**Student Engagement during Online Classes in Covid-19: A Sentiment Analysis**

**Abstract**

**Purpose:** Online classes are valuable learning materials that can assist flexible, remote, and distant learning, especially during the Covid-19 pandemic. This study determines how students engage with online classes and how much they contribute to their learning experiences. The objective is to focus on the student's engagement in an online class. This study identifies the core concern of the education system amid this global pandemic.

**Methodology:** Using the Azure Machine learning for sentiment analysis from the qualitative responses, this study reveals the current state of students' engagement in online classes during the Covid-19 pandemic. This approach provides a better stand towards the student's quantitative data and depicts a better understanding of their sentiment.

**Findings:** The significant findings of this study are: (a) Students' academic effectiveness is not improving. (b) There is a need to restructure the academics according to online circumstances to maintain the student's engagement. (c) Co-curricular activities have been ignored.

**Contribution:** To the best of knowledge, this is the first study on student engagement during online classes after the Covid-19 pandemic. Compared to the available methodologies, this study uses sentiment analysis based on respondents' qualitative data, making this study unique in the relevant literature.

**Keywords**: Online education; online classes; learning experience; sentiment analysis.

**1. Introduction**

Understanding the nature of students’ engagement in an online lecture is critical since it impacts student future achievements (Nkomo et al., 2021). Literature on online student engagement reveals that technology is a significant mediator in promoting student engagement in online learning (Nkomo & Daniel, 2021a). Lundberg et al. (2017) also found a link between students' engagement with technologies like lecture recording and improved learning results. Students' access to lecture recordings aids their learning (St. Clair & Jensen, 2020) and helps to balance competing demands (Nkomo & Daniel, 2021b).

The sentiment analysis process is very sophisticated in analyzing the sentiment of qualitative responses. A sudden online shift to all academic activities is a huge stress factor, and only quantitative data will not correctly explain students' lack of engagement in classes. Thus, sentiment analysis is used in this scenario. It can provide us with a helpful sentiment score of the qualitative data set, and we can use that information to reach a better-suited conclusion. This process is fundamental when the respondents face a new challenge and are unsure how to express that quantitatively.

Despite the growing usage of online lectures among students, experts have expressed conflicting sentiments about their widespread use (Edwards & Clinton, 2019). Many lecturers question the efficacy of online classes facilitating learning, claiming that using online classes lowers live lecture interaction and inhibits academics from employing stories and comedy in their teaching (Joseph-Richard et al., 2018). This can affect the engagement of students both directly and indirectly, and extensive use of this can affect the students long term understanding

However, much engagement research on the student experience focuses on whole groups of students with certain qualities or within specific institutional settings. (Kuh, 2009). This focus on specific groups of students can also be seen in studies that attempt to explain patterns of participation among ethnic minorities and low-income students (Harper, 2009) .

Nevertheless, engagement research on the student experience focuses on whole groups of students with certain qualities or within specific institutional settings {Citation} This focus on specific groups of students can also be seen in studies that attempt to explain patterns of participation among different demographics of students. However, it is evident that these viewpoints only provide a partial explanation for student participation, as "the variance within any group of students is usually always greater than the variance across the groups," as claimed by (Kuh, 2009). It is critical to investigate how individual students determine their engagement to get a more comprehensive picture of student engagement.

The remaining of this paper has six additional sections. Section two outlines the literature on student engagement during online lectures followed by methodology discussion on Section three. Section four critically examines the literature in light with the results of this study. Section five explains the policy implication followed by research limitations in Section six. The conclusions of this study are presented in Section seven.

