The Application and Development of Zoom Teleconferencing Technology in the Virtual Undergraduate Environment

Appalachian State University

Imajin Graham, Rain Quijosa, Colson Smith,
Rachael Tilley, Laura Voytko

May 4, 2022

INTRODUCTION

The COVID-19 pandemic has transformed how people interact with each other across many everyday social interactions, including the workplace and the focus of this particular study- education. Even after cases diminish and this virus no longer dominates the globe, the effects will carry over into the future.

One of the most significant developments from the COVID-19 pandemic is the popularization of Zoom- the namesake video teleconferencing software program from Zoom Video Communications. This technology has been available since 2011, but it wasn't until 2020 that the company's revenue increased by 317% (Iqbal, 2022.) Technology quickly became one of the most common communication tools to connect people virtually.

The abrupt suspension of face-to-face meetings for classes in school called for an immediate and widespread transfer to Zoom- a new technology for many. In 2019, Zoom's daily meeting participants were reported at 10 million, increasing to 200, 300, and 350 million throughout 2020 (Business of Apps, 2022.) Although Zoom is a tool that people have come to adopt, many students have reported that they prefer in-person learning rather than online for many reasons, including engagement and participation ((Kemp & Grieve, 2014.)

The following empirical research will support further research into the potential of Zoom as a virtual learning tool, specifically in the undergraduate academic setting. Students and professors will continue to operate to the best of their ability throughout the pandemic, with and without the aid of Zoom video-conferencing, but how can this technology be enhanced?

LITERATURE REVIEW

Hind and Alfadda proved Zoom to be an effective virtual learning tool in their December 2020 study. Their research is set firmly in the context of navigating virtual learning during the COVID-19 pandemic. These researchers used the TAM model to measure attitudes, intentions,

and behaviors towards Zoom as a learning tool in their study of undergraduate students learning English as a Foreign Language (EFL).

Davis's Technology Acceptance Model (TAM) is widely recognized as an empirically-validated tool used to predict the approval and use of technology. This model states that behavior is determined by the intention to perform that behavior, the attitude towards conduct, and the social pressure to perform that behavior.

The TAM model considers five variables: perceived ease of use (PEU), usefulness (PU), attitude towards service, behavioral intention, and actual use. Alfadda and Mahdi (2020) also included demographic variables in their study, especially considering gender and experience in using Zoom. Computer skill was also included in this study's TAM model.

75 (46.6% male, 57.14% female) of the participants were undergraduate students in the English department across selected Saudi universities. They were each given a questionnaire divided between demographic questions (gender and experience level) and questions based on the TAM model (PEU, PU, attitude, behavioral intention, actual use, and computer self-efficacy.)

There was a strong correlation (positive relationship) between computer-self efficacy and overall technology acceptance, perceived usefulness and computer usage, PEU and perceived usefulness, attitude towards computer use, and Zoom experience and acceptance.

These findings are all useful in informing further research on Zoom technology. The variables used and the overall model can identify user technological experience and attitudes. One critique is that this research only applies to virtual language learning, as well as Saudi university students. So, would their findings apply to a more generalized undergraduate population? Would research on American students differ?

Faudy, Sutarjo, and Ernawati (2021) measured the *perceptions* of Zoom among other virtual learning platforms during the COVID-19 pandemic. Their study analyzed students' perceptions of multiple commonly used learning platforms.Their critical intake is how individual

behavior is influenced by the perceptions of technology and how it is helpful in an online environment. These researchers designed a quantitative study exploring several ease factors using online learning platforms. Researchers developed an explanatory research survey to describe the variables in the research and how they will be measured.

The study tested a student population between three universities and used convenience sampling. Data analysis was later used to determine the students' perceptions of learning media in the early COVID-19 stage. The survey focused on the effectiveness and feelings towards online learning platforms and was judged by perceived usefulness and ease of use (Fuady et al., 2021).

Gaudy et al. structured the results in tables by perceived ease, easiness perception, and how helpful the online learning platforms -including Zoom- were. These results are calculated by the mean, standard deviation, and percentages.

