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Factors Affecting Students' Satisfaction with Synchronous Online Instruction During the COVID-19 Pandemic

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Cover Page Footnote

Factors Affecting Students' Satisfaction with Synchronous Online Instruction during the COVID-19 Pandemic Xue Bai Virginia State University xbai@vsu.edu Ade Ola Virginia State University aola@vsu.edu Ephrem Eyob Virginia State University eyyob@vsu.edu Serena Reese Virginia State University sreese@vsu.edu

Abstract A large number of institutions of higher learning at all levels transitioned hurriedly to remote and online learning in response to the novel coronavirus (COVID-19) pandemic. However, recent studies have concluded that university-level students prefer learning in face-to-face settings. This study seeks to understand the factors that are driving students' rejection of remote and online learning options and to provide insight into future efforts to implement strategies and tools to mitigate these adverse factors. The results show factors that contribute the most to students' perceived satisfaction in the remote instructional setting are less interaction during live lectures, more distractions, less engagement in virtual classrooms, less effectiveness in understanding lectures, delayed responses and inability to get immediate assistance. A theoretical framework was developed to classify the contributing factors into three desirable learning related dimensions. Understanding the factors that students believe are hindrances to achieving desired learning outcomes should serve as a useful input to efforts aimed at improving learning outcomes in remote and online settings. **Keywords:** Synchronous online instruction, remote instruction, students' perceived satisfaction in online learning, digital learning

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ABSTRACT

A large number of institutions of higher learning at all levels transitioned hurriedly to remote and online learning in response to the novel coronavirus (COVID-19) pandemic. However, recent studies have concluded that university-level students prefer learning in face-to-face settings. This study seeks to understand the factors that are driving students' rejection of remote and online learning options and to provide insight into future efforts to implement strategies and tools to mitigate these adverse factors. The results show factors that contribute the most to students' perceived satisfaction in the remote instructional setting are less interaction during live lectures, more distractions, less engagement in virtual classrooms, less effectiveness in understanding lectures, delayed responses and inability to get immediate assistance. A theoretical framework was developed to classify the contributing factors into three desirable learning related dimensions.

Understanding the factors that students believe are hindrances to achieving desired learning outcomes should serve as a useful input to efforts aimed at improving learning outcomes in remote and online settings.

Keywords: Synchronous online instruction, remote instruction, students' perceived satisfaction in online learning, digital learning

INTRODUCTION

Recent studies on university-level students have concluded that students overwhelmingly prefer learning in a physical classroom (Brooks & Grajek, 2020; Lederman, 2020). This study seeks to understand the factors that are driving students' rejection of remote and online learning options and to provide insight into future efforts to implement strategies and tools to mitigate these adverse factors. As many higher education institutions scrambled to respond to the pandemic, our institution transformed to remote instruction two weeks after Spring break in March, 2020. To better understand the impact of remote instruction on the learning process and to investigate factors that may affect the effectiveness of remote instruction, the research team conducted surveys after the first week of remote instruction in March and six weeks later in May during the last week of the Spring semester. The surveys were designed to measure students' perceived satisfaction and the effectiveness of remote learning experience and to capture the underlying factors that contribute to the perceived satisfaction levels. This paper is organized as follows: First, we present a literature review and relevant theoretical framework for the study. We then present our method for the study followed by results and discussions. Finally, the conclusions of the study with a discussion on the challenges and lesson learned with a roadmap for future studies are provided.

LITERATURE REVIEW

Henriksen, Creely, and Henderson (2020) argued moving pedagogy from one mode to another is logistically challenging. Furthermore, the paucity of a pedagogical framework for synchronous instruction has limited its effectiveness as pointed out by (Chen, Ko, Kinshuk and Lin 2005).

One theoretical framework that classifies factors that impact students' satisfaction and synchronous online learning effectiveness are interactions (Jung, Choi, Lim and Leem, 2010, Vrasidas and McIsaac, 1999, Swan, 2002) and engagement (Hurst, Wallace and Nixon, 2013, Powers and Rossman, 1985) are prominent factors that impact learning outcomes and effectiveness. To better understand the impact of remote instruction on the learning process and to investigate factors that may affect the effectiveness of remote instruction, we analyzed those factors affecting student's satisfaction on the learning process in previous research (Swan, 2002, Hurst, Wallace and Nixon, 2013, Powers and Rossman, 1985), and identified their dominant factors that may affect student's satisfaction in a remote instruction settings. The three factors include engagement, interaction and learning outcomes. Based on the three factors, we created a framework that was used to assess factors that impact students' satisfaction with different instructional formats. Figure 1

illustrates three instructional dimensions that may affect students' satisfaction with instructional form, including engagement, interaction, and learning outcome. Figure 1 illustrates three dimensions in the learning process—engagement, interaction, and learning outcomes—that may affect students' satisfaction with specific instructional settings. One or more categories of survey questions were designed to measure each dimension. The category of questions for each dimension are presented in the dimension classification diagram shown in Figure 2.

Engagement

In the framework, engagement is measured using questions relating to perceived engagement, focus, and distraction. To measure perceived engagement, students were asked to state the instructional setting in which they were most engaged. Measurement of distraction is based on students' choice of settings that most enable being off-task (check of messages, texting, attending to emails, etc.).

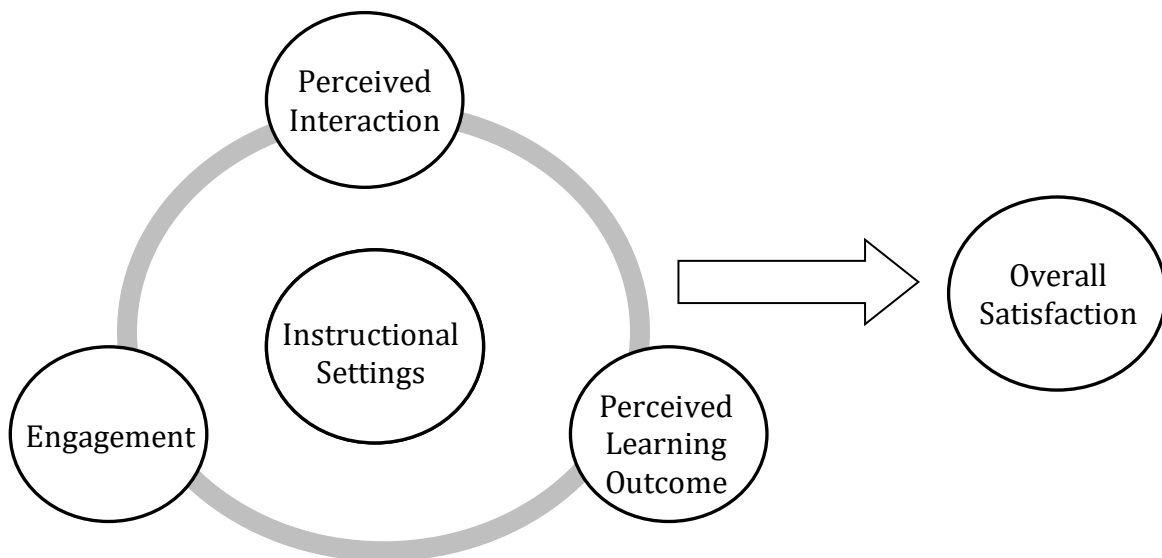


Figure 1: Theoretical framework for classifying factors that impact student's satisfaction under various instructional settings

