

**Optimizing the existing video conferencing platforms used in academia to make them more academic-friendly**

by

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The student author, whose presentation of the scholarship herein was approved by the program of study committee, is solely responsible for the content of this thesis. The Graduate College will ensure this thesis is globally accessible and will not permit alterations after a degree is conferred.

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**DEDICATION**

I dedicate my dissertation work to all the students and teachers around the world who have braved the COVID-19 pandemic and have made every possible effort to help continue spinning the wheels of education in such uncertain and testing times, to all the healthcare professionals and frontline workers who have risked their lives and worked a day in and day out to meet this unprecedented health emergency, to all the sanitation workers who have worked tirelessly to sanitize work/public spaces every single working day, to all the researchers and scientists who worked round the clock to help develop the COVID-19 vaccines, and last but not the least to every individual who has lost a loved one to this unfortunate pandemic and yet remained hopeful for a better tomorrow. You have all been an inspiration to this thesis. I thank you with all my heart.

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**NOMENCLATURE**

VC	Video Conferencing
UI	User Interface
UX	User Experience
UI/UX	User Interface/User Experience
FTF	Face-to-face
TBD	To Be Determined

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**ABSTRACT**

Video conferencing was initially developed to meet business needs in a corporate setting, enabling businesses and companies to substitute frequent face-to-face meetings, often costing companies hundreds of thousands of dollars in travel and lodging expenses, with relatively inexpensive virtual conferences. Video conferencing has also been used extensively to orchestrate seminars involving hundreds of professional participants (also aptly called webinars) to make the process of attending such official events more accessible and cost-effective. Their use in education was limited to large research conferences that required scholars worldwide to participate in such circumstances and provide distance education to students who cannot attain in-person classes for various reasons. However, with the 2019 COVID-19 pandemic, the use of video conferencing in academia has sky-rocketed after schools and educational institutions worldwide were forced to shut operations by their local governments to put a check on the deadly virus. This has resulted in schools and universities extensively using video conferencing platforms in their everyday curriculum in order to make up for the gap created by the cancellation of in-person classes. But, with this rushed implementation of a tool designed for industry use, students have had to face their own set of challenges when using these platforms for their regular coursework. This paper provides insight into the use of these video conferencing platforms in academia, the different platforms being used and their comparison, the various challenges the user interface and feature sets of these platforms bring to the students using it for their everyday coursework, and the different ways in which these platforms can be made more academia-friendly for use in academia.

## CHAPTER 1. INTRODUCTION

### Background

Gone are the days when companies (both big and small) would fly their individuals from one city to another, multiple times in a week, to meet with employees from other companies and discuss business needs. In the last decade, video conferencing has taken the driver's seat and has seen a significant boost in its use in professional settings. For proven monetary and time-saving reasons, companies and individuals are now increasingly preferring remote meetings over in-person discussions. Video conferencing has aptly replaced in-person meetings and seminars. It is now part and parcel of the daily corporate culture and lifestyle, with video conferencing platforms like Zoom, GoToMeeting, Cisco, WebEx, Google Meet, etc., becoming an everyday affair. Video conferencing global market in 2019 surpassed USD 14 billion and is expected to grow 19% between 2020-2026 (Global Market Insights: Video Conferencing Market Size By Component, 2020). In 2020, Zoom saw its daily meeting participants count reach 300 million a day; Cisco clocked in a total of 300 million users (The Verge, 2021), Microsoft Teams claimed to have 75 million daily active users (The Verge, 2020), while Google Meet hit over 100 million daily meeting participants (The Verge, 2020). These video conferencing platforms have seen a steep incline in their number of daily users and meetings being conducted through them, in turn sky-rocketing the industry to a whole new level. Businesses in the United States alone contribute a staggering 11 million video conference meetings every day, with the average call duration ranging between 31-60 minutes (Attentiv, 2021). It is worth noting that though video conferencing can hold hundreds of people in a single session simultaneously, over 73% of video conferencing meetings are smaller, involving somewhere between two to four individuals only. And with over 54% of the workforce in the United States taking part in video conferences

frequently, more than 87% of people choose to use video conferencing at present over in-person meetings compared to just 2 years ago (Global Market Insights: Video Conferencing Market Size By Component, 2020). The pandemic, thus, brought video conferencing to the forefront like never before. Businesses have now started seeing video conferencing as an immensely practical and convenient tool for organizing daily meetings and have been able to do so any time, at any place, and with a large number of people with an internet connection.

The sudden outbreak of the COVID-19 pandemic in the year 2020 further boosted video conferencing's growth rate worldwide. Corporate organizations and businesses adopted a 'Work from Home' strategy owing to the risk posed by the pandemic, and governments enforced lockdowns to curb the spread of the novel coronavirus. The adoption of video conferencing platforms sky-rocketed in only a few weeks, creating a 'new normal.' 2020 saw about 62% of companies use three or more video conferencing platforms (Forbes Insights, 2021), with about 86% of companies conducting employee interviews via video conferencing (Gartner, 2021). The use of video conferencing has also been hailed as a much-needed welcome change by users worldwide. Reports suggest that 43% of remote and in-house working teams use video conferencing (Forbes Insights, 2021). The report goes on to state that 95% of survey participants say that video conferencing has a positive impact on performance, 95% believe that a greater sense of trust is built through the use of video, and 93% agreed that the use of video enhances remote workers' engagement and effectiveness.

The surge of COVID-19 has also affected academia worldwide, with various government bodies recommending strict social distancing guidelines and closure of educational institutions in exchange for remote learning. This resulted in the education sector being another industry relying on video conferencing to meet its daily requirements. But while video conferencing has

proved an excellent meeting tool for corporate entities worldwide, the same can be highly debated for its use in academia. The use of the same platform for education and academic purposes has posed its challenges - which were glaringly made evident and clear with numerous schools and universities moving to an online-only/hybrid method of course delivery for their students. In less than a month, professional corporate tools meant to discuss business deals, presentation slides, and excel sheets were now suddenly being used to teach students as young as six years old. With advanced industry-catering features, complex user interfaces, and a lack of personalization, these platforms can be immensely perplexing to students when used for receiving education daily. This problem is further complicated by the availability and subsequent use of different video conferencing platforms like Zoom, Cisco WebEx, Google Meet, Microsoft Teams, ClassDoJo, etc., by various schools and universities.