Perceived ease is how a person believes that using a particular system will be effortless and suggests perceived ease of use positively affects perceived usefulness (Fuady et al., 2021). Table 1: Zoom (3.6) mean and a 0.54 SD, very easy. Table 2: (Easiness Scale) 63% of students find Zoom very easy. While 34% find it just easy and 2.8% find it difficult. Table 3: (perceived usefulness) Zoom (3.5) mean, and a 0.6 SD, reasonably practical. Table 3 shows that most students find Zoom beneficial compared to other platforms like Google Meet and LMS. Table 4 converts table 3’s results into percentages, and 61.5% find Zoom very useful. 31.7% find Zoom quite useful, 5.8% find it less useful, and 1% find Zoom unuseful (Fuady et al., 2021).

Based on the concluded results, the student's perception of Zoom technology is influenced by the perceived ease of the platform and how the platform is easy to operate. The technology is perceived as accessible media, and students have no interest in trying new software such as Google Meet and LMS. Students from the survey expressed that Zoom has excellent benefits, such as face-to-face learning, and is most comfortable to operate from their home.

This study focuses on the learning techniques of different learning platforms like Zoom and measures students' perceptions about operating and liking. More reasoning from the students on why they think Zoom is the most accessible platform would be informative. What are some of the features? What can Zoom offer that some other platforms cannot do? This research study further supports our cause in the development of Zoom technology in academia and how the likeliness of Zoom can exceed the expectations of college students.

Similarly, Derar Serhan (2020) investigated students' perceptions about Zoom by measuring students' attitudes towards the use of Zoom in remote learning and their perceptions of its effects on their knowledge and engagement in comparison to face-to-face learning (Serhan, 2020). The study was meant to register students' perceptions, engagement levels, preferences, and perceived advantages and disadvantages of online learning.

Methods involved in the study used 31 student participants at a major university in the United States. These students had attended classes in the Spring of 2020 until the end of March (Serhan 2020). Students filled out a Linkert-type survey using the range from Strongly Disagree (1) to Strongly Agree (5) for 19 items participants were to answer. All of the items were divided into four sections. The sections included: students' attitudes toward using Zoom, the perceived impact of using Zoom on their learning, students' perceptions of their classroom engagement while using Zoom, and student's perceptions of the differences between face-to-face and Zoom sessions (Serhan 2020). At the end of these sections, two open-ended questions were added asking about the advantages of using Zoom are? What are the disadvantages of using Zoom?

In regards to the attitude of students towards the use of Zoom, 22.58% agreed that they enjoyed using it, while 48.39 % disagreed. Student perceptions of Zooms impact their learning 9.68% agreed that the use of Zoom improved their learning, while 61.29% opposed it. The items of the students' engagements registered that 12.91% agreed that the use of Zoom helped them

participate in the class, while 61.29% disagreed. The survey reported 80% of students overall felt that they would instead resume face-to-face learning.

The advantages listed by students in the open-ended questions were flexibility (78.95%), easier interaction (10.53%), written communication (5.26%), and the use of multimedia (5.26%) (Serhan 2020). The disadvantages listed by students were: Distractions (42.11%), quality of interaction and feedback (36.84%), poor education quality (15.79%), and technical difficulties (5.26%) (Serhan 2020).

The conclusions of the results indicate dissatisfaction and a negative attitude towards utilizing Zoom as an online learning platform. This study expresses the value of open-ended questions, which can be concluded to overall trends of participants' thoughts. These results differ from the previous research mentioned above.

Another aspect of the progression of Zoom is the focus on approaching alternative routes of engagement and students' learning styles. El-Sabagh (2021) conducted an exploratory study with a sample of 118 university students. The author used a qualitative research method to conduct open interviews with first-year college students to analyze students' difficulties learning in class.

El- Sabagh hypothesized that online learning could motivate students' engagement by diversifying their learning styles. The process by which a learner organizes, analyzes, represents, connects, and stores information is an individual learning process. This process helps recognize and piece together information in their minds (Franzoni, 2020).

