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Students' Achievement Emotions Towards Teaching and Learning Between Physical Classes and Online Distance Learning (ODL)

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Abstract

The transition from traditional face-to-face classes to online learning has been accelerated by the global pandemic. This study aims to compare the emotional experiences of engineering students in physical and online classes. A sample of 35 undergraduate students from a University Technology MARA participated in the study. The students completed two semesters of online courses and one semester of traditional physical classes. A questionnaire was distributed to assess students' emotions related to class-related enjoyment, hope, anxiety, and boredom. Descriptive statistics, including mean scores and standard deviations, were calculated for each variable. Reliability analysis showed high internal consistency for both physical and online classes. The results revealed that students reported higher levels of enjoyment, hope, and boredom in physical classes compared to online classes. However, the difference in mean scores was relatively small, indicating considerable individual variation. The findings from paired sample T-test suggest that, while physical classes may provide a more enjoyable and hopeful learning experience for students, online classes offer flexibility and convenience. The study highlights the importance of considering emotional experiences when designing and implementing instructional strategies in both physical and online learning environments.

Keywords: Emotional Experiences, Physical Classes, Online Learning, Reliability Test, Paired Sample T-Test.

Introduction

The methods used in teaching and learning have changed beyond our expectations in recent years. Students and teachers had been greatly affected by the global pandemic that occurred in 2020. Online distance learning (ODL) has been implemented since then for more than two

years. In 2022, when the endemic had been declared by many countries including Malaysia, many schools and higher education institutions adopted blended learning which combines standard physical classroom teaching with online learning. This method is taken to help students make the transition back to normal classroom settings. According to Banihashem et al. (2023), blended learning was perceived to cause a heavy workload by both teachers and students with teachers displayed high stress while students displayed low stress.

Physical classes, which are also known as face-to-face classes, have their own advantages and disadvantages. The most significant one is the social interaction and engagement in classes among peers and lecturers. Mainhard et. al (2018) findings indicate that teacher related aspects and the classroom setting are important and subsequently have influenced in a range of student emotions. Students will have the opportunity to ask questions, take part in discussions, and receive prompt, accurate answers that can help them better understand what's being taught. In addition, physical classes offer access to campus resources such as libraries, labs, and research facilities. A study by Gherhes et. Al (2021) found that more than half of respondents expressed they wished to return to the traditional teaching model after the pandemic is over.

There are also disadvantages of physical classes where the students have limited flexibility to manage their time and commitments as they need to adhere to a fixed schedule of classes. Moreover, the rise in cost-of-living results in higher daily expenses such as housing and commuting to and from classes. After the most recent outbreak, health issues are also another aspect that needs to be addressed. Higher education institutions are advised to implement a reliable security protocol that can ensure the safety of everyone on the campuses. This would let the students feel more confident about their own well-being and allow them to enjoy their studies without distraction.

Online learning, despite its many advantages, also comes with some disadvantages. The main advantage of online learning is it provides flexibility in terms of time and place. Students can access course materials and participate in classes from anywhere and at any time if they have an internet connection. Online learning may lead to potential for lack of social interaction. In contrast to physical classes, where students can participate in face-to-face discussions and build personal relationships with peers and teachers, online learning often lacks immediate social interaction and feedback (Alexander et. Al, 2012).

Online learning also has shown several significant disadvantages, including a higher probability for task delay, a challenge in understanding the subject without direct contact with the teacher, and a requirement for more self-discipline when reading and studying. According to Axmedova & Kenjayeva (2021), students are more likely to become quickly distracted by social media or other websites when they are learning online where it can affect their ability to concentrate and be productive. Students also struggle to maintain long-term attention on a screen is one of the biggest challenges of online learning. Additionally, students may become frustration and stress related to online learning, including misunderstanding assignment requirements, trouble contacting the teacher for help, and issues with technology.

In short, physical classes in universities have benefits including improved social contact, individualized learning experiences, and access to campus resources. However, they also have issues such as a lack of flexibility, higher costs, and health and safety concerns. Through online learning it allows students to access course materials and lectures from anywhere at any time. However, online learning lacks face-to-face interaction. Therefore, it requires self-motivation and discipline in time management. Physical learning, on the other hand, allows for direct

face-to-face interaction between teachers and students, students will get immediate feedback and collaborative discussions. However, physical learning may lack flexibility, entail higher costs, and have limited access to resources. To provide a balanced and inclusive learning environment that meets the wellbeing of a variety of student populations, higher education institutions must carefully weigh both the pros and cons of physical classroom teaching and online learning. Therefore, the objective of this study is to compare the emotional experiences of engineering students in physical and online classes. The study aims to investigate the differences in students' emotions related to class-related enjoyment, hope, anxiety, and boredom between the two learning environments.