### **Research Goal**

This research aims to delve deeper into the use of video conferencing platforms in academia, and in doing so:

- *Understand:* To understand the present-day video conferencing scenario in academia and understand students' needs concerning video conferencing in education. This will include but will not be limited to understanding how frequently students use video conferencing in their day-to-day life. Secondly, to understand which platforms are the most commonly used video conferencing platforms in students' education for their coursework. Thirdly, compare the video conferencing platforms with respect to their user interface, iconography, available features, etc. And lastly, compare the available features against the wish list of students to understand which features fall short of expectations and are

missing and need to be added. This research also aims to understand the best way to incorporate these features into the user interface to make it more accessible and easier to understand by individuals in the education sphere - mainly students.

- *Identify:* To identify the various pain points for users in an academic setting. Firstly, this will include identifying the most frequently used video conferencing platforms in students' education realm for their coursework. Secondly, it will pinpoint the various bottlenecks that obscure an individual's user experience when using a video conferencing platform and address how it may be solved by either adding/removing a feature and/or making incremental changes to a feature to make it more student-friendly. Thirdly, it will also include identifying the most-used features for that video conferencing platform, understanding how those features can be made more accessible by positioning them in apt locations in the user interface, and how their visibility can be improved compared to the current implementation. Lastly, this research will also attempt to identify and tabulate the different feature requests that students demand to smoothen their user experience when using these video conferencing platforms frequently for substituting in-person classes.
- *Recommend:* To recommend, based on the above findings, a student-friendly user interface for video conferencing platforms that may work better and more seamlessly in an academic environment. The suggested user interface will combine features from all the discussed existing video conferencing platforms into a hypothetical platform. It will recommend the necessary changes based on student and faculty feedback and justify the

addition/removal of features to the video conferencing platform and how it may affect the overall experience in a positive/negative way respectively in an academic setting.

- *Implement:* To implement the recommended changes through a study-based UI-redesign which will include (but not be restricted to) further developing included features like reactions, notes, captions, etc., user testing the suggested user interface (creative component) mockup, conducting in-person interview/user-testing and/or focus group studies, conduct follow-up survey with questions based on new interface redesign, evaluating additional video conferencing/discussion platforms, and more.

### **Research Question**

How can we optimize the existing video conferencing platforms in academia to make them more student-friendly?

This may be understood better by researching the following:

- What are the existing video conferencing platforms being used in academia?
- How does their user interface design affect (positively or negatively) a student's learning experience?
- How do the features offered by these video conferencing platforms align with a student's present-day needs in academia?
- What are the features that students find useful/not useful in an academic setting?
- What changes are necessary to make these platforms more student-friendly?

## **CHAPTER 2. RESEARCH METHODS**

This research uses qualitative and quantitative research methods to gather relevant information to understand how the various video conferencing platforms are being used for academic coursework/classes and to inform possible changes to the user interface and feature set of a hypothetical video conferencing platform.

### **Quantitative Method**

The quantitative methods for this research included a Qualtrics survey containing 35 questions. These questions were a mix of multiple-choice questions, text entries, and visual hotspots where participants could select icons in the video conferencing interface. The Qualtrics survey started with an “Informed Consent” form, which allowed participants to choose “I agree to participate in this study” to continue with the survey. A copy of the informed consent was also made available if any participant wished to keep a copy of the same. The survey was designed to ensure that no question was mandatory for a participant to answer. A participant could skip a question/s at any point of the survey without any penalty. The participant was also allowed to terminate the survey if and whenever needed and/or move back and forth between questions throughout the participation process.

The Survey started with simple demographic questions asking individuals about their nature of study at the university (undergraduate or graduate student) followed by the gender they identify with. They were then asked if they had used video conferencing in the last 12 months and primarily how often they used video conferencing every week for their class/academic coursework. The survey then went deeper into video conferencing-related questions about the exact video conferencing software the participant uses for their every class. This is a crucial

question in the survey, as it would then branch out into visual hotspot questions based on which video conferencing platform the participant chose in the previous question. The visual hotspot questions used screenshots showing the actual video-calling screen of these video conferencing platforms and were two-fold:

- i. The first question asked participants to select the five features they use the most in the particular video conferencing platform
- ii. The second question asked the participants to select icons in the user interface that described the feature well, and the icons that did not describe the feature well.

While the information from the question [i] helped decide the list of features the creative component needed to focus on for this study/research, the second question was able to give a clearer indication of how students perceived icon design and what exactly the creative component prototype had to strive towards or steer away from.

The survey also included a question about students' preference for the primary dock implementation for their video conferencing use, their preference concerning labeled vs. unlabeled icons in the user interface, their ease of using, understanding, and navigating the user interface, their privacy concerns with sharing their computer screen with their class (if any), and their take on how close these video conferencing platforms were to meeting their academic needs. The survey asked participants for feature recommendations based on their use case. Participants were asked how likely they were to use proposed features.



### **CHAPTER 3. LITERATURE REVIEW**

#### **Major changes in academia**

The field of academia and education, in general, have seen major paradigm shifts in the recent past, significantly affecting the way knowledge has been imparted or consumed by educators and students, respectively. For example, the introduction of Apple iPads in K-12 education enabled educators and instructors to not only move beyond the restrictions of conventional textbooks and provide multimedia content but also enabled students to read and write anywhere and anytime and enhance their overall knowledge base using the power of the internet - something that was never possible earlier using conventional pen and paper. This also had never-seen-before benefits of combining a laptop's keyboard with the touch screen of a tablet, along with a pen input for navigating, drawing, taking notes, etc., around desktops and programs (Henderson & Yeow, 2012). Its size similarity with a modern-day storybook enabled students to hold it and interact with it the way they would do with any physical storybook available today (Hourcade, Beitler, Cormenzana, & Flores, 2009). This also enabled students to finally move around different locations with their tablet devices and communicate with their peers when doing so (Leichtenstern, André, & Vogt, 2007) among other benefits.

The introduction of e-books had a similar effect on education. It enabled instructors and educators to give students access to information beyond what was available in the prescribed course materials, which in turn allowed students to access that additional information in a more time-saving and cost-effective way. So, with the introduction of e-books, students could finally access a large volume of academic-related information "anytime, anywhere" (Wilson, 2003). Likewise, the availability of low-cost laptops for use in education, the introduction of education-

based platforms like Canvas and Blackboard, the availability of more free education-centric mobile applications, etc. have all contributed to the growth of academia and ultimately resulting in an increase in student participation and knowledge building in the last decade or more.