**2. Literature review**

The literature reveals that online lectures are used differently in different disciplines; for example, business, social sciences, and engineering lecturers have a more positive attitude toward lecture recording than lecturers in science disciplines. The phrase "student engagement" has its origins in a corpus of work concerned with student involvement. It is now widely used, particularly in North America and Australasia, where yearly large-scale national surveys have firmly established it. The most prolific authors (in particular, (*What the U.S. (and Rest of the World) Should Know About Higher Education in China: Change: The Magazine of Higher Learning: Vol 51, No 3*, n.d.) have affiliations to the organizations that devised, executed, and supported these nationwide student engagement surveys, which are housed in universities or commercial businesses. (Trowler, n.d.)

A variety of factors can influence students' engagement with Online classes. For example, Visser et al. (2014) found that students are more likely to attend lectures in courses offered in a short amount of time, are primarily lecture-driven, and feature content not available in other media. Edwards & Clinton, (2019) investigated students' interaction in Online Classes and their effects on learning outcomes in a recent study.

When lecture recordings were made public, they discovered that attendance on Online Lectures had plummeted dramatically. They did find, however, that students frequently engage with Online Lectures differently. Ebbert & Dutke, (2020) backed this up by stating that students who employ deep learning use lecture recordings as supplemental learning tools and are highly engaged in their studies. However, the curriculum developed with online lectures in mind can have a greater engagement rate than conventional methods that are just online. This provides an excellent outline of how the low engagement score and somewhat negative sentiment can be mitigated.

A more comprehensive picture would thus necessitate a thorough examination of the areas mentioned above that are potentially related to student engagement (including, but not limited to, student feedback, student representation, student approaches to learning, institutional organization, learning spaces, architectural design, and learning development), as well as the literature tagged as "student engagement." This, however, was outside the scope of this project and would be a massive undertaking. As a result, our assessment focuses on publications behind student engagement by their authors rather than any publication that substantively addresses issues within our definition. (Trowler, n.d.)

**3. Methodology**

This study is based on primary data. A survey research approach guided the investigation, including an online structured questionnaire with closed and open-ended questions. The quantitative data was utilized to explain the qualitative measures and provide context for the results' interpretation (n = 263). Profiles of university-wide courses that provided students with access to recorded lecture materials were used in the recruitment process. Following ethical approval, academic staff responsible for different courses were asked to email students to participate in an online survey on the importance of online classes. A total of 263 students took part in the survey freely.

The azure machine learning (AML) has been used to analyze the respondents' sentiment of the qualitative data. This study uses AML because it collects vast and reliable data compared to any other similar lexicons. AML presents its results into percentage scores. The cumulative scores calculated from each response indicate the sentiment of the given dataset. The description of the AML percentile method is shown below.

* A score between 0% and 49% is treated as unfavorable, while 0% being the most negative sentiment and 49% being the least.
* A score of 50% represents a neutral sentiment.
* A score between 51% and 100% represents positive while 51% being the least favorable and 100% being the most positive.

**Measures:**

Demographic information was gathered from students and their opinions on the value of Online Classes in their learning. The survey included both closed-ended and open-ended items graded on a 5-point Likert scale.

Because the survey was sent to students from various academic divisions and levels across various academic institutions, the experiences of those who replied varied, as did their personal views about Online classes; thus, the data analysis is mainly focused on self-reported experiences.

Table 1: Demographic statistics of respondents (Age, gender, Academic stage, division, and level)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| |  |  | | --- | --- | | **Gender** | **Frequency (%)** | | Male | 202 (76.8%) | | Female | 61 (23.2%) | | **Age group** |  | | 17-18 | 19 (7.2%) | | 19-20 | 49 (18.6%) | | 21-22 | 110 (41.9%) | | 23-24 | 76 (28.9%) | | 25+ | 9 (3.4%) | | **Academic Stage** | **Frequency (%)** | | | Under-Graduation |  | | | 1st year | 46 | | | 2nd year | 106 | | | 3rd year | 80 | | | 4th year | 25 | | | Post-Graduation |  | | | MBA | 3 | | | MSS | 1 | | | PhD | 2 | | | |  |  | | --- | --- | | **Academic Division** | **Frequency (%)** | | Science | 105 (39.93%) | | Business | 124 (47.15%) | | Humanities | 27 (10.27%) | | Social Science | 3 (1.14%) | | Bachelor of Fine Arts | 2 (0.8%) | | Engineering | 1 (0.38%) | | LLB | 1 (0.38%) |  |  |  | | --- | --- | | **Academic Level** | **Frequency (%)** | | Under graduation (BBA, BSc or equivalent) | 205(77.9%) | | Post-Graduation (MBA, MSC or equivalent) | 54(20.5%) | | PhD | 4(1.5%) | |