Literature Reviews

Over the past few years, a significant amount of research has been conducted to explore the effectiveness of online learning compared to face-to-face classes. According to statistical analysis, students who attended face to face class achieved significantly better results than the online class in both exam scores and improvement on instructor questions in the post-test. (Arias et al., 2018). No significant difference in student performance between online and face-to-face (F2F) learners overall, with respect to gender, or with respect to class rank were found (Paul & Jefferson, 2019). A study by Allen & Seaman (2017) found that online learning is growing at a faster rate than face-to-face enrollment, but there is still a debate about which is better. According to Smart & Cappel (2006), the results indicate that participants in an elective course rated the online modules significantly better than those in a required course. Overall, participants in the elective course rated the online modules marginally positive while those in the required course rated them marginally negative. Besides that, Hollister et al. (2022) find that most students expressed that they were at ease with asking and responding to questions in online classes. This implies that there may be aspects of online learning that students are open to and that could also be advantageous in traditional classroom settings. A study by Naved et al. (2017) argue that, unlike face to-face learning, online learning has its advantages, such as flexibility, no need to travel to school, and a low cost, requiring only an Internet connection. The field of e-learning and face-to-face learning has also explored the topic of students' emotional states and attitudes. Several studies suggest that students tend to be less content with online learning and prefer traditional face-to-face courses (Alenka et.al,2019). Overall, the research suggests that the choice between online learning and face-to-face classes depends on a variety of factors, including the subject matter, the learning objectives, and the preferences of the learners.

Various findings have been found in Malaysian research on students' satisfaction with face-to-face and online distance learning. Online distance learning has gained popularity in recent years due to its flexibility and convenience which are offers flexibility, access to diverse learning resources, self-paced learning, technology skills development, collaborative learning opportunities, cost-effectiveness, global learning opportunities, and individualized support. However, it also has some potential disadvantages that students may face. (Chung et al., 2020) found that the biggest challenge facing online learning among university students in Malaysia is a poor internet connectivity and it leads to students’ anxiety in reference to online learning. (Ahmad et al., 2022) also stated that online distance learning has not been effective for TVET student mental health. From the research results, students are facing high levels of anxiety with online learning. In other words, the previous conventional learning method is still dominant and preferable to student acceptance. Nevertheless, face-to-face learning, which is also known as traditional classroom learning, has its own set of advantages and

disadvantages. Face-to-face learning continues to offer unique advantages that can contribute to a holistic and well-rounded educational experience for students likes provides opportunities for social interaction, personalized attention, structured learning, immediate feedback, motivation, social and emotional development, and networking, which can positively impact student learning outcomes and overall satisfaction with the educational experience. Students of Medical Physics at University Malaya still preferred face-to-face lectures compared to e-learning modes. They found the physical lecture sessions less boring, more engaging and enabling them to ask questions directly to lecturers (Azlan et al., 2020). Next, present online anatomy teaching and learning activities only covered the cognitive part of the knowledge. It is debatable whether the current anatomy teaching and learning could ensure the attainment of skills and affective learning outcomes, as these competencies are mainly achieved through the face-to-face sessions (Tg Muda et al., 2021). Despite that, face-to-face learning may have limited access to digital learning resources or materials, such as online databases, simulations, or virtual labs, which can limit the scope of students' learning.

Numerous studies have been conducted to compare the effectiveness of online learning and face-to-face classes, but the results have been inconsistent. While one study revealed that face-to-face classes lead to better exam scores and post-test question improvements, another study found no significant difference between the two formats. Although online learning is growing at a faster rate, there is still a debate about which format is better. In elective courses, students tend to rate online modules better than in required courses and are more comfortable asking and responding to questions in online classes. Nonetheless, they express less satisfaction with online learning overall. Ultimately, the choice between online learning and face-to-face classes depends on various factors such as subject matter, learning objectives, and learner preferences. While previous research has explored the effectiveness and preferences of online learning compared to face-to-face classes, this study specifically examines the emotional aspects of the learning experience. By assessing emotions such as enjoyment, hope, anxiety, and boredom, the study provides insights into how students perceive and engage with the two learning environments.