However, a factor that has resulted in a negative tectonic shift in academia, with the potential of leaving a lasting impression in the time to come, is the outbreak of COVID-19 in 2019.

### **Covid-19 and education**

COVID-19 has had a disastrous consequence on millions of people worldwide, causing over 143,865,299 cases and over 3,058,657 deaths as of 22 April 2021 (John Hopkins University, 2021). It has affected almost every possible economic and social sector, including education and academia. Governments have taken various actions with a common goal of reducing the spread of the coronavirus, limiting social contact by encouraging strict physical distancing, and imposing lockdown. 2020-21 saw over 177,179,786 learners affected by the outbreak of this pandemic, with over 27 country-wide closures in effect (UNESCO, 2021). The closure of public and private schools, colleges, and universities not only interrupted the teaching for students around the world; the closure also coincided with a critical assessment period, and many exams had to be postponed or canceled. By mid-April 2020, over 94% of learners globally were affected by the pandemic, representing 1.58 billion children and youth extending from pre-primary to higher education in over 200 countries (United Nations, 2020). The social aspect of learning has been disconnected from student life; curricula and lesson planning, assessment, and other pedagogical skills and strategies have been overwhelming for educators; and parents have been sitting alongside K-12 students to monitor and assist with their progress (Stefanile, 2020).

Thousands of schools and institutions have also had to adapt quickly and learn new ways to operate, function, and communicate on a day-to-day basis. Institutions that continued rendering their academic services to students, hundreds of thousands of institutions either moved classes online using video conferencing platforms to substitute in-person interaction with virtual interaction and even more forged ahead with a hybrid model, i.e., conducting a portion of the courses online by utilizing a video conferencing platform and a part of it in-person, thus ensuring government-regulated social distancing are adhered to. Moreover, strict social distancing guidelines have also been implemented in several countries around the world. While highly effective in combating the virus's spread, studies have clearly shown that social distancing constraints may negatively affect resident education. Our educational systems have traditionally depended on the in-person exchange of knowledge (Włodarczyk, Wolfswinkel, & Carey, 2020). The worldwide effect of the absence of this in-person interaction can be seen with students suffering from a lack of attention, countless videos of children crying while on online sessions, students struggling with their coursework, and more. This has resulted in a landslide number of education institutions switching to video conferencing platforms for their everyday coursework—as compared to a year ago. However, what is interesting—and concerning at the same time—is that video conferencing was primarily developed for corporate or industry use for large-scale businesses to substitute face-to-face (FTF) meetings and not for educational institutions in academia.

### **Video conferencing**

“Video conferencing is defined as interactive and synchronous voice, video, and data transfer conducted between two or more points via communication lines.” (Gough, 2006). The video conferencing market has grown substantially during the past 20 years, increasing fivefold

from 1991 through 2006 (Denstadli, Julsrud, & Hjorthol, *Videoconferencing as a Mode of Communication: A Comparative Study of the Use of Videoconferencing and Face-to-Face Meetings*, 2012) to reach a total value of \$1.06 billion. Video conferencing has been used as the primary tool for replacing FTF meetings. Many businesses are now using these platforms even to conduct in-house team meetings within the same premises. Thus, FTF meetings, which were initially steadily being replaced by audio-conferencing, now saw even more competition due to video conferencing's mass implementation. Initially, this digital solution was an expensive proposition limiting the technology only to multi-national companies owing to their high investment and user costs. However, with many fewer video conferencing platforms being more cost-efficient, or even free, and less complex to use and understand, they have quickly started replacing traditional room-based face-to-face meetings. Although large multinational companies were more likely to use video conferencing for their everyday business needs, the COVID-19 pandemic and the emergence of cost-effective desktop and Web-based systems have made technology more affordable for small and medium-sized companies. Manufacturers of cheap and affordable video conferencing equipment have also aided in the widespread implementation of this technology solution, offering flexible communication services for conference rooms, desktops, and mobile terminals to accommodate different groups and situations. In addition, video conferencing is also known can save time and costs, which is a strong argument for its implementation and use (Denstadli, *Impacts of videoconferencing on business travel: The Norwegian experience*, 2004). Multinational companies like Dell have revealed that they have been able to save \$12 million a year by allowing their employees to work remotely and by using video conferencing tools (CNN Money, 2016), further stating that employees could save about \$350 a year when working remotely for ten days per month at home. These factors have

contributed to the global video conferencing market surpassing \$14 billion USD in 2019 and being expected to grow 19% between 2020-2026 (Global Market Insights: Video Conferencing Market Size By Component, 2020).

### **Video conferencing in business**

FTF meetings have been considered as the most effective way to do business. “FTF contact enables business associates to transmit equivocal information, produce immediate feedback, and build a personal, authentic, and trustworthy atmosphere” (Nardi & Whittaker, 2002) (Nohria & Eccles, 1991). Research has also shown that intraorganizational contact has been a prime motivator the use and inclusion of video conferencing (Denstadli, Impacts of videoconferencing on business travel: The Norwegian experience, 2004) (Lu & Peeta, 2009), implying that large multinational companies have used technology mainly as a communication tool. Businesses in the United States alone contribute a staggering 11 million video conference meetings every day, with the average call duration ranging between 31-60 minutes. As discussed above, video conferencing platforms have been designed with corporate/business needs in mind. Hence these platforms can be seen accompanied by industry-specific features built into them in order to substitute face-to-face (FTF) meetings. Video conferencing in business aids in the following:

- It eliminates expensive travel
- It makes excellent use of limited time
- It allows effective dialogue between all participants.
- It allows immediate, full two-way verbal & pictorial communication
- It provides a sense of social presence during the session (Coventry, 1995)

### **Video conferencing in academia**

While the corporate industry appears to fare well in the realm of video conferencing, academia has its own set of needs and challenges. In education, the situation is further complicated by the wide range of teaching and learning methods. Video conferencing has been known to have the potential for learning in academia, especially in higher education. “The potential lies in creating a more significant opportunity for dialogue, facilitating more effective learning than working in isolation. Discussion may be between tutors and learners or amongst learners. However, the success of video conferencing may well be dependent on factors other than the technology.” (Coventry, 1995). This includes factors ranging from institutional issues to the cost of technology to students and instructors' attitudes towards this technology.