The author has defined the independent variable as the use of various online learning media, including Zoom, Google meets, Google classroom, and LMS platforms. The dependent variable is a student's ability to stay engaged—the research-based is on a quasi-experiment. The experimental and control groups were given a pretest and posttest. Results showed that the scores of the two groups were similar in terms of student engagement before the experiment

El-Sabagh (2021). This is a positive correlation between online learning allowing students to learn individually and improve their cognitive behavior. (Atherton, 2017) found a correlation between the use of course materials and student performance; course content is more expected to lead to better grades.

As mass communication continues, we are too. However, it is slower for us to keep up with technological advancements because we are human. Engagement can differ depending on prior knowledge and frequency of usage of various online learning media. The results of the study showed the dependent variable strongly influences one's cognitive ability to adapt; instinctive behavioral engagement factors are pushed to the side. There is still more research to increase academic performance and motivation in the learning process.

The 2020 study conducted by Sei-Hwa Jung distinguished the effectiveness of communication through Zoom when used in academic settings. The study was conducted on 71 undergraduate university students who all studied English. There were two separate classes, one being current issues and the other being English listening and reading.

Students were instructed to post questions, comments, and answers using the "chat" feature in Zoom. They were also told that their online participation on Zoom would account for 20% of their grades in the class. The messages in the chat were separated into three different categories. These categories were instructor to the student (IS), student to the instructor (SI), and students to students (SS). The total number of collected responses was then compared at the end to the students' final grades to find if there was any correlation.

The research findings were put into SPSS so that the data could be analyzed quantitatively. Across the two different courses throughout the semester, 6,086 chat messages were produced between the total number of 71 students. The average number of chat messages posted per student across both studies was 85.72, with a standard deviation of 52.59. In course one alone, the average chat messages posted was 89.91, with a standard

deviation of 60.29, with the student sending the most messages having 244 messages, while the least had 21. In course two, the average student sent 82.08 messages throughout the semester. The standard deviation was 45.39, with the most participating student sending 205 messages and the minor participating student sending 15 messages total.

These interactions were then split into three categories: IS, SI, and SS. There were 393 IS interactions, 115 SI interactions, and eight SS interactions. Course one accounted for 208 IS interactions, 67 SI interactions, and 4 SS interactions. Course two accounted for 185 IS interactions, 48 SI interactions, and 4 SS interactions (Jung 2020). Instructor-to-student interactions dominated the total number of interactions. The student-to-instructor interactions were in the middle, and student-to-student interactions were last.

After this step, correction analysis was conducted to distinguish between student Zoom participation and student performance. It was found that there was a significant positive relationship between the number of unlimited chat messages per student and their final grades in that course. The final results proved that students that received higher grades posted and used the chat function in Zoom more often than those who received lower grades in that same course. These findings were also consistent with previous studies conducted by Dalelio (2013), He (2013), Morris et al. (2005), and Tayebinik and Puteh (2013), who all found that student performance was increased when online learning participation increased as well. This study is consistent with our research in that it tells us what indicators can help improve the overall performance of the students.

When thinking about this study, questions that come to mind are if 20% of the students' grades did not rely on online participation. If the students were not strongly encouraged to participate by their instructors, how much differently would this study have played out? Would there still be as many participants in the online learning environment?

Research Questions and Hypotheses

Further study must be accomplished to achieve more generalizable results and understand Zoom technology. This may lead to further sociological research on the cultural implications of this communication tool.

The **primary independent variable for this study is the implementation of zoom technology and its digital learning capabilities**, specifically for undergraduate students.

The **dependent variable is the student motivations and behaviors in the transition from a traditional classroom to virtual learning.** It can be measured through attendance, engagement, grades, and feedback and answer the following research questions.

1. Fully virtual courses allow students to focus better on their coursework.
2. How do external virtual resources affect testing?
3. How is students' ability to learn measured according to the logistics of Zoom? Is it motivationally driven given a new environment?
4. What is the relationship between students' attitudes towards Zoom technology and their performance?
5. How does prior experience with Zoom affect future use of virtual communication technology? Are students more receptive to alternative methods of education?

METHOD

Study Overview

This study aims to evaluate students' perceptions and experiences with Zoom video conferencing technology. Designed on the Qualtrics platform, a virtual survey containing 19 questions was distributed to undergraduate students in a major public university. This questionnaire includes multiple-choice demographic questions, followed by Zoom-technology

questions posed on a 5-point Likert scale. There are also open-ended questions to provide more personalized feedback.