**4. Results and analysis**

The demographic differences among the respondents in terms of gender, age group, academic divisions, stage, and level demonstrate a wide variety in response (Table 1) and, thus, advocates for a robust outcome. The majority of the respondents opined that online lecturing could be a supplementary tool for education during this intermediate period of Covid-19 but not the replacement. They stated different scenarios explaining the limitations of online lectures at this stage. One respondent reported-

*"Online classes don't offer the same immediate and regular access to instructors and classmates as traditional face-to-face classes."*

Despite the above direct oppositions by the respondents, this study found mixed sentiment from the respondents, which are explained in the later sections.

**Q1. Do you think that online classes have made you less likely to attend class? And to what extent?**

Online classes have dramatically overtaken conventional physical classes as the covid-19 pandemic has forced us to stay apart and practice social distances. This has a long-tail impact on daily activities for people of all walks. Students have been facing difficulties due to this change. Sudden change in the way of participating in classes has both positive and negative impacts. Carefully analyzing curated feedback of the 140 participants, the overall impact of this online class situation paints a negative picture. Table 2 presents the summary of the responses.

Table 2: Sentiment analysis summary for Q1

|  |  |  |
| --- | --- | --- |
| **Sentiment** | **Count of Response** | **Average of Score** |
| negative | 72 | 22% |
| neutral | 21 | 53% |
| positive | 47 | 67% |
| **Grand Total** | **140** | **42%** |

The sudden shift from physical to online classes with the same curriculum presented the students with various hiccups. The online classes come with a couple of flexibilities that enable students to gain knowledge from the comfort of their choosing. A respondent expressed-

*"The environment of peer-group, obligement to the teacher's presence and mystery of the new 'going to be discussed' topic, teacher's certain body language and tone for certain description, the thrive to end the class soon and go out for an air-this essential classroom environmentis more or less absent during online classes in addition to internet and device issues disrupting the smooth flow of conversation and understanding. Staying at home makes it even harder."*

Figure 2 shows the quantitative representation of the respondents on a 5-point Likert Scale. From the Likert scale presentation, it is evident that very few respondents believe that online classes have made respondents less likely to attend class. However, most respondents believe that online classes have made them less likely to attend class either to some extent or a great extent. It must be mentioned here that many respondents believe that there is no effect on their presence whether the class is being held physically or digitally. It indicates a considerable group of respondents have a studentship nature in their phycology and will attend classes in any circumstances.

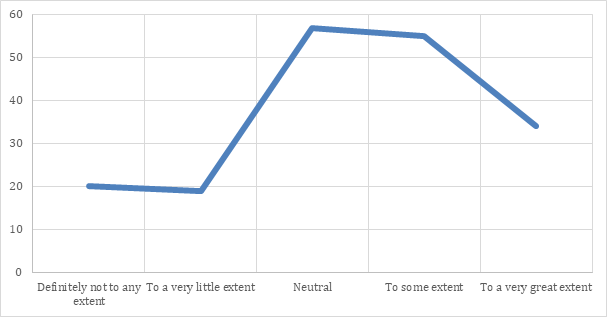


Figure 2: Respondents' feedback in 5-point Likert Scale on Q1

**Q2. Do you think the use of online lectures has improved your engagement with the content of the course?**

Colleges and universities are spending much time and effort to provide their students with the best educational experiences. It is believed that more learner-centered and collaborative activities will surely enhance a student's learning experience. Though a positive learning experience could be defined by several factors, student engagement, and perceived course value are two of the most dictating constituents to a student's positive learning experience (Floyd et al., n.d.). Carefully inspecting 157 feedbacks from the respondents, the result indicates overall negative feedback from the students. The lack of engagement with the course content is summarized in figure 3.