One of the major uses of video conferencing in academia prior to the 2019 pandemic was in the field of distant education. Open/distance learning has made great use of video conferencing platforms, enabling students to attend classes from any part of the world with an internet access. Concepts of open and distance learning provide the necessary flexibility for adults to continue their education or training even though they work and have families. Open/Distance Learning has enabled individuals with the flexibility to continue pursuing their education even when they cannot attend in-person classes because of being in a different location due to work and/or family (Gladović & Deretić, 2020).

While these platforms have excelled in open/distant education, it is essential to understand that video conferencing was not designed to educate the masses and/or replace in-person classes as a whole. It was designed as a business method of communication on an individual or small group basis, with one of its major bottlenecks being its inability to replace the use of print or other methods used in the conceptualization process. One facet that video

conferencing has definitely excelled in regarding academia is its ability to reducing education costs. It has consistently done so by connecting students and teachers in different locations. It has also offered a connected environment for students to relate their experiences to each other, creating a feeling of togetherness, while students benefit from instructions for experts (Kocesi & Kocaska, 2013). It has also been noted that rapid comprehension in this virtual environment, where students can express themselves, can enable better teacher-student communication (Hackman & & Walker, 1990). Studies aimed at evaluating the efficiency of video conferencing in education clearly indicate that the participants' expectations still cannot be met adequately (Motamedi, 2001) (Knipe & Lee, 2002) (Delaney, Jacob, Iedema, Winters, & Barton, 2004). However, it is also important to note that easily accessible online platforms (replacing in-person meeting spaces) have allowed for large groups to meet virtually and have a digital face-to-face interaction without incurring the risk of contamination or getting infected. As of 2021, there are multiple Health Insurance Portability and Accountability Act of 1996–compliant platforms at educational institutions' disposal for real-time online video interaction and academic curriculum. These online platforms can facilitate educational activities and permit large groups of users in the same online meeting space to address various educational needs (Włodarczyk, Wolfswinkel, & Carey, 2020). But it is also essential to note that this transition from a formal and time-tested in-person education to conducting virtual classes using video conferencing platforms has been a learning curve and, to some extent, can be frustrating to use for many educators and students.

### **User Interface in Existing Video Conferencing Platforms**

While there are a few studies showing the potential of video conferencing in academia and how certain aspects of it make it a good tool for online classes and how certain aspects

hinder the same, there is very little information available on how the user interface of a particular video conferencing platform may affect its acceptability by students in education and how the user interface for those video conferencing platforms can be made more student-friendly. We now use multiple video conferencing platforms in our everyday academic life, each having different layouts, features, and implementation. Students face numerous challenges when using these platforms, further complicating this pandemic's hindrances to the overall education system. Every platform uses a different approach to their ultimate goal of providing a video conferencing alternative to in-person sessions, leaving gaping holes in the overall user experience and the need to propose a video conferencing platform that is not only student-friendly but also academic-centered. For example, a study focusing on higher education with traditional method (face-to-face), showed that individuals considered Zoom as less stressful when compared to Cisco WebEx, with the latter being considered “slower” than the prior. Participants also found Zoom more “attractive” compared to Cisco WebEx (Parra & Granda Fernanda, 2021). We can also utilize the general principles of user interface design and propose an interface that caters to academia's needs instead of being business-first. Aspects of user interface like design, usability, learnability, efficiency, etc., can be researched to better understand how video conferencing can be a more helpful tool for educators and students alike. For this thesis, the focus stands primarily on design and usability, keeping students and their needs in mind.

### **Iconography in Video Conferencing Platforms**

Another essential aspect of the video conferencing user interface is its iconography. Icons form an essential part of the user interface. They are primarily responsible for the ease in which participants can navigate the interface and use features available at their disposal during a particular session. While different video conferring platforms vary in terms of their iconography,



it is interesting to note that their approach varies widely, even to the extent of being labeled or not labeled. Hence, the three important factors to consider when researching student-friendly icons would include understanding icon classification, icon usability, and icon recognizability.

### **Icon Usability**

Icon usability is the basic principles that help make the icons in the video conferencing way to use by the participants. According to the Neilson Norman Group, some of the basic tenets of icons usability are:

- **Keep the design schematic and straightforward (not realistic):** Reduce the amount of graphic details by focusing on the essential characteristics.
- **Use text labels for icons:** Some icons are used in multiple ways across different apps, so text labels help. Some of the significant reasons to consider icons labels are:
  - Icons can be ambiguous (Icons like a Star can mean Favorites, Ratings, Feedback, etc., while a Heart can mean Like, Add to List, etc.)
  - Major companies can set the wrong example for others by not labeling their icons. Such companies can have a loyal base using those UI/icons for a long time. If they use it, it simply doesn't mean it is successful. One simply cannot tell if that is helping/hurting them.
- **Use the 5-second rule for designing icons:** It shouldn't take more than 5 seconds to think of an appropriate icon for a feature, else an icon is not effective its representation

## Icon Classification

Icons Classification segregates icons into categories based on their design principles. They can thus be classified into these three main types:

- **Resemblance Icons:** Icons depicting a physical object which the icon is intended to represent. Example: Using a picture of an envelope to represent a file of electronic mail
- **Reference Icons:** Icons depicting some object that may represent the concept the icon is intended to convey by reference or analogy. Example: Using a picture of a clamp to represent a file-compression utility (because it squeezes)
- **Arbitrary icons:** Arbitrary shapes that only have meaning by convention (are most challenging for users to learn). Example: Traffic signs (Stop, Go, U-Turn, etc.) used as icons in user interfaces. (Nielson, 2020) (Harley, 2020)

## Icon Recognizability

Recognizability for icons includes factors that help determine how easy or difficult it is for participants to find and use icons present in the video conferencing platform's user interface. It also includes the use of remembering what it does and its overall aesthetics. Testing icons for recognizability consists of the following principles:

- **Findability:** Can users find a specific icon on the user interface?
- **Recognition:** Do users understand what a specific icon represents?
- **Information Scent:** Can users correctly guess what the icon will do once they interact with it?
- **Attractiveness:** Is the icon aesthetically pleasing?

While video conferencing platforms are yet to be considered ideal for replacing in-person instruction in academia or for everyday coursework use, an in-depth research into the use patterns of these platforms during a pandemic will help understand the needs and requirements of students and educators. This information can help us develop a video conferencing platform that is more tailored for educational use and help unlock the possibilities of modifying the existing platforms into more student-friendly alternatives through multiple login methods or simple software updates.