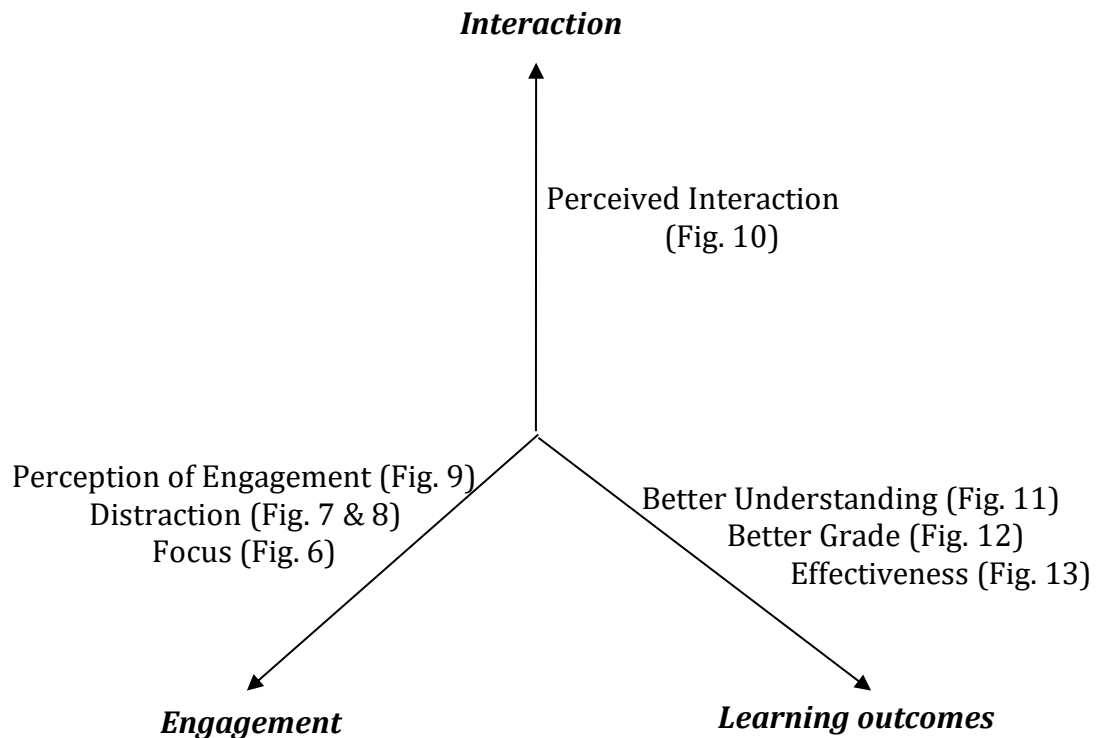


Figure 2: Classification of factors according to the dimensions proposed

Interaction

Interaction plays an important role in the learning process. When interaction is high, the teaching-learning process is expanded to a teaching-studying-learning process where the active role of the student is emphasized. Thus, interaction is suggested as the central concept in the learning process. The relationship between student–teacher interactions and learning outcomes has been well documented in traditional classrooms (Madden & Carli, 1981; Powers & Rossman, 1985, Swan, 2002). Weiner and Mehrabian (1968) concluded that teacher immediacy and immediacy behaviors were of particular importance in face-to-face classroom instruction (f2f). The team found no practical mechanisms to uniformly assess interaction across instructional settings; so, interaction is measured using students’ perceived interaction as they compare f2f and synchronized remote instruction.

Learning Outcomes

Learning outcomes describe the knowledge, skills, attitudes, behaviors or values students should be able to demonstrate at the end of a course or program of study. Typically, learning outcomes are assessed using direct or indirect measures. In this study, indirect measures were used because the survey was completely anonymous. Several questions in the survey—including self-reporting of understanding, expected grade, and perceived effectiveness of the learning process—were designed to provide indirect assessments of the perceived learning outcomes under different instructional settings. The results and discussions section presents a discussion on factors that impact students' satisfaction with choice of instructional settings and on the dimensions described in the theoretical framework.

METHODS OF STUDY

Data were collected from a convenience sample of students after Spring Break, 2020 in March and again in May. To examine whether students' perceived learning effectiveness with the new learning experience would change over time, data were collected in March after the first week of remote instruction and again in May during the last week of the Spring semester. A request to send emails with a survey link to all undergraduate and graduate students enrolled in all disciplines across campus was approved by the Institutional Review Board (IRB). Emails were sent to all students through the Office of Marketing and Communications. The survey form (included as Appendix) consisted of thirty questions, which were a mixture of multiple choices, ranking on five-point Likert scale, and free responses. Question number 28 in the survey was used to measure the students' overall satisfaction with remote instruction. The free-response questions allowed students to state the reasons for their preference of instructional setting and to share their experiences with the remote instruction from various perspectives, including engagement, effectiveness of live lectures, and advantages and disadvantages of remote instruction. The free-response questions also provided insight into students' experiences with remote instruction during the COVID-19 pandemic.

The study participants were enrolled in undergraduate and graduate courses across various disciplines at a regional university in the South-Central region. Participation was entirely voluntary and no course marks were awarded for completing the survey. In the first phase of data collection, there were 458 responses, which represented 10% of students who were enrolled in Spring semester, 2020 and participated in at least one remote instruction class. During the second phase, there were 428 responses, which is also about a 10% response rate. Incomplete responses where respondents answered only a portion of the survey questions were excluded from analysis. Responses from respondents who took less

than 3 minutes to complete thirty questions were also discarded. After eliminating the invalid surveys, there were 224 valid responses from the first phase and 239 from the second phase. Table 1 and Table 2 summarize the distribution of participants by classification and by schools, respectively.