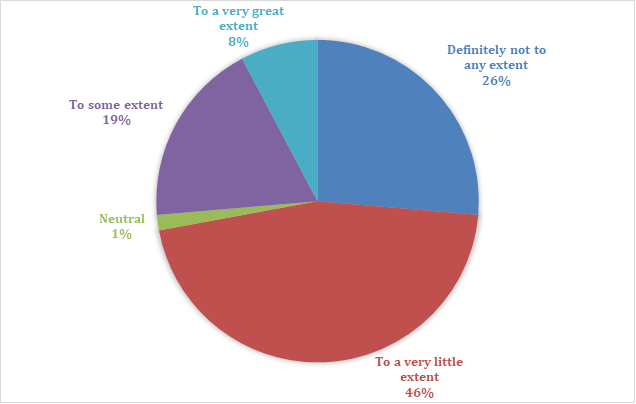


Figure 3: Respondents' feedback in 5-point Likert Scale from Q2

Figure 3 describes the engagement level of the content of the course. It is found that 46 percent of the respondents have stated that their engagement with the course content has been improved to a very small extent. In addition, 26 percent of the respondents have shown that online classes have not improved their course engagement. On the contrary, only 19 percent of respondents reported their engagement has increased to some extent, and 8 percent of the respondents think this has increased their engagement with the course content to a very great extent. Overall, it is evident that most of the respondents feel that online classes lag behind expectations in terms of student engagement. Besides the negative feelings, there is somewhat of a mixed feeling. As one respondent stated:

"I can't focus much on the class too much. While the answer tends to be a negative one, the response also stretches out to the positive end with the aid of class recording and also browsing up many resources on the topic for somewhat in-depth knowledge."

A total of 132 respondents have given their written statements for this question. The sentiment analysis has a contrary result that advocates for respondents' neutral feedback (Table 3). The average sentiment score for this question is found neutral with 49 percent. Nevertheless, student engagement is found either negative or neutral indicating a gap in student engagement during online classes during Covid-19.

Table 3: Sentiment analysis summary for Q2

|  |  |  |
| --- | --- | --- |
| **Sentiment** | **Count of Response** | **Average of Score** |
| negative | 53 | 23% |
| neutral | 18 | 53% |
| positive | 61 | 70% |
| **Grand Total** | **132** | **49%** |

**Q3. Do you think the use of online lectures has improved your engagement with the lecturer?**

It is widely believed that a better learning experience comes from an engaging and collaborative classroom. Although online lectures have been on the rise for quite a while now, due to this Covid-19 pandemic, The growth of online courses continues to rise dramatically. Alongside the increasing online classes, a need for a better engaging class scenario has been growing at the same pace. Several studies have found that online classes often outperformed students from the in-person classroom (Dixson, n.d.)

Curating the answers of 187 respondents, the majority of the answers are leaning towards the negative part of the 5-point Likert scale that has been used to analyze the results. Forty-five percent of the total 187 respondents think that it has not helped increase engagement with the lecturer. 27.28 percent of respondents think that it has minimal impact on their engagement. 29.95 percent of respondents are unsure about the fact. Only 34 percent of respondents are leaning towards the positive side of the given scale.

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Figure 3: Respondents feedback on a 5-point Likert scale from Q3

Analyzing the sentiment of 128 statements, the total sentiment score is 52%. This number depicts that the genuine sentiment is neutral. There are 66 positive statements, and their average sentiment score is 69 percent. As one of the respondents stated-

"Yes, I can raise any questions turning my video off which is tough for introverts to do in the classroom in front of classmates."