Additionally, the study contributes to the existing literature by examining the emotional experiences of engineering students, a specific student population with unique learning needs and challenges. Engineering education often involves technical and complex subjects, and understanding how students in this field experience emotions in different learning environments can provide valuable insights for instructional design and pedagogical strategies tailored to their needs. Overall, this study adds to the body of knowledge on the emotional experiences of students in physical and online classes, particularly in the context of engineering education. By highlighting the similarities and differences in emotional experiences between the two learning environments, the study aims to inform educational institutions and instructors about the importance of considering emotional factors when designing and implementing instructional strategies in both physical and online learning settings.

Methodology

The samples were taken from 35 undergraduate students majoring in engineering at the UiTM campus in Permatang Pauh, Pulau Pinang (19 males and 16 females) as shown in Figure 1. Students completed two semesters of online courses and one semester of traditional physical classes. In December 2022, a questionnaire was distributed internally, inviting each student to participate in a web-based survey that had been created using Google Form. To measure

the diverse emotions of achievement that students commonly experience in both physical and online classes, the poll included Likert-scale items. This survey was adapted from exploratory reports by Pekrun et al. (2011).

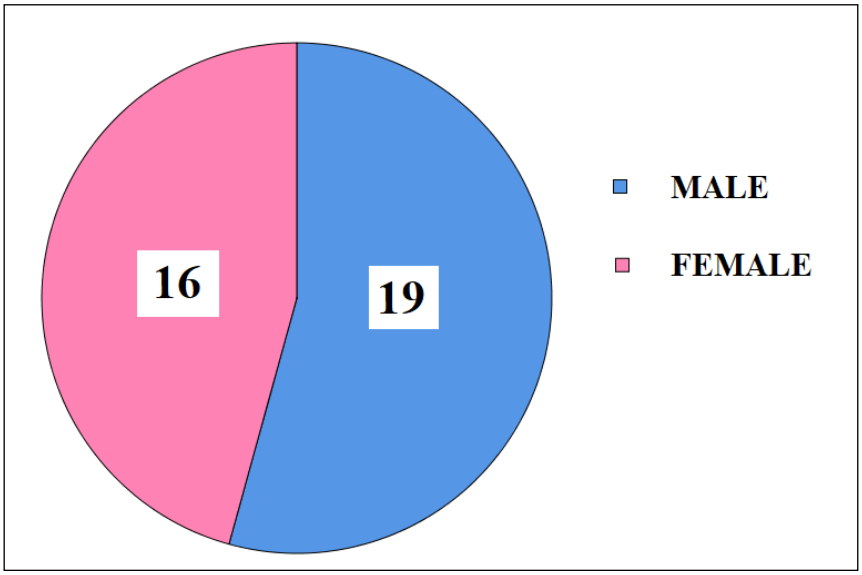

Figure 1 Number of Male and Female Students for online and physical classes

Instrument

The survey in this study consists of 12 questions for online classes and 12 questions for physical classes that are organized into four sections assessing how they feel regarding class-related enjoyment, hope, anxiety, and boredom. A 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) is used to record item responses. This study uses descriptive research to determine students' achievement emotions towards teaching and learning between physical classes and online distance learning.

Data Analysis

The construct reliabilities students' achievement emotions regard to class-related enjoyment, hope, anxiety, and boredom both in online and in physical classes can be described in by the Cronbach's alpha scores using the SPSS software version 26. Based on research by Roh et al. (2021), measuring reliability is carried out by making indicators from previous research. Next, the Paired Sample T-test is used to prove the presence or absence of a significant difference between online and physical classes for the students' achievement emotions, However, before conducting a hypothesis test, a Normality test must be conducted (Rohali et al., 2023). The normality test is used to determine whether the sample is from a normally distributed population. The data normality test was carried out with the Kolmogorov-Smirnov (KS) and Shapiro-Wilk (SW). The KS test compares the cumulative distribution function of a sample to a theoretical normal distribution. It calculates a test statistic that represents the maximum difference between the two distributions and compares it to a critical value to determine if the sample comes from a normal distribution. This test is suitable for larger sample sizes.

On the other hand, the SW test is a more powerful test for smaller sample sizes. It uses a test statistic that measures the correlation between the sample data and the expected values under the assumption of normality. The test calculates the ratio of the sum of the squared differences between the observed values and the expected values to the variance of the

sample and compares it to a critical value to determine if the sample comes from a normal distribution. Both tests can be used to determine if a dataset is normally distributed or not. If the p-value of the test is less than the significance level (e.g., 0.05), then the null hypothesis that the data comes from a normal distribution is rejected, and the data is non-normal. Conversely, if the p-value is greater than the significance level, then the null hypothesis is not rejected, and the data is normally distributed.