Table 1: Student Distribution According to Classification

Classification	First Phase		Second Phase	
	n	%	n	%
Freshman	41	18.30	46	19.25
Sophomore	43	19.20	60	25.10
Junior	55	24.55	63	26.36
Senior	84	37.50	63	26.36
Graduate	1	0.45	6	2.51
Others	0	0.00	1	0.42

Table 2: Student Distribution According to Schools

School	No. of Participants	%
Agriculture	16	6.3
Business	49	19.4
Education	46	18.3
Engineering	14	5.6
Humanities	43	17.1
Sciences	30	11.9
Unknown	54	21.4

We performed correlation coefficient analysis and the result (-0.05, 0.03, -0.04, 0.08, 0.07, -0.01, 0.06, 0.02, 0.10, -0.07, -0.07, -0.03, -0.14, -0.19, 0.08, -0.15, 0.03, -0.10, 0.07, 0.01, 0.02, 0.07, 0.19) indicated that the correlation efficient of school with all other variables are within the range of (-0.2, 0.2). Correlation coefficient values below 0.3 are considered to be weak. therefore, an overall response was reported. Participants were not separated by discipline.

A frequency analysis was performed on every item. Then, we analyzed students' responses to the free-response questions designed to ascertain students' preference of instructional setting. The open-ended questions provided an opportunity to

discover students' feelings and opinions not captured by other categories of questions. A text-mining of the free response questions revealed some of the primary factors that may affect students' perceived satisfaction with remote instruction.

RESULTS AND DISCUSSIONS

There were four preferred instructional settings listed for the participants to choose, face to face (f2f), remote, online and hybrid. Each setting aimed to explore instructional methods, and explain how students' perceptions were interpreted by examining their responses to critical areas in the educational process that provide insight into teaching and learning.

Preference of Instructional Settings

As shown in Figure 3, the majority of students across all disciplines (69%) preferred the f2f instructional setting. The percentage of students who preferred f2f instructional setting remains almost at the same level in both phase I and phase II of the data collection. Only 4% of students expressed preference for remote instruction, which is significantly lower than all other options.

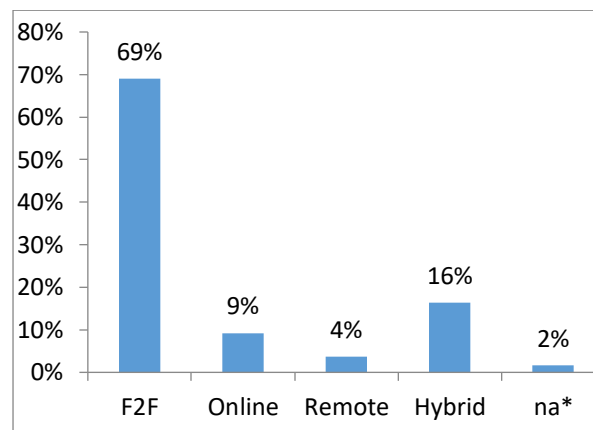


Figure 3: Preference of Instructional settings
*Answered no difference

To further investigate whether preference for instructional settings varies among classifications, preference data were classified. Figures 4 and 5 show that students

prefer the f2f instructional setting, regardless of classifications. The data also revealed that as students progress in college, they tend to be willing to accept remote instruction and online instructional settings. For example, 74% of freshmen and 75% of sophomores prefer f2f instruction; moreover, no one in these two classifications selected remote or online instruction formats. Preferences changed for juniors and seniors: 70% of juniors and 65% of seniors prefer f2f. Unlike freshman and sophomores, 8% of juniors and 6% of seniors indicated a preference for remote instructions.

Classification	Format				
	F2F	Hybrid	na	Online	Remote
Freshman	34	12			
Graduate	1	3		2	
Junior	44	9		5	5
Others				1	
Senior	41	8	1	9	4
Sophomore	45	7	3	5	

Figure 4: Preference of Instructional settings by Classification

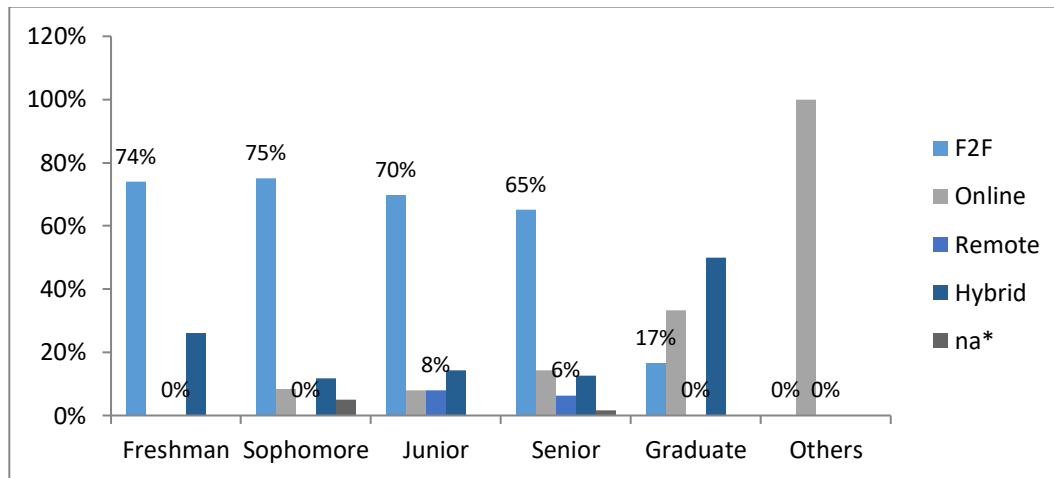


Figure 5: Preference of Instructional setting by Classifications

Effect of instructional Settings on Students' Engagement

The effect of instructional settings on students' engagement was investigated. Research has demonstrated that engaging students in the learning process increases their attention and focus, motivates them to practice higher-level critical thinking skills, and promotes meaningful learning experiences. Estelami (2012) found that students who displayed engagement—as measured by coming to class on time, being prepared for and participating in class work, and making the effort to complete assignments and homework—were more likely to be academically successful, have passing grades throughout high school, and graduate on time. To investigate how remote instruction affects engagement, several questions in the survey were designed to measure engagement. The traits used to measure engagement include focus, engagement and distraction. Figure 6 presents a comparison of f2f and remote instructional settings; 85% of the students claimed they tended to be more focused in a f2f setting compared to 3% of the students during remote instruction.