Participants

The recruitment method involves convenience-snowball sampling. In addition to this, the goal of the virtual survey is to be easily between undergraduate peers to grow the sample size. There is no compensation or reward offered to the respondents of this questionnaire.

135 responses were recorded. 9.6% of which were freshmen; 22.76% respondents sophomore, 26.83% junior and 40.65% senior.

The demographic of participants varies in many ranges. There was a good range of multiple academic years, with There being eight freshmen, 17 sophomores, 26 juniors, and 37 seniors. We have 64 females and 20 male participants, and five who prefer not to say. However, caucasians held the highest ethnicity percentage among our participants, at 74%. This was the vast majority of our participants, as the second-highest number was black people at 7 participants, and Latinx had 5 participants.

Procedure

A respondent must first read and agree to the informed consent statement when accessing the survey. The consent form outlines the purpose of the study and the key elements being examined by researchers.

Respondents were then asked to provide their age and answer four demographic-related multiple-choice questions. Here, survey subjects provide their academic year, gender, ethnicity, and work status.

Following the demographic questions, participants were asked to rank their feelings towards Zoom technology on a five-point Likert Scale based on how much they agree or disagree with the prompting statement. Questions include I prefer Zoom class meetings over in-person meetings, Cheating on course materials is more accessible via Zoom, and Virtual video conferencing makes education more convenient and accessible.

Two open-ended questions regarding participants' opinions of Zoom's place in education conclude this survey. Although not necessary for quantifying data, these questions are intended to provide researchers with more personable insights into an undergraduate student's feelings towards Zoom and distance learning. In one of our questions, we asked participants, "what would you recommend changing about the zoom application?"

Independent Variables

The core independent variables of this study were the attitudes towards the Zoom platform. Attitudes and behaviors are used to measure the successful application of the platform's technology in the classroom. Some of the statements that were asked in the survey include, "I perform better academically with Zoom class meetings," "It is easy to learn how to operate Zoom," and "Generally, I believe I can use technology effectively." There is a need to consider individual learning styles. It is recognizable that some individuals' acceptance of Zoom could vary according to the TAM model which measures the acceptance of technology by potential users. The key is to focus on the emphasis of user perceptions and their self perceived ease of use in technology.

Dependent Variables

Our dependent variable is the use of Zoom technology in the classroom. The success of said technology is determined by student's attitudes and behaviors. This was accomplished by measuring engagement, performance, and general feedback. Participants provided insights to how they feel about the Zoom platform and how they perform academically in their survey answers. Some of the statements that participants were asked to rate were "Virtual video conferencing makes education more convenient and accessible," "I've used resources outside of the curriculum to help me with assignments through Zoom," and "Cheating on course materials is easier via Zoom." Participants used their personal experience to determine their answers.

Sample Survey
DEMOGRAPHIC (Direct Answer and Multiple Choice):

Q1. What is your age?
Q2. Academic Year
Q3. Gender
Q4. Ethnicity
Q5. Work Status

Based on your personal experience, please indicate your degree of agreement to the following statements:

1. I've used virtual teleconferencing tools in an academic setting before the COVID-19 pandemic.
2. I perform better academically with Zoom class meetings.
3. It is easy to learn how to operate Zoom.
4. I prefer Zoom class meetings over in-person meetings.
5. Virtual video conferencing makes education more convenient and accessible.
6. I've used resources outside of the curriculum to help me with assignments through Zoom.
7. Cheating on course materials is easier via Zoom.
8. Generally, I believe I can use technology effectively.
9. Zoom has enabled me to communicate well with my peers in the classroom.
10. Zoom has enabled me to communicate well with my professors in the classroom.
11. Zoom has allowed me to participate more often compared to in-person meetings.
12. Learning via zoom eliminates distractions.
13. I feel engaged in a zoom class meeting.
14. My internet connection makes it difficult to access my schoolwork.
15. I have to travel outside of my home to connect to the internet.
16. I am open to fully virtual learning in the future.
17. Zoom and similar teleconferencing tools are the most effective method for distance-learning thus far.