Forty-two of the response are negative, with an average score of 25%.

"Technological issues and psychological profoundly unexplored barriers cause a much lesser performance in the interaction between teachers and students. I feel they (the lecturer) behave kind of robotically in front of the cameras. Empathy is lost as well."

This advocates the negative sentiment are more robust than positive ones. There are 20 neutral words found where the average sentiment score is 53%. Nevertheless, overall, the results are somewhat neutral, but interestingly this differs from the respondent's response on the prior 5-point Likert Scale.

Table 4: Sentiment analysis of the answers of Q3

|  |  |  |
| --- | --- | --- |
| **Row Labels** | **Count of Response** | **Average of Score** |
| negative | 42 | 25% |
| neutral | 20 | 53% |
| positive | 66 | 69% |
| **Grand Total** | **128** | **52%** |

**Q4.** **Do you think the use of online lectures has improved your engagement with peers?**

Online classes are different from conventional physical classes at their core. Distant learning is the opposite of being on the campus and having an independent learning and practice environment. The data that has been collected in the form of the Likert scale has shown that the majority of the students have mentioned that their engagement with peers has declined significantly. Amongst 172 respondents of these specific questions, 46 (26.14%) students think their engagement with peers has not improved to any extent at all. 53 (30.82%) participants think that it has improved to a very small extent. 44 (25.59%) students are neutral about that fact, and 17 (9.89%) respondents think that their engagement with peers has improved to some degree. 12 (6.98%) think that the online class scenario has improved their engagement with peers to a very great extent.

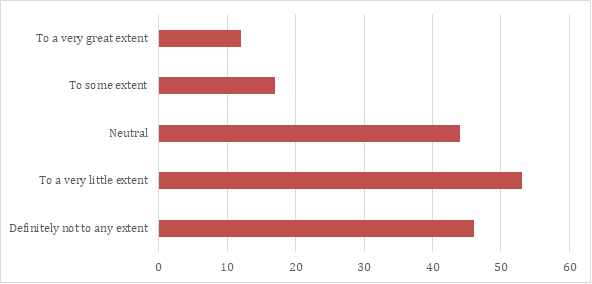


Figure 4: Respondents' feedback in 5-point Likert Scale from Q4

The sentiment of the respondents (126) shows instead, their sentiment is somewhat neutral. In their words,

"The use of online lectures has improved my engagement with the relevant peers regarding the betterment of the classes."

"We used to share class notes more than ever. However, these are mostly need-based. Peers use to have selective communication according to their study requirements."

Total 43 (34.13%) responses that are received demonstrate negative sentiment with an average score of 29%. The average score of neutral statements is 52%. 24(19%) of the responses are neutral. 59(46.8%) responses are positive sentiments. Considering all these, 49.667% is the overall sentiment score, which is a neutral number.

**Table 5:** Sentiment analysis summary for Q4

|  |  |  |
| --- | --- | --- |
| **Sentiment** | **Count of Response** | **Average of Score** |
| negative | 43 | 29% |
| neutral | 24 | 52% |
| positive | 59 | 68% |
| **Grand Total** | **126** | **49.66%** |

**Q5. To what extent has access to online lectures improved your learning?**

Among 152 respondents, 30 (19.7%) think that Online Classes have not improved their overall learning experience to any extent. This may be the effect of a sudden shift from conventional to online classes without much time to update and accommodate the curriculum for online learning. Forty-five (29.6%) respondents think this has not improved their learning experience, even to a very small extent. Forty-nine (32.24%) responses were neutral. Twenty-five (16.45%) participants think that online classes have somewhat improved their learning experience. Three (1.98%) respondents think that the shift from physical to online classes has improved their learning experience greatly.