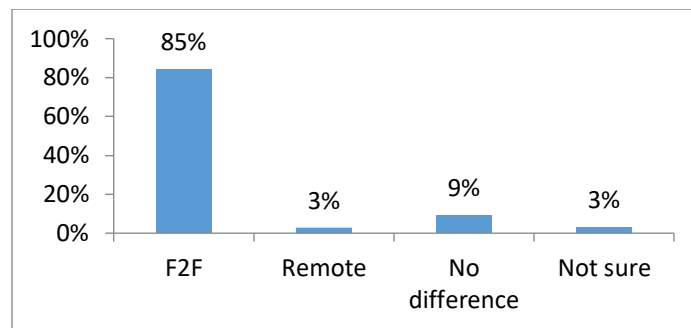


Figure 6: Students' Focus by Instructional settings

As shown in Figure 7, students were much more likely to check messages, text, email, etc., when they attended remote instruction classes. Twice as many students responded that they checked for messages, texts, email, etc. in a remote instructional setting than in f2f.

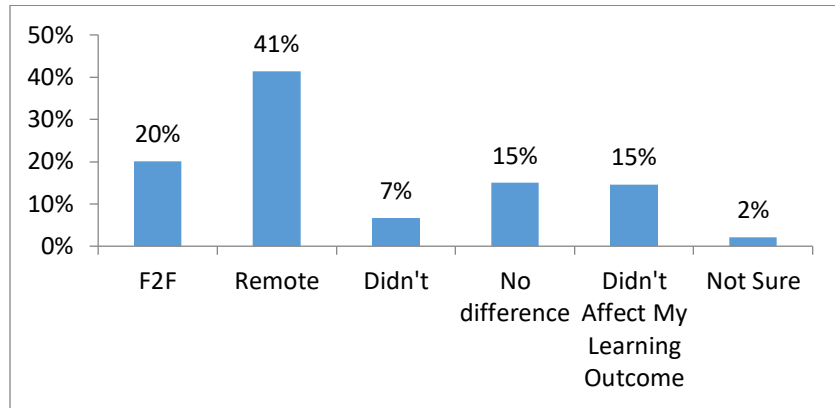


Figure 7: Checking messages, texts, emails, etc. under Different Instructional settings

Distractions

To investigate why students were less focused in remote instructional settings, students were asked to state the causes of distractions in live remote instruction. Surprisingly, as shown in Figure 8, 37% of students responded that “lecture was not engaging” was the major reason.

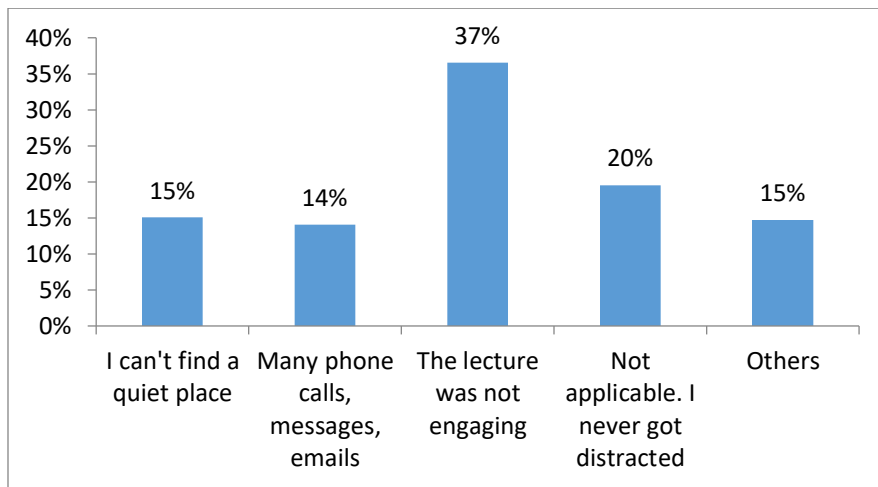


Figure 8: Distraction During Live Remote Instruction

Perception of Engagement

As is depicted in Figure 9, data on students' perceived engagement show the majority of students claimed that they tended to be more engaged by taking notes, asking questions, etc., during f2f and hybrid in-person classes. Only 3% of students responded that they were more engaged in remote instructional setting.

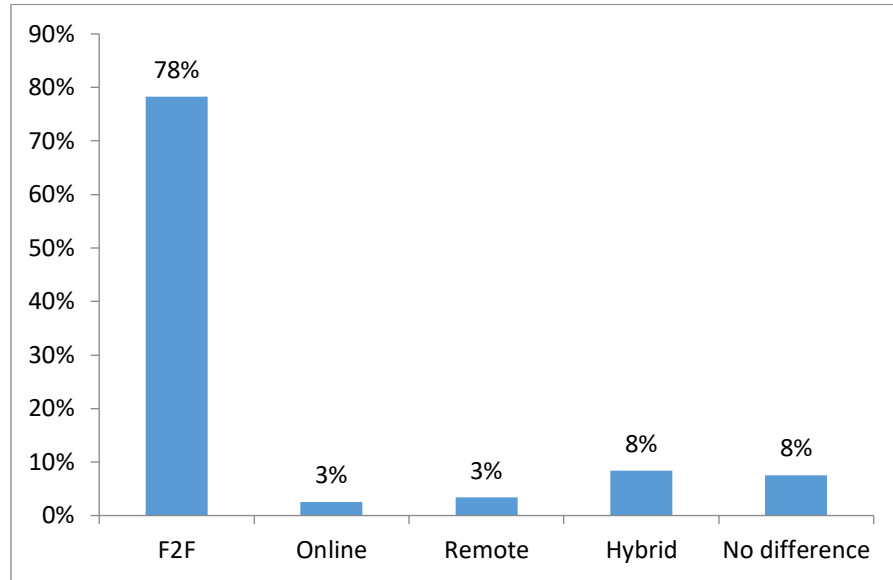


Figure 9: Engagement perception on different instructional settings

Interaction

The study also included an investigation of students' interaction, which plays an important role in the learning process. Garrison and Shale (1990) stated that "in its most fundamental form education is an interaction among teacher, student, and subject content." One key reason that students tend to prefer f2f classes to online courses is the latter's lack of personal contact between students and teachers (Kelly et al., 2007; Stojić et al., 2014). Data presented in Figure 10 shows that most of the students (60%) claimed that interaction reduced significantly in the remote instruction environment compared to a f2f setting.