Open-ended Questions:

1. What would you recommend changing about the Zoom application?
2. If you are willing to convert to a completely online education, what might be your reasons?

RESULTS

1. **Fully virtual courses allow students to focus better on their coursework.**

The correlation between “I perform better over Zoom.” and feelings about “I prefer Zoom class meetings.” was significant, $r(20) = .58$, $p = .005$. The correlation between “I perform better over Zoom” and feelings about “communicating well with professors and peers” was significant, $r(98) = .35$, $p<.001$. The correlation between “I perform better over Zoom” and feelings about “Zoom eliminates distractions” was significant, $r(20) = .65$, $p<.001$. The correlation between “I perform better over Zoom” and feelings about “being open to virtual learning in the future” was significant $r(20) = .69$, $p<.001$.

2. **How do external virtual resources affect testing?**

The statement, “Cheating on course materials is easier via Zoom,” was observed in order to answer this question. The correlation between cheating and using external sources was significant, $r (20)= .549$, $p = .008$. The correlation between cheating and the statement, “Generally, I believe I can use technology effectively,” was significant, $r (20) = .465$, $p<.029$ Lastly, the relationship between cheating and the statement, “Learning via zoom eliminates distractions,” was significant, $r(20) = .438$, $p <.042$.

3. **How is students' ability to learn measured according to the logistics of Zoom? Is it motivationally driven given a new environment?**

The correlation between both statements, “I perform better over zoom” and “virtual video conferencing makes education more convenient and accessible” was significant, $r (101)= .601$ $p=.003$

4. **What is the relationship between students' attitudes towards Zoom technology and their performance?**

The correlation between both statements, “I am open to fully virtual learning in the future” and “I perform better academically with Zoom class meetings” was significant, r (93)= .686, p<.001.

5. **How does prior experience with Zoom affect future use of virtual communication technology? Are students more receptive to alternative methods of education?**

The correlation between both statements, “I’ve used virtual teleconferencing tools in an academic setting before the COVID-19 pandemic” and “I am open to fully virtual learning" is not significant correlation, r (20)=.125 p=.580. This tells us that students might have used virtual learning tools but do not want to fully assimilate to online use.

Conclusion:

The overall findings of our study exhibits a presence of correlations between students' answers taken in the survey. State findings here (not just selective findings).The question, “I perform better academically via zoom” had several significant correlations to many other questions, including: “I prefer Zoom class meetings,” “communicating well with professors and peers,” “Zoom eliminates distractions,” and “being open to virtual learning in the future.” These findings support the hypothesis that fully virtual classes allow students to focus better on coursework.

Research question 2 asks how external sources affect testing. Significant relationships were found between the statement, “Cheating on course materials is easier via Zoom,” and using external resources to aid in coursework, as well as a proficiency in using technology and the elimination of distractions on Zoom.

“I perform better over zoom” and “Virtual video conferencing makes education more convenient and accessible,” had a significant correlation; thus supporting a relationship between a student’s ability to learn and the future implementation of Zoom and similar technology.

A significant relationship was found between “I am open to fully virtual learning in the future,” and “I perform better academically with Zoom class meetings.” This correlation supports the fourth research question.

Lastly, a *negative* correlation was found between prior use of Zoom/similar technology and the statements” and “I am open to fully virtual learning.”

DISCUSSION

Most results point to Zoom technology being an efficient conductor of communication. Certainly, there are students that perform better and thus prefer class meetings on Zoom, as proven through the findings for our first research question. However, just because this relationship is significant, does not mean that it applies to all students. The findings from question five actually prove that having prior experience using such technology is not indicative of an interest in virtual learning. Those who perform better also feel as though they can communicate well with professors and peers, and that the application eliminates distractions in studies. This may imply that universities should incorporate virtual and hybrid class options into their standard semester from now on.

Students who perform better using Zoom in the classroom also agree that the tool makes learning more convenient and accessible (significant, $r(93) = .686$, $p < .001$.) Investing in virtual learning will allow higher institutions of learning to create more work and educational opportunities for their students. It would be interesting to see if there are any positive environmental impacts, as more virtual education opportunities will reduce transportation costs, emissions, etc.