## **CHAPTER 4. METHODOLOGY**

### **Participants**

The study was conducted with 313 undergraduate and graduate-level students from Iowa State University. The pool of participants included students hailing from different majors and departments of the University, with the only precondition on participation requiring them to be above the age of eighteen to participate in the survey.

### **Data Collection**

An anonymized Qualtrics survey consisting of 35 questions was emailed to the Iowa State University students using the Iowa State Mass Email service. The survey was emailed to students' university email addresses, using which they could take the survey using a laptop, computer, tablet, or smartphone device. It is also worth noting that the "Informed Consent" question set at the very beginning of the survey was set up as a precondition to participate. In contrast, all remaining questions in this survey were optional, and a participant could skip them if they wanted. The survey also gave individuals the option to go back and forth between questions and change answers before submitting. The survey was also set up to ensure that no personally identifiable data was being collected at any time.

### **Data Analysis**

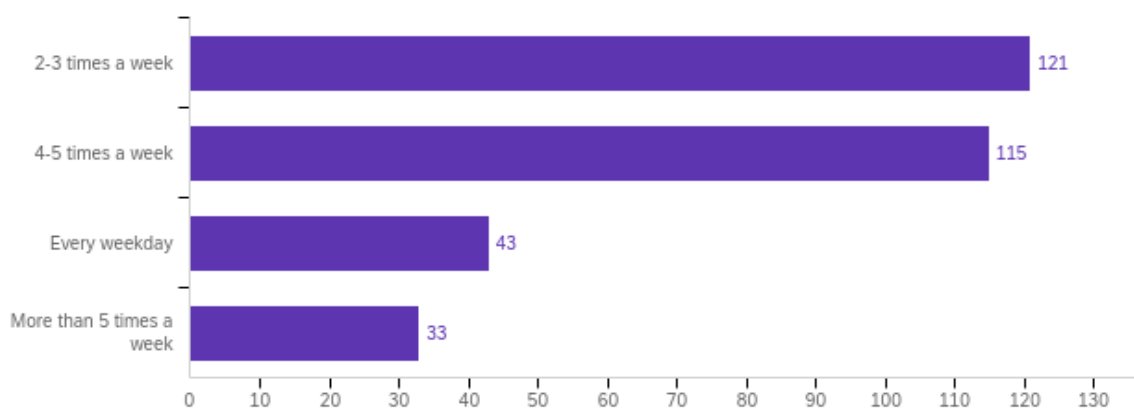
The data generated from the Qualtrics survey responses were analyzed 48 hours after the survey was distributed among Iowa State University undergraduate and graduate students. This ensured that participants had two working days to respond to the survey before the survey

responses were analyzed. The data was extracted from the survey in the form of numerical data, bar charts, pie charts, and numerical tables.

## CHAPTER 5. SURVEY RESULTS

The survey was conducted with 313 students from Iowa State University, Ames, IA, and 99.0%, who indicated they has used a video conferencing platform for their class/coursework in the past 12 months. Out of these 313 participants, 53.9% of the participants were female, 40.2% were male, 4.4% of the participants identified as either non-binary, transgender, or preferred to self-describe 1.2% chose not to answer. Given that the survey was conducted with students, 243 of the 313 participants (78.2%) were undergraduate students, and 68 participants (21.7%) were graduate students. This also directly correlates with the survey results that show 92.9% of the participants were between the age of 18-30, while 6.7% were between the age of 31-59.

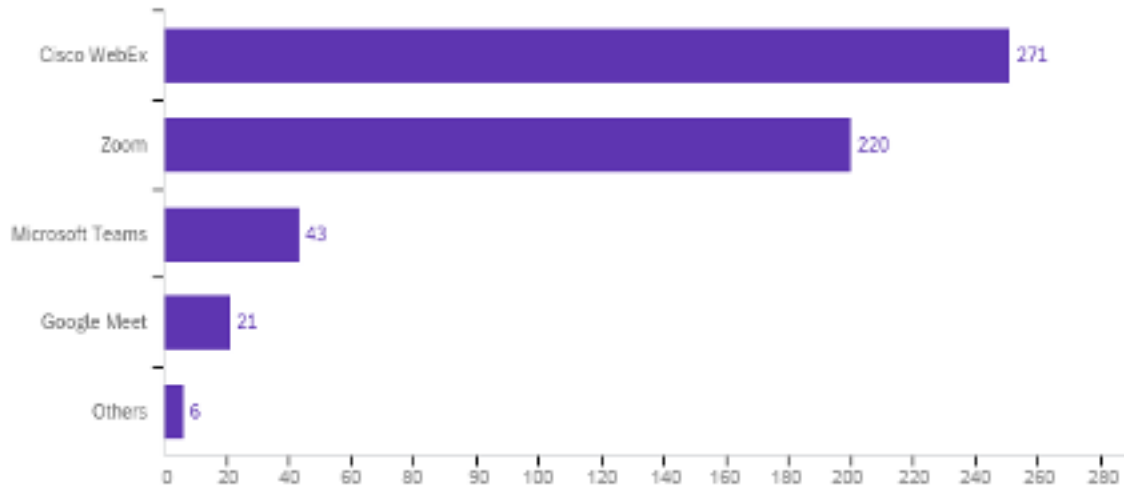
When asked how often they use video conferencing for their classes/academic coursework (see Figure 1), 38.7% of the participants said they used video conferencing 2-3 times a week, 36.8% of the participants said they used video conferencing 4-5 times a week, 13.7% of the participants used video conferencing every weekday, while 10.5% used video conferencing more than five times a week.



**Figure 1:** Question from the Survey “How often do you use video conferencing for your classes/academic coursework?”

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When asked about the different video conferencing platforms that they use for their classes/academic coursework (Figure 2), 48.3% of participants said they use Cisco WebEx, followed by 39.2% of participants using Zoom, 7.6% of participants using Microsoft Teams, 3.7% using Google Meet, and 1.07% participants using other video conferencing platforms like GoToWebinar, Discord, Skype, etc.