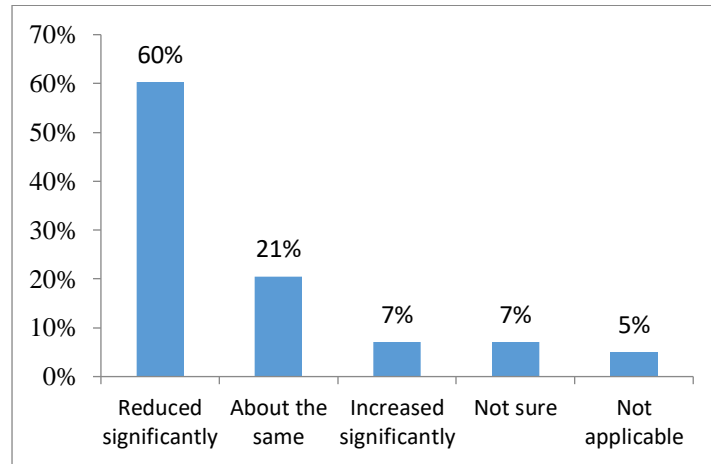


Figure 10: Comparison of Perceived Interaction in Remote Instruction and F2F settings

Comprehension

As aforementioned in the framework (figure 2), learning outcomes were measured with self-reporting of understanding, expected grade, and perceived effectiveness of the learning process. As shown in Figure 11, 82% of the students claimed they had a better understanding of lectures in f2f classes. Only 3.35% of students reported they learned better in a remote instructional setting. This result is consistent with the data presented on perceived interaction and engagement; students indicated that they were more engaged and had more interactions in f2f settings, which resulted in improved understanding of the course materials.

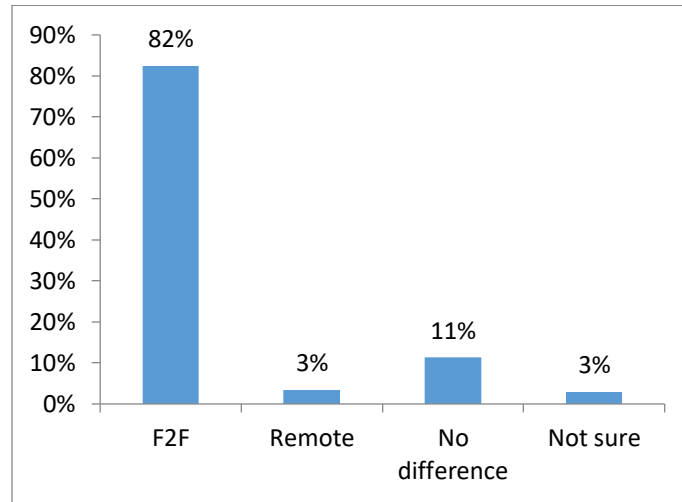


Figure 11: Comparison of Comprehension in Remote Instruction and F2F settings

Grade Expectation

Figure 12 shows grade expectation under different instructional settings. Not surprisingly, the majority of the students indicated that they expect to get better grades in f2f settings. The combined percentage of students expecting a better grade in f2f and hybrid settings represents 66%, which is significantly higher than all others combined.

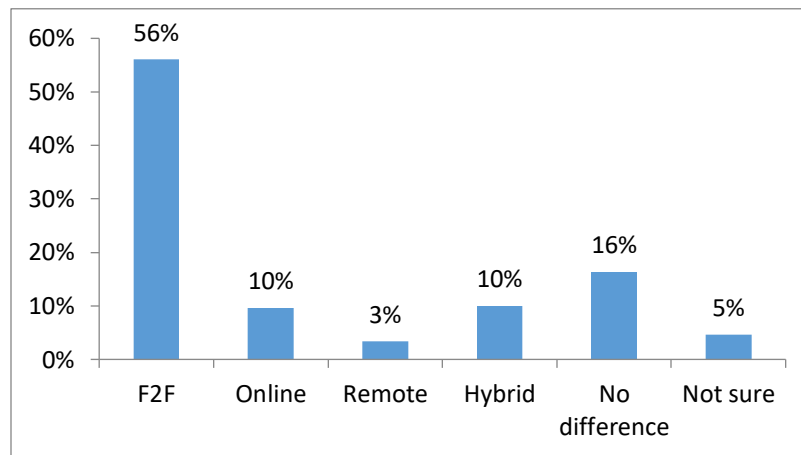


Figure 12: Percentage of students expecting better grade in different instructional settings

Learning outcomes

Finally, the study looked into learning outcomes under different instructional settings. As shown in Figure 13, 81.17% of the students responded they learned better in a f2f setting. The result is consistent with the data present in Figures 11 and 12, where students claimed they would have a better understating and expect a better grade in a f2f setting.

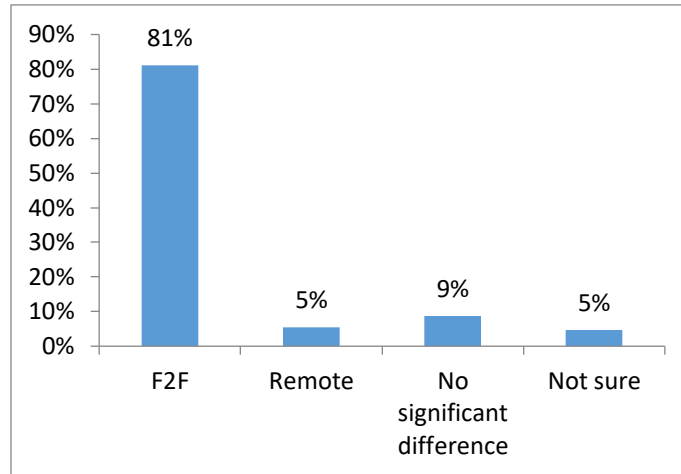
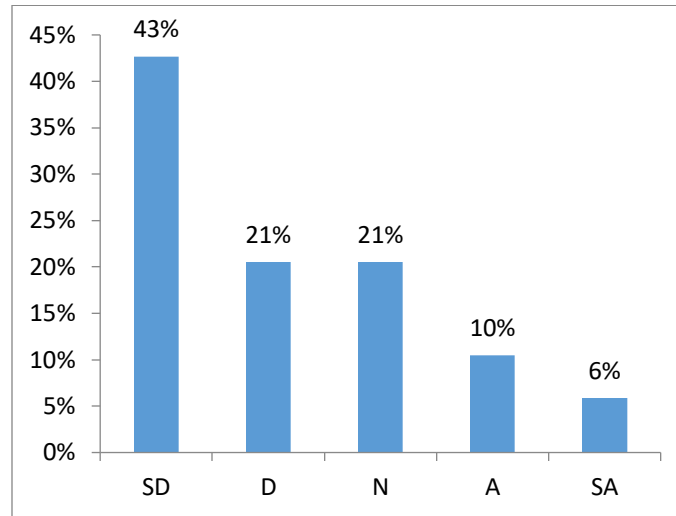


Figure 13: Perceived effectiveness of learning outcome under different instructional settings

The results presented thus far in this paper show factors that contribute the most to students' perceived satisfaction in the remote instructional setting are less interaction during live lecture, more distraction, less engagement in virtual classroom, less effectiveness in understanding lectures, delayed responses and inability to get immediate assistance. To further examine how those factors impact students' satisfaction with remote instruction, students were asked to indicate to what extent they were satisfied with remote instruction. The results presented in Figure 14 show that 16% of the students were satisfied with remote instruction; the majority—64% of the students—were unhappy when the university transformed from f2f to remote instruction.