Another focus of the study is on cheating on the Zoom application. This is the element of our study that may require further and more focused research. Students who used external resources in their studies agreed that cheating on the application is easy, (significant, $r(20) = .549$, $p = .008$.) However, cheating can be accomplished to many degrees in many ways. A

more refined definition of the term would allow for more focused investigation. It should also be considered that individual institutions and professors conduct screen monitoring, or monitor and enforce cheating policies. Cheating may also look differently between students who write papers and those who perform calculations, and so on; so further research may need to be done across fields of study.

Perhaps it would have been helpful to include survey questions pertaining to course content, to see if there is such a relationship between Zoom technology and subject matter. Measuring the success of Zoom across different subjects can also lead to further research into student performance.

While these students agree that cheating is easier via Zoom, there is something to be said about using external resources in coursework. This could be indicative of students learning how to conduct independent research online.

Beyond academics, universities provide students with health, housing, dining, and extracurricular resources. In further research, it would be interesting to see if students have had positive experiences with telehealth services, or in meeting with student services online. If so, universities and similar institutions can implement virtual means of meeting students across several branches and departments. In thinking along the lines of this, I wonder if a survey distributed to professors, administration and faculty would provide any new or conflicting results.

In addition to this, there is very likely sample bias present within the results. Respondents were obtained via snowball and convenience sampling. In addition to this, the flyers posted to share the survey are located within Walker hall, leaning towards a bias in communication students as well. If flyers were distributed across campus, this may reduce such bias.

It’s only fair to mention that the data collected was compromised due to insufficient response rate. Vital survey responses were missing from the majority of respondents, indicating that there was an error in how the population sample could read the survey. For further

research, I would recommend ensuring how well respondents can read and answer the survey. A live feedback option for respondents to fill if they wish would also help the research team.

Although not without some shortcomings, this study points to a future for Zoom and similar technologies in higher education. It also points towards further research on the matter.

Works Cited

Alfadda, H. A., & Mahdi, H. S. (2021). Measuring students' use of zoom application in language courses based on the technology acceptance model (TAM). *Journal of Psycholinguistic Research*, *50*(4), 883–900. https://doi.org/10.1007/s10936-020-09752-1

Atherton, M., Shah, M., Vazquez, J., Griffiths, Z., Jackson, B., & Burgess, C. (2017). Using learning analytics to assess student engagement and academic outcomes in open access enabling programs". *Journal of Open, Distance and e-Learning, 32*(2), 119–136.

El-Sabagh, H. A. (2021). Adaptive e-learning environment based on learning styles and its impact on development students' engagement. *International Journal of Educational Technology in Higher Education*, *18*(1), 1–24. Retrieved February 23, 2022, https://doi.org/10.1186/s41239-021-00289-4

Jung, S.-H. (2020). *Online Learner Participation and Student Performance in Online Courses via Zoom*. Kamall Journal. Retrieved March 31, 2022, from http://journal.kamall.or.kr/wp-content/uploads/2022/01/24_4_2.pdf

Franzoni, A., & Assar, S. (2009). Student learning style adaptation method based on teaching strategies and electronic media. *Journal of Educational Technology & Society*, 12(4), 15–29. Retrieved March 21, 2020, from http://www.jstor.org/stable/jeductechsoci.12.4.15.

Fuady, I., & Sutarjo, M. A. S. (2021, January 1). Analysis of Students' Perceptions of Online Learning Media During the COVID-19 Pandemic (Study of E-Learning Media: Zoom, Google Meet, Google Classroom, and LMS). Retrieved from http://www.randwickresearch.com/index.php/rissj/article/view/177/117

Kemp, N., & Grieve, R. (2014, November 12). *Face-to-face or face-to-screen? undergraduates' opinions and test performance in classroom vs. online learning*. Frontiers in psychology. Retrieved March 30, 2022, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4228829/

Serhan, D. (2020). Transitioning from face-to-face to remote learning: Students' attitudes and perceptions of using Zoom during COVID-19 pandemic. International Journal of Technology in Education and Science (IJTES), 4(4), 335-342.

Zoom Revenue and Usage Statistics (2022). Business of Apps. (2022, March 3). Retrieved March 30, 2022, from https://www.businessofapps.com/data/zoom-statistics/