**Figure 2:** Which Video conferencing platform/s do you use the most for your online classes and/or group projects? (Choose multiple if applies)

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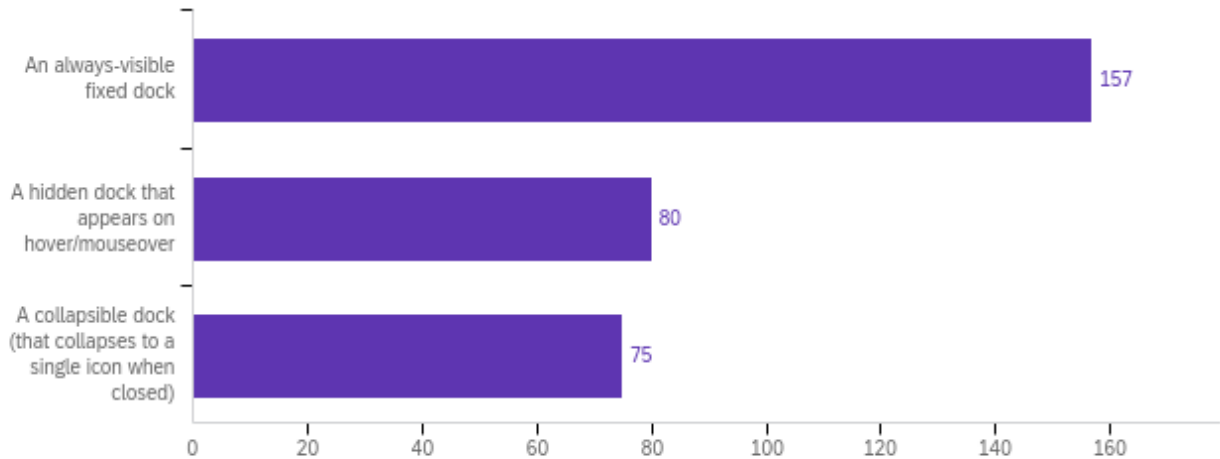
The study participants were also asked about their *user interface design preferences* concerning these video conferencing platforms being used for their classes/academic coursework.

### Primary Dock design

Participants were asked to choose between three different dock design concepts:

- i. An always-visible fixed dock
- ii. A collapsible dock (that collapses to a single icon when closed)
- iii. A hidden dock that appears on hover/mouseover

Of the total 311 participants that answered this question, 157 participants (50.4%) responded with option [i]. While 74 participants (23.7%) responded with option [ii], 80 participants (25.7%) responded with option [iii].



**Figure 3:** Question from the Survey: With respect to the primary dock (which houses all the video, audio, chat, etc. feature icons), which of the following do you prefer?

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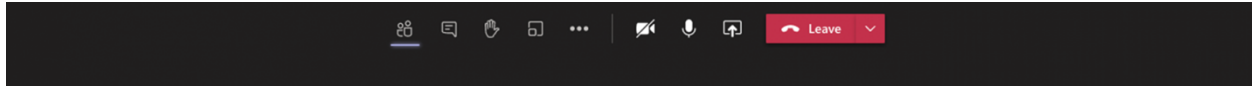
## Icons and Text Labels

When asked to choose between three options of an interface using either

- i. Icons without text labels (Figure 3)
- ii. Icons with visible text labels (Figure 4), and
- iii. Icons with hidden text labels, where text labels appear only on hover/mouse-over (Figure 5),

As per the participants' response (Figure 7), only 1.9% responded with option [i], 50.4% participants responded with choosing option [ii], a close 47.5% choosing option (iii).

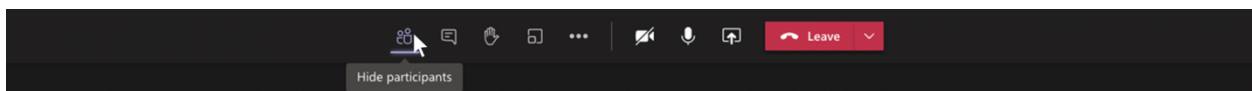




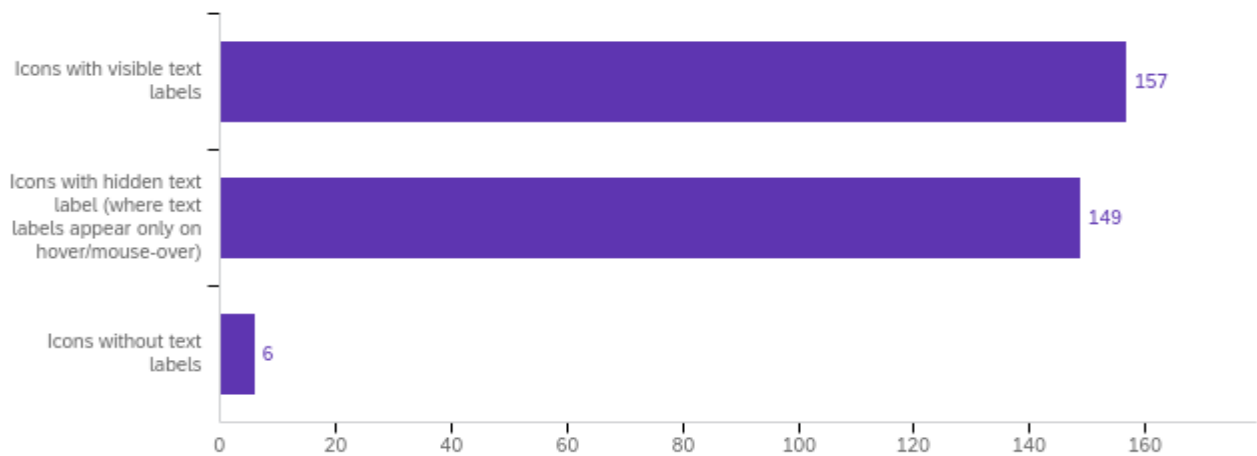
**Figure 4:** A video conferencing platform's primary dock featuring icons without text labels.



**Figure 5:** A video conferencing platform's primary dock featuring icons with visible text labels.



**Figure 6:** A video conferencing platform's primary dock featuring icons with hidden text labels, where text labels appear only on hover/mouse-over.



**Figure 7:** Question from the Survey: With respect to the user interface icons (video, microphone, chat, etc), which of the following do your prefer?