(SD)-I strongly disagree with this statement
 (D)-I disagree with this statement
 (N)-I neither agree nor disagree with this statement
 (A)-I agree with this statement
 (SA)-I strongly agree with this statement

Figure 14: Students' satisfaction with the remote instruction

Text mining of open-ended questions

Three open-ended questions were designed to elicit from the students any pertinent information, which might not have been captured by other survey questions, to explain students' preferences and perceived satisfaction levels. The first question deals with students' preference of instructional setting. The second and third questions invite the students to describe what they liked the most about remote instruction and what they disliked the most, respectively. Results of word cloud analyses of the responses are presented in Figures 15, 16, and 17.



Figure 15: Word cloud of stated reasons for students' preference of instructional setting

Word cloud: Preference of instructional setting

While not all word occurrences provide meaningful information, some words appear prominently. Regarding students' preference of instructional setting, the dominant words include face, interaction, communication, quick, relationship, and home. The prevalent words appear to reveal that students' preferences center around interaction, communication, work from home, and maintaining relationship.

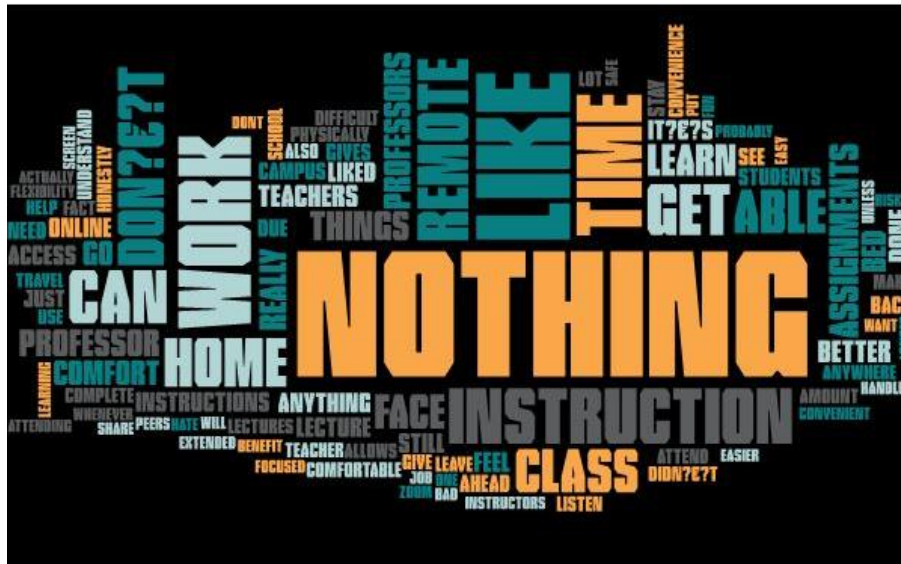


Figure 16: Word cloud for responses on what students liked the most about remote instruction

Word cloud: What students liked or disliked about remote instruction

On the question of what students liked the most about remote instruction, words such as work, home, online, and anywhere come from responses in which students stated that they liked remote instruction because they can easily maintain employment while taking remote instruction classes or attend classes from home. However, the most prominent word is NOTHING; most of the students responded that they liked nothing about remote instruction. Regarding the question on what students disliked the most about remote instruction, the word EVERYTHING features prominently. Other conspicuous words, which include work, teachers, and professors, didn't appear to provide useful information.



Figure 17: Word cloud for responses on what students disliked the most about remote instruction

Analyses based on predefined phrases

The word cloud did not provide much useful information to explain students' preference of instructional setting. A text data mining of students' responses to the instructional setting question (using AlterYX and Textalyser) didn't yield meaningful phrases that could be used as a measure of traits of students' preferences. Therefore, we developed an application with java programming that allowed predefined phrases to be entered and input text to be checked for similarity against the predefined phrases¹. The results of the text data mining are presented in Tables 3 through 5.

¹ The predefined phrases were built manually by going through several steps (interested users may contact authors for details).

The top five reasons why students prefer the f2f setting, as shown in Table 3, are:

- students could ask questions and get responses immediately;
- students felt they would learn better and have a better understanding of subject matter content;
- students could interact with professors and peers;
- students felt it was easy and more effective; and
- students could be more focused in f2f instructional settings.

The accompanying Pareto chart in Figure 18 shows that the top 5 factors accounted for 87% of all reasons why students preferred f2f instructional settings.

Table 3: Reasons for students' preference of instructional setting

Instructional setting	Reasons for their preference	Frequency
F2F	Ask questions and immediate response	45
	Learn better/better understanding	43
	Interaction/Develop relationship/communication	30
	Easy and effective	26
	Focus	20
	Hands-on learning experience	14
	Used to it	5
	Engaged	4
	Quality is better	2
Online	Flexibility/manage time/convenient/fit my work schedule	14
	Self-paced learning	3
	Better learning through reading steps	1
Remote	Stay home/comfortable	3
	Get work done on your own time	1
Hybrid	Interaction when needed	14
	Able to see professor as well as do my assignments online	9
	Like going to class and also learn from home	8
	Work at own pace	5
	Save time	2