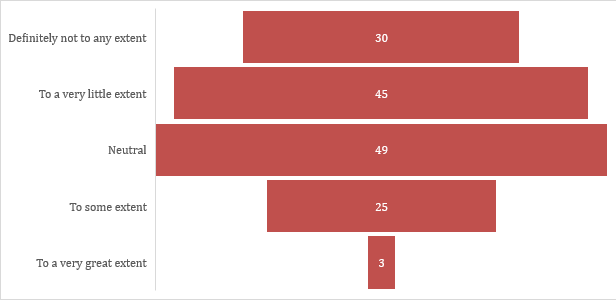


Figure 6: Respondents' feedback in 5-point Likert Scale from Q5

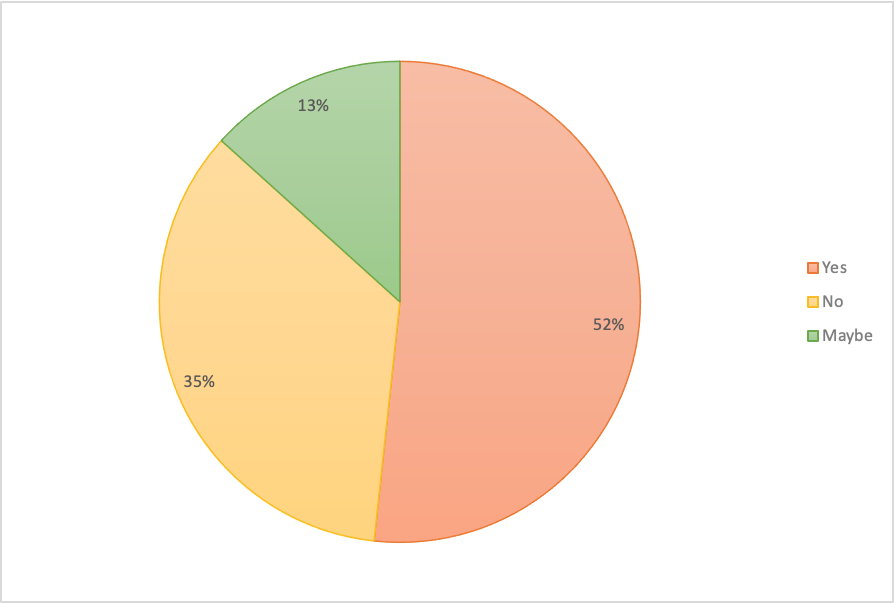
Analyzing the sentiment of the responses, this is observed that the sentiment of the overall learning experience with online classes has a great score of 43%. This sentiment score of 43% depicts that the respondents have a negative sentiment towards online lectures in Bangladesh. 126 respondents briefly described the reasoning behind their answer to the Likert Scale, 63(50%) responses had negative sentiment in them with an average score of 23%. 22(17.46%) of the responses were neutral, having an average sentiment score of 53%. 41(32.54%) responses have positive sentiment in their description. The sentiment score for these positive statements is 68%.

Table 6: Sentiment analysis summary for Q5

|  |  |  |
| --- | --- | --- |
| **Row Labels** | **Count of Response** | **Average of Score** |
| negative | 63 | 23% |
| neutral | 22 | 53% |
| positive | 41 | 68% |
| **Grand Total** | **126** | **43%** |

**Q6. Do you think online classes have affected your co-curricular activities?**

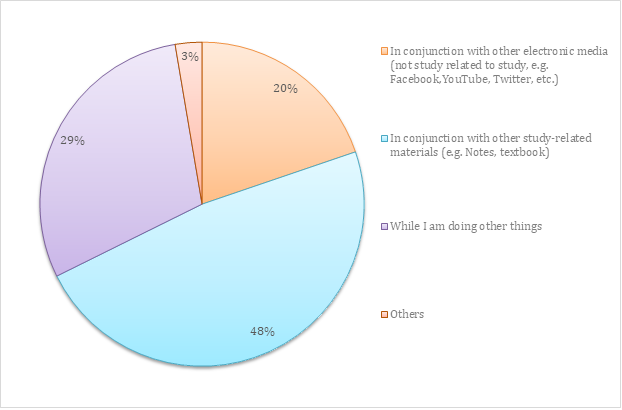
Being physically absent from the campus has affected the co-curricular activities of many students. The chart shows that 136 (52%) respondents opine that this sudden transition has affected their co-curricular activities. 92(35%) respondents think that they are unaffected by this. This may be because their co-curricular activities (such as graphic designing and so on) do not require them to be on the campus. 35(13%) of the respondents are unsure about the answer.