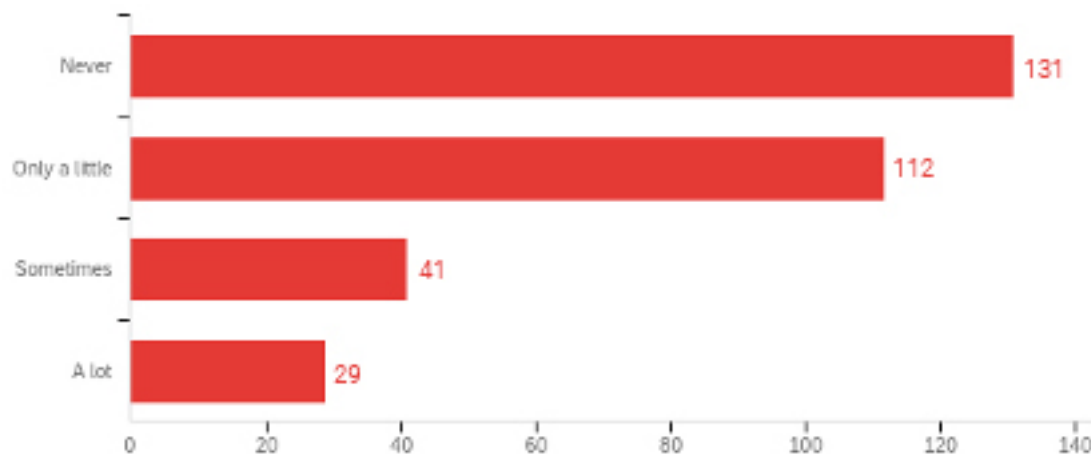
The participants were then asked about *the concerns (if any) of using the user interface* offered by these video conferencing platforms to understand which design choices made by these platforms hampered their user experience.

### Accidental muting/unmuting of microphone

Participants were asked how often do you mute/unmute their microphone unintentionally during a video call:

- i. Never
- ii. Only a little
- iii. Sometimes
- iv. A lot

Of the 313 participants that answered this question, 41.8% responded with option [i], while the remaining 58.1% collectively admitted to having muted/unmuted themselves by mistake at least once (35.7% responded with option [ii], 13.1% responded with option [iii], and 9.2% responded with option [iv])



**Figure 8:** Question from the Survey: How often do you mute/unmute your microphone unintentionally during a video call?

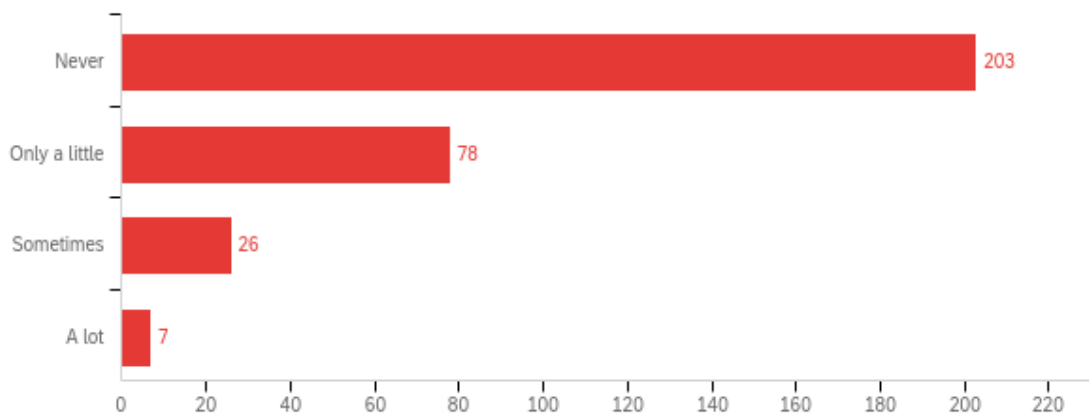
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### Accidental switching ON/OFF of web camera

Participants were asked how often do you switch on/off your video/camera unintentionally during a video call?:

- i. Never
- ii. Only a little
- iii. Sometimes
- iv. A lot

Of the 313 participants that answered this question, 64.6% responded with option [i]. In contrast, 35.3% collectively agreed to have unknowingly switched their video feed ON/OFF at least once (24.8% responded with option [ii], 8.2% responded with option [iii] while 2.2% responded with option [iv]).



**Figure 9:** Question from the Survey: How often do you switch on/off your video/camera unintentionally during a video call?

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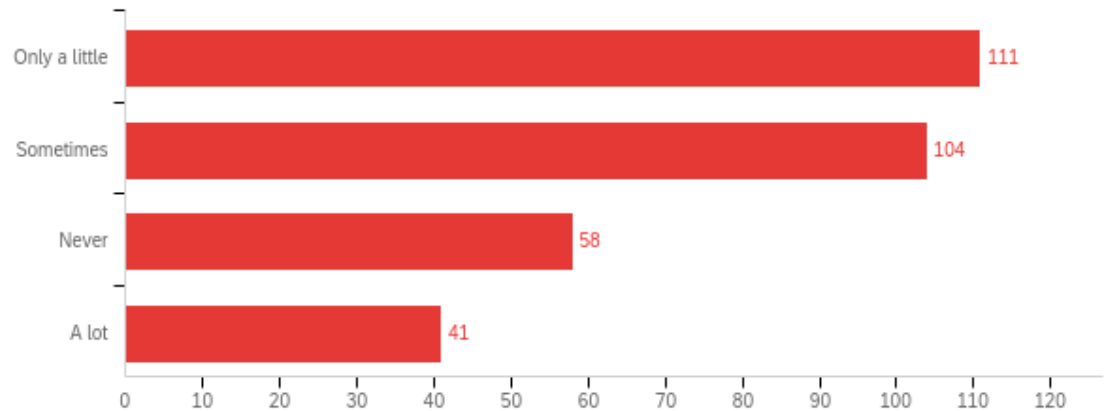
### Privacy concerns when sharing the computer screen

Participants were asked if they had privacy concerns when sharing their desktop/entire screen with the instructor or class?

- i. Never
- ii. Only a little
- iii. Sometimes

iv. A lot

Of the 313 participants that answered this question, 18.2% responded with option [i], 35.4% responded with option [ii], a close 33.2% responded with option [iii], while 13.1% responded with option [iv].



**Figure 10:** Question from the Survey: How often do you switch on/off your video/camera unintentionally during a video call?