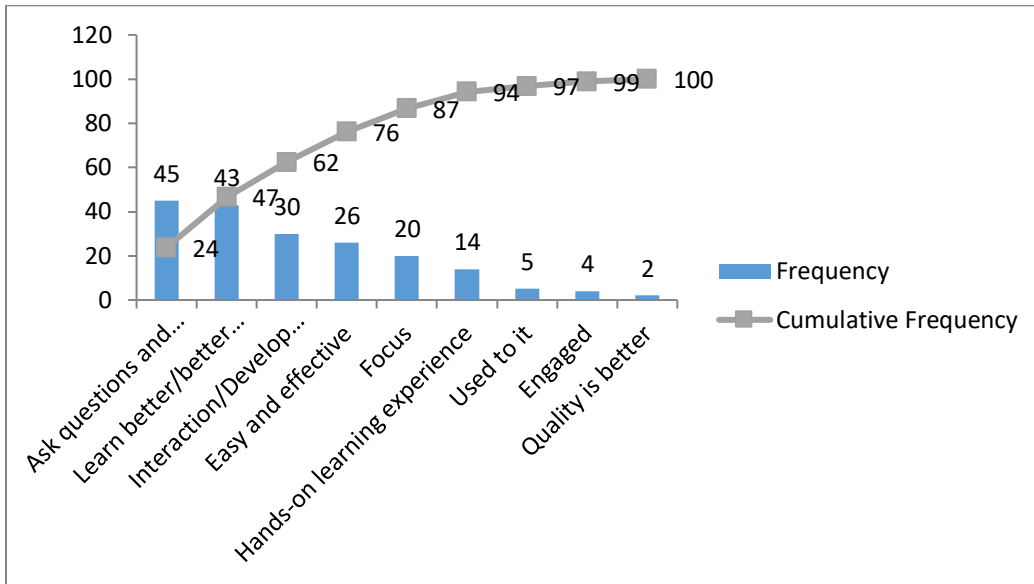


Figure 18: Pareto chart of frequency distribution for students’ instructional setting preference

We can observe in Table 3 that the major reason for students’ preference for online settings was the flexibility provided, which supports balancing employment and learning. The main reason students preferred remote instruction is that they can take class from home and avoid traveling to campus. Hybrid seems to be an ideal combination of f2f and online formats. As indicated by many students who preferred hybrid, hybrid allows students to interact with professors and peers when wanted or needed while still completing assignments online and working from home. The fact that hybrid combines the benefits of both f2f and remote instruction was the major reason that the hybrid format was the second choice among all of the instructional setting options.

Table 4 summarizes students’ responses regarding what they like the most about remote instruction. Note that students’ responses were classified based on their preferred instructional setting.

Table 4: What students liked most about remote instruction

Preference Group	Like the most about remote instruction	Frequency
F2F	Nothing	69
	Learn from home/work/anywhere/comfortable/convenience	16
	Sleep more	6
	No need to dress up	4
	Easy to do other things	4
	See assignments in advance	3
	Deadline for assignments are extended	3
	Engaging learning	2
	Replay recorded lecture	2
	Easy to handle	1
	Share screen	1
	Get better grade	1
	Better access to information	1
	Instructors more lenient with remote	1
	Learn better	1
	More time to complete my work	1
Online	Nothing	5
	Learn from home/work/anywhere/comfortable/convenience	4
	Easy to do other things	2
	No need to dress up	1
	Take screenshot	1
	Replay recorded lecture	1
	Teachers response faster	1
	Better detailed assignment instructions	1
Remote	Learn from home/work/anywhere/comfortable/convenience	4
	Nothing	1
Hybrid	Learn from home/work/anywhere/comfortable/convenience	13
	Nothing	5
	More time for assignment	4
	Easy	3
	Flexibility/do other things	3

	Online homework	2
	Self-paced assignments	1
	No need to dress up	1
	Replay recorded lecture	1

As can be observed in Table 4, the convenience of taking classes from home was what the students liked the most about remote instruction. Being able to attend class anywhere as long as they have internet connection was another key reason students preferred remote instruction. As shown in Table 5, the top reasons why students disliked remote instruction included lack of interaction with professors and peers, increased opportunities to be distracted, difficulty focusing, and lack of engagement in the learning process. Delayed responses and lack of immediate assistance were also among the top reasons why students were not happy with remote instruction.

Table 5: What students disliked the most about remote instruction

Preference Group	Dislike the most about remote instruction	Frequency
F2F	Everything	68
	No interaction/lack interaction/hard to develop relationship/ Unable to get physical help	27
	No engagement/distraction/hard to focus	23
	Delayed responses/less immediate help/ Questions did not get answered quickly	13
	Harder to understand content	10
	Increase work load	7
	Internet connection issues	7
	No/lack of hands-on	3
	Not respond to emails	3
	Boring lecture	2
	Did not learning anything	2
	Hard to find quiet place at home	2
	Quality went down	1
	Hard to take notes	1
	Confusing instruction	1
Online	Everything	3

	No engagement/distraction/hard to focus	2
	Harder to understand content	1
	lack interaction	1
	Network issues	1
	Professors are not engaging	1
	Not respond to emails	1
Remote	Nothing	2
	Increased workload	1
Hybrid	Everything	6
	No engagement/distraction/hard to focus	6
	Less Interaction with professor	5
	Internet connection issues	5
	Cannot get immediate help/response	4
	Harder to understand content/ineffective to learn	3
	Increase work load	2
	Lack of communication	1
	Repeat lecture when some students show up late	1

CONCLUSIONS

This study sought to understand the factors that are driving students' rejection of remote and online learning options and to provide insight into future efforts to implement strategies and tools to mitigate these adverse factors. Survey data were collected to measure students' perceived satisfaction, effectiveness of remote learning experience and to capture the underlying factors that contribute to the perceived satisfaction levels. A theoretical framework was developed to classify the contributing factors into three desirable dimensions: Engagement, Interaction, and Learning Outcomes. Analyses of the data show that students' satisfaction with remote instructional settings are driven by negative factors such as less interaction during live lecture, more distraction, less engagement in virtual classroom, less effectiveness in understanding lectures, delayed responses and inability to get immediate assistance. The results suggest that the learning resource community needs to find ways to improve students' involvement in a remote instructional setting and provide methods to support interaction among all the participants in the learning environment. Classifying the underlying factors that influence the effectiveness of learning in a virtual learning environment could provide a roadmap for the development of methods and tools to achieve the

effectiveness of learning in a f2f setting, along with the advantages to remote-online learning.

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APPENDIX: Survey

Instructions:

In order to better understand the impact of remote instruction on learning outcomes and investigate factors that may affect the effectiveness of remote instruction and improve instructional processes in the future, we developed this survey. This pre-survey is an opportunity for you to anonymously express your experiences in remote instruction. There are 30 questions. It will take 10-15 minutes to finish. Your cooperation is requested in order for this survey to accurately reflect your involvement. Before you start, please review the terms used in this survey:

Face-to-face: meet in classroom;

Remote instruction: synchronous, required to participate in live lectures through Internet at scheduled times;

Online course: asynchronous learning, without live lecture, study at your own pace;

Hybrid courses: face to face mixed with online contents.