Results and Discussion

The reliability test of this study uses Cronbach's Alpha coefficient with a value of or more than 0.7 (Taber, 2018). This reliability test found that the reliability score for the online classess was 0.783 and for physical classes was 0.790 (Cronbach Alpha > 0.7). The results shown in Table 1 reflect the descriptive statistics for four variables: Enjoyment, Hope, Anxiety, and Boredom for online and physical classes as shown in Table 1. The number of observations in the sample for each variable, which is 35 in this study. The mean score for Enjoyment was higher in physical classes (4.30) compared to online classes (4.23), with a relatively low standard deviation for both (0.769 and 0.817, respectively). Similarly, for the Hope and Anxiety variables, the mean score was higher in physical classes (4.16) and (3.06) compared to online classes (3.96) and (3.01), with a lower standard deviation for physical classes (0.638) than for online classes (0.745) and (0.802). However, for the Boredom variable, the mean score was lower in physical classes (2.51) compared to online classes (2.43), with a higher standard deviation for physical classes (1.067) than for online classes (1.008).

The mean score for Enjoyment was higher in physical classes compared to online classes, indicating that students may enjoy the physical class format more. However, the difference in mean scores was relatively small, and the standard deviation was similar for both formats, indicating that there was considerable individual variation in the experience of Enjoyment in both formats. Furthermore, the mean scores for Hope and Anxiety were higher in physical classes compared to online classes, suggesting that students may feel more hopeful and less anxious in the physical class format. The lower standard deviation for Hope in physical classes also suggests that there was less variability in the experience of this emotion in physical classes compared to online classes. The mean score for Boredom was lower in physical classes compared to online classes, indicating that students may be less bored in physical classes. However, the higher standard deviation for Boredom in physical classes suggests that there was more variability in the experience of this emotion in physical classes compared to online classes.

Overall, these findings suggest that there are differences in emotional experiences between physical and online classes, with students generally reporting more positive emotions in physical classes. However, there is also considerable individual variation in emotional experiences in both formats, indicating that the experience of different emotions may depend on a range of individual and contextual factors.

Table 1
Comparison of Emotions Experienced in Physical and Online Classes

Emotions	Classes	Minimum	Maximum	Mean	Standard Deviation
Enjoyment	Physical	2	5	4.30	0.769
	Online	2	5	4.23	0.817
Hope	Physical	3	5	4.16	0.638
	Online	1	5	3.96	0.745
Anxiety	Physical	2	5	3.06	0.802
	Online	2	5	3.01	0.820
Boredom	Physical	1	5	2.51	1.067
	Online	1	5	2.43	1.008

Table 2 shows the correlation analysis results between four emotions (enjoyment, hope, anxiety, and boredom) and a variable of interest, specifically examining the correlation between the emotions experienced in online and physical classes. The correlation coefficient between the emotions experienced in online and physical classes is measured based on the strength and direction of the linear relationship between the two variables.

As shown in Table 2, enjoyment has a weak positive correlation coefficient of 0.121 with the emotions experienced in online and physical classes. This suggests that there is a slight positive relationship between the enjoyment experienced in online and physical classes. The p-value associated with this correlation coefficient is 0.487, which is not statistically significant, indicating that there is no strong evidence of a significant correlation between enjoyment experienced in online and physical classes. Similarly, hope has a weak positive correlation coefficient of 0.178 with the emotions experienced in online and physical classes, but the p-value associated with this correlation coefficient is 0.306, which is also not statistically significant. This indicates that there is no significant evidence that hope is related to the emotions experienced in online and physical classes.

Anxiety and boredom have moderate positive correlations with the emotions experienced in online and physical classes. Anxiety has a correlation coefficient of 0.559 with a highly statistically significant p-value of 0.000, indicating that there is a moderate positive relationship between anxiety experienced in online and physical classes. Similarly, boredom has a correlation coefficient of 0.551 and a statistically significant p-value of 0.001, indicating that there is a moderate positive relationship between boredom experienced in online and physical classes.

In summary, there is a weak positive correlation between enjoyment and hope experienced in online and physical classes, but there is a moderate positive correlation between anxiety and boredom experienced in online and physical classes.