**Figure 7:** Respondents' feedback in 5-point Likert Scale from Q6

**Q7. In which state do you attend your online classes?**

The figure shows different states in which the students participate in online classes. There has been an exciting variation in the participants' answers. Almost 52% of the participants attend their classes with multiple distractions that are very concerning. The students with more significant numbers of online courses also reported less exposure to effective teaching practices and lower quality of interactions.

**Figure 8:** Respondents' feedback in 5-point Likert Scale from Q7

Analyzing the results, 48% of the participants join their classes in conjunction with study-related materials. Though this number is good, this can be a lot better. The figure shows that 78 (29%) of the respondents participate in class while doing other things. In contrast, 52 (20%) of them join classes in conjunction with different electronic media. Three percent of the respondents stated other different scenarios.

"It depends on the situation. If I find the class interesting and motivating, I will concentrate fully."

"I attend while I am sleeping."

"It basically depends on the class lecture. I use to participate in the interesting one and ignore the boring one."

"I find myself watching recordings of previous classes because the recordings can be paused, and I seem to need breaks far more frequently due to the nature of the lectures as mentioned above."

**5. Policy implications**

The findings of this study advocate for several policy implications at a national level. Regarding student engagement in online classes, a neutral result is found in sentiment analysis indicating a need for policy formation in online teaching, highlighting the need for student engagement to make the classes more effective than last year.

Online classes have been heavily used during this covid-19 pandemic to avoid academic delays and keep the students in the loop. Nevertheless, this sudden change without restructuring the curriculum in favor of the class delivery method very concerns when it comes to students' engagement in various forms. An immediate and scientific approach to mitigate the engagement problem is very much needed to have a significant improvement over the current position.

**6. limitations and future research**

This study is not out of limitations. For convenience, this study did not focus on collecting data from the poor student group highlighting their financial condition. Respondents from rural areas and urban areas were not also considered. Thus, this study's results may not be equally applicable for the students from a remote area. The failure to monitor the response rate and the risk of missing data are two disadvantages of questionnaires used as self-reported measures. As a result, specific questions had missing data or had fewer respondents.

We used sentiment analysis to back up the findings of the questionnaire's self-reported data. Nevertheless, sentiment analysis restricts the ability to pre-train any dataset and relies on a pre-trained classifier, so the findings do not reliably score the sentiments. In addition, most sentiment analysis algorithms ignore the meaning of the document. Shorter sentences are more reliable than large blocks of text for the classifier used in this analysis. However, AML outperforms other resources like the Stanford NLP Sentiment Analysis engine (Chatterjee & Perrizo, 2016). Furthermore, since the questionnaire was distributed to students from various academic divisions and levels around the university, the analysis did not capture the design of the videos or their length, which may have differed.

**7. Conclusions**

The results from this study shed light on the acute need for several future research. There is a clear need for rigorous study on technology adoption among the students for online classes based on the technology adoption theory. Our sentiment analysis illustrates how qualitative data can be triangulated to confirm or contest research findings with different types of data available to researchers. In addition to that, study on poor society and remote areas would help develop a unique national policy. We will collect further data about online classes in the future and compare it to what students said and the learning analytics gathered from the system. It would also be crucial to look into how undergraduate students reacted to online versus postgraduate students. We assumed that various students look at online classes in different ways. Understanding how individuals and groups used these tools will help educators tailor learning support to their specific needs.

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