Note: data should be collected after the first week of Remote Instruction (pre-test) and again during the last week of the Remote Instruction (post-test).

1. Which college/school are you from? What is your major?

2. What is your classification?
 - A. Freshman
 - B. Sophomore
 - C. Junior
 - D. Senior
 - E. Graduate Study
 - F. Others

3. If you have options, which of the following teaching formats would you prefer?
 - A. Face to face classroom
 - B. Online (asynchronous learning, without live lecture)
 - C. Remote instruction (synchronous, where you need to participate in live lectures at scheduled times)
 - D. Hybrid courses (classroom mixed with online delivery)
 - E. No differences among these four

4. You made your choice of the teaching format preference in the previous question (face to face classroom, online, remote instruction, or hybrid). Explain why you prefer that teaching format?
5. You tend to be more focused in which of the following teaching formats.
 - A. Face to face classroom
 - B. Remote instruction (synchronous, where you need to participate in live lectures at scheduled times)
 - C. No differences between these two
 - D. Not sure
6. I check for messages, texting, email, etc., on my phone MORE OFTEN when I take _____?
 - A. Courses delivered in face to face classes
 - B. Courses delivered via remote instruction (live lectures through Internet)
 - C. I do not check messages when I take face to face or remote instruction classes
 - D. No differences between these two
 - E. I check for messages on phone, but I don't think it affects my learning outcome
 - F. Not sure
7. I understand instructor's lectures better in _____.
 - A. Courses delivered in face to face classes
 - B. Remote instructions
 - C. No differences
 - D. Not sure
8. I tend to be more engaged (asking questions, taking notes, etc.) in the learning process in which of the following teaching formats.
 - A. Face to face classroom
 - B. Online courses (asynchronous, no live lectures)
 - C. Remote instruction (synchronous, where you need to participate in live lectures at scheduled times)
 - D. Hybrid courses (classroom mixed with online delivery)
 - E. No differences among these four
9. I tend to spend less time on homework assignments when I take _____.

- A. Courses delivered in face to face classes
 - B. Courses delivered via remote instruction (live lectures through Internet)
 - C. No differences
 - D. Not sure
10. I expect to get better grades when I take _____.
- A. Courses delivered in face to face classes
 - B. Online classes (asynchronous, no live lectures)
 - C. Courses delivered via remote instruction (live lectures through Internet)
 - D. Hybrid courses (classroom mixed with online delivery)
 - E. No differences
 - F. Not sure
11. Compared to face-to-face classroom, how do you feel about the effectiveness of the learning outcome of remote instruction (better understanding of contents, engagement, etc.).
- A. Remote instruction is more effective than face to face classroom
 - B. Face to face classroom is more effective
 - C. No significant differences between these two
 - D. Not sure
12. How do you access the Internet to participate in live lectures?
- A. Internet at home
 - B. Public WiFi, such as public library, parking lots, retailers
 - C. Hot spot from mobile device
 - D. No Internet access so I cannot participate live lectures
 - E. Others
13. What kind of Internet connection do you have at home?
- A. DSL enabled phone line
 - B. Cable TV modem (Comcast, for example)
 - C. Fiber optic (for example, FiOS or U-Verse)
 - D. Mobile Wireless (Smartphone, Mobile Laptop Card)
 - E. No Internet connection
 - F. Don't know
14. What tools do your professors use to deliver virtual lectures (live lectures delivered through Internet)?
- A. Blackboard Collaborate

- B. Zoom
 - C. WebEx
 - D. Skype
 - E. Microsoft Team
 - F. Other
15. Do you prefer to turn on video (camera to show your face) when you participate in remote instruction?
- A. Yes
 - B. No
 - C. I don't care
16. Do you prefer the instructor to turn on video (camera to show his/her face) during live lectures?
- A. Yes
 - B. No
 - C. I don't care
17. Did your instructors record live lectures and make them available for replay?
- A. Yes
 - B. No
18. If recorded videos are available, how many times did you replay them?
- A. None
 - B. 1 time
 - C. 2 times
 - D. 3 times
 - E. More than 3 times
 - F. Not applicable, no videos were available
19. Did the recorded videos help you understand the material better?
- A. Yes, it significantly improved my understanding
 - B. Yes, but the improvement is marginal (not that much)
 - C. No, I don't think the recorded videos are that much helpful
 - D. Not helpful at all
 - E. I don't need the videos because I already understood the materials well
 - F. Not applicable, no videos were made available

20. I can find a quiet place so I won't be distracted when I participate in remote instruction.
- A. Yes, always if I want to
 - B. Sometimes
 - C. No, it is hard for me to find a quiet place
21. I was frequently distracted when participating in live lectures (remote instructions) because _____.
- A. I can't find a quiet place
 - B. Many phone calls, messages, or email I need to respond to
 - C. The lecture was not engaging
 - D. Not applicable. I never got distracted
 - E. Others
22. When participating in live lectures (through remote instruction),_____.
- A. I do nothing but focus on the live lectures.
 - B. I mainly focus on the live lecture, but I use my smartphone occasionally for texting, email, and others.
 - C. I also do something else, because I am a multi-tasking person.
 - D. I do not participate all the time. I walk around and back to live lecture from time to time.
 - E. Others.
23. What do you like the most about remote instruction?
24. What do you dislike the most about remote instruction?
25. I have high speed and stable Internet connection when I participate in the remote instructions.
- A. Yes, always
 - B. Sometimes
 - C. No
 - D. Not sure
26. How would you rate the quality of audio and video during live lectures?
- A. The quality of both audio and video quality is good
 - B. The quality of audio and video is acceptable
 - C. Audio and video glitchy

- D. Audio and video quality is NOT acceptable
 - E. Not applicable
27. Compared to face-to-face classroom instruction, the amount of interaction between you and professors in remote instructions was
- A. Reduced significantly
 - B. About the same
 - C. Increased significantly
 - D. Not sure.
 - E. Not applicable
28. Please indicate the extent to which you agree or disagree with the following statement: I am very satisfied with remote Instruction.
- A. I strongly disagree with this statement (SD)
 - B. I disagree with this statement (D)
 - C. I neither agree nor disagree with this statement (N)
 - D. I agree with this statement (A)
 - E. I strongly agree with this statement (SA)
29. Please share your experiences with remote instruction during the first week. You may focus on: 1. Engagement 2. Effectiveness of live lectures 3. Advantages and disadvantages of remote instruction 4. Any suggestions 5. Other topics
30. What is the first thing you are going to do when the pandemic is over? Please limit your response to a few words, no more than 100 characters.