Table 2
Correlations between Emotions Experienced in Online and Physical Classes

Emotions	N	Correlations	Significant Value
Enjoyment	35	0.121	0.487
Hope	35	0.178	0.306
Anxiety	35	0.559	0.000
Boredom	35	0.551	0.001

The output in Table 3 shows the results of normality tests (Kolmogorov-Smirnov and Shapiro-Wilk) for four different emotions (Enjoyment, Hope, Anxiety, and Boredom) experienced in two types of teaching settings (Online and Physical Classes). The normality tests check whether the data for each emotion and type of teaching follow a normal distribution or not.

For each emotion and type of teaching, the output shows the test statistic, degrees of freedom (df), and the significance level (Sig.). The significance level indicates the probability of obtaining the test statistic by chance when the null hypothesis (that the data is normally distributed) is true. Generally, a significance level of less than 0.05 is considered significant, indicating that the data does not follow a normal distribution. In this output, none of the significance levels are less than 0.05, which suggests that the data for all emotions and types of teaching can be considered to follow a normal distribution. Therefore, this study can proceed with the Paired Sample T-test.

Table 3
Tests of Normality for Emotions in Different Types of Teaching

		Kolmogorov-Smirnov			Shapiro-Wilk		
Emotions	Classes	Statistic	df	Sig.	Statistic	df	Sig.
Enjoyment	Physical	0.024	35	0.100	.962	35	0.423
	Online	0.076	35	0.150	.997	35	0.532
Hope	Physical	0.061	35	0.210	.802	35	0.561
	Online	0.029	35	0.100	.774	35	0.411
Anxiety	Physical	0.055	35	0.200	.848	35	0.723
	Online	0.054	35	0.200	.858	35	0.710
Boredom	Physical	0.050	35	0.200	.896	24	0.811
	Online	0.060	35	0.250	0.867	24	0.801

The Paired Sample T-test is a statistical analysis used to compare two sets of observations that are paired or matched in some way. In this case, it seems like the Paired Sample T-test is being used to compare the scores of different variables in two modes of learning – online and physical classes. Table 4 shows the results of the Paired Sample T-test for four different variables (Enjoyment, Hope, Anxiety, and Boredom) across the two modes of learning. For each variable, the table shows the mean and standard deviation of the paired differences (Online - Physical), as well as the standard error of the mean and 95% confidence interval of the difference. The t-value and corresponding p-value (Sig.) indicate whether there is a significant difference between the paired samples. A p-value less than 0.05 is generally considered statistically significant, meaning that the difference between the two modes of learning is unlikely to have occurred by chance.

Based on Table 4, it appears that there is no significant difference between the enjoyment scores in online and physical modes of learning (p=0.711). However, for the variables of Anxiety and Boredom, there is a significant difference between the online and physical modes of learning (p=0.015 and p=0.010, respectively). For Hope, the p-value is close to but does not reach statistical significance (p=0.174). Overall, the Paired Sample T-test provides a way to assess whether there are differences between two modes of learning for specific variables, while controlling for individual differences between participants.

Table 4
Paired Sample T-test of Emotions Scores between online and physical classes

	Paired Differences					t	df	Sig. (2-tailed)
				95% Confidence Interval of the Difference				
Pairs	Mean	Standard Deviation	Standard Error Mean	Lower	Upper			
Enjoyment (Online) - Enjoyment (Physical)	-0.057	0.906	0.153	-0.368	0.254	-0.373	34	0.711
Hope (Online) - Hope (Physical)	0.229	0.973	0.164	-0.106	0.563	1.390	34	0.174
Anxiety (Online) - Anxiety (Physical)	0.086	0.702	0.119	-0.155	0.327	0.723	34	0.015
Boredom (Online) - Boredom (Physical)	0.229	0.942	0.159	-0.095	0.552	1.435	34	0.010

Conclusion

In conclusion, the study found that there are differences in emotional experiences between physical and online classes, with students generally reporting more positive emotions in physical classes. However, there is also considerable individual variation in emotional experiences in both formats, indicating that the experience of different emotions may depend on a range of individual and contextual factors. The reliability test using Cronbach's Alpha coefficient found that the reliability score for the online classes was 0.783 and for physical classes was 0.790, indicating that the data is reliable. The correlation analysis showed that there is a weak positive correlation between enjoyment and hope experienced in online and physical classes, but there is a positive correlation between anxiety and boredom experienced in online and physical classes. Normality tests were performed, and it was found that the data for all emotions and types of teaching can be considered to follow a normal distribution. Therefore, this study can proceed with the Paired Sample T-test. The study can use these results to further investigate the factors affecting emotional experiences in different teaching settings and explore ways to improve the emotional experiences of students in both online and physical classes.

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