3. The slight decrease in student approval rates in semester 20222 highlights the changing dynamics of student perceptions, which have likely been influenced by the transition from online to physical teaching methods. This analysis emphasises the importance of understanding these trends in order to implement targeted improvements to teaching and learning activities. Continually monitoring and adapting feedback trends is crucial for universities to refine their strategies and ensure a supportive and effective learning environment that balances the benefits of face-to-face and distance learning.
4. Student feedback on infrastructure highlights the changing perception of the teaching and learning environment, particularly in relation to physical facilities and the adequacy of resources. During the transition from physical to online courses due to Covid-19, satisfaction dropped significantly, reflecting the challenges of moving to online learning. However, as institutions adapted and moved back to physical courses, satisfaction steadily improved, culminating in exceptionally high ratings, indicating successful improvements to the educational infrastructure.

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DECLARATION OF COMPETING INTEREST

None.

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