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### **Ease of using the video conferencing platform**

Participants were asked a three-part question on how strongly do they agree/disagree with the statement, "The video conferencing platform/s being used in my school/university are (1) easy to use, (2) easy to understand, and (3) easy to navigate." And they were given the following options to respond with:

- i. Strongly Agree
- ii. Somewhat Agree
- iii. Neither Agree nor Disagree
- iv. Somewhat Disagree
- v. Strongly Disagree

### Easy to Use:

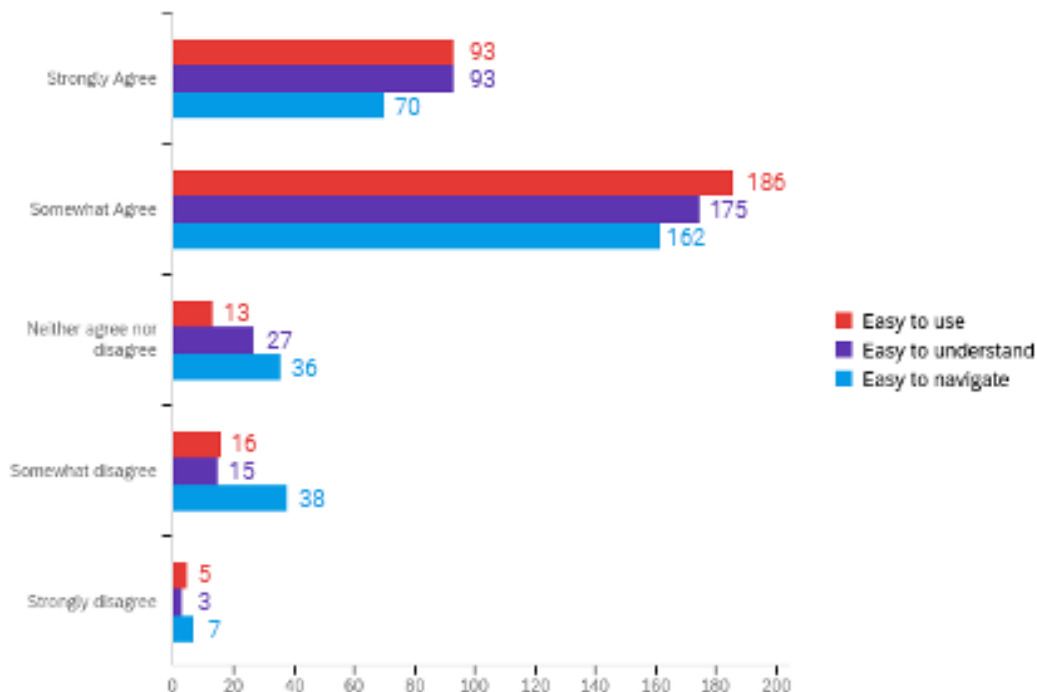
Of the 313 participants who answered this question, 59.4% participants said that they “Somewhat Agree” that the video conferencing platform used in their school/university was “Easy to Use.” In contrast, only 29.7% said they “Strongly Agree.”

### Easy to Understand:

55.9% of participants said that they “Somewhat Agree” that the video conferencing platform being used in their school/university was “Easy to Understand,” while only 29.7% said they “Strongly Agree.”

### Easy to Navigate:

51.7% of participants said that they “Somewhat Agree” that the video conferencing platform being used in their school/university was “Easy to Navigate,” while only 22.3% said they “Strongly Agree.”



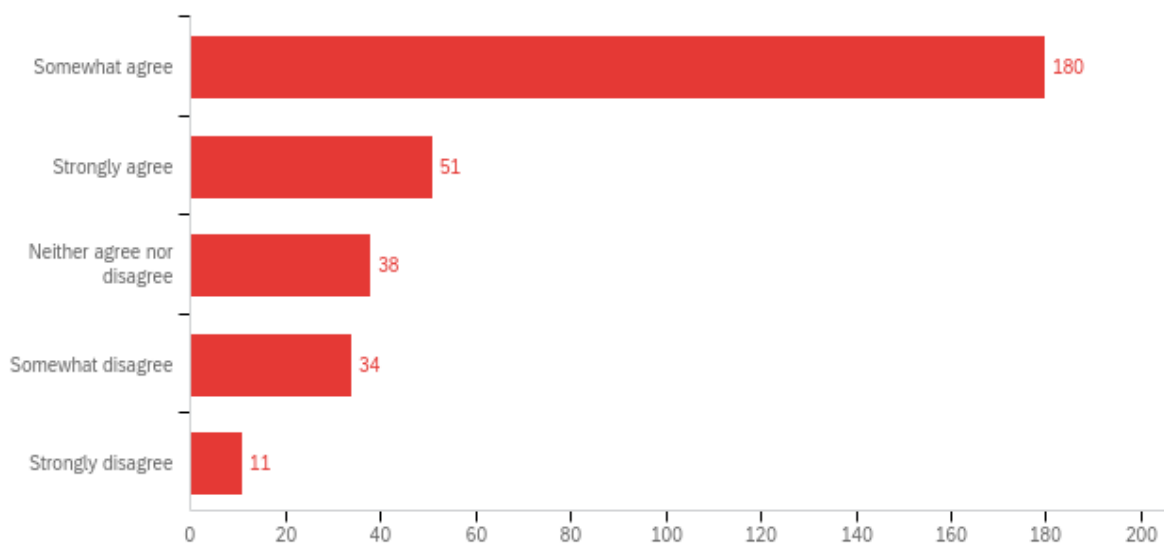
**Figure 11:** Question from the Survey: "The video conferencing platform/s being used in my school/university are easy to use, understand and navigate."

### Video conferencing platform meeting academic needs

Participants were asked how strongly do they agree/disagree with the statement, "The video conferencing platform/s being used most frequently in my classes meet my academic needs." And they were given the following options to choose from:

- i. Strongly Agree
- ii. Somewhat Agree
- iii. Neither Agree nor Disagree
- iv. Somewhat Disagree
- v. Strongly Disagree

Of the 313 participants that answered this question, 16.2% of participants said they choose option [i] ("Strongly Agree"), 57.1% participants responded with option [ii] ("Somewhat Agree"), 12.1% participants responded with option [iii] ("Neither Agree nor Disagree"), 10.8% participants responded with option [iv] ("Somewhat Disagree"). In contrast, 3.5% of participants responded with option [v] ("Strongly Disagree").



**Figure 12:** Question from the Survey: "The video conferencing platform/s being used most frequently in my classes meet my academic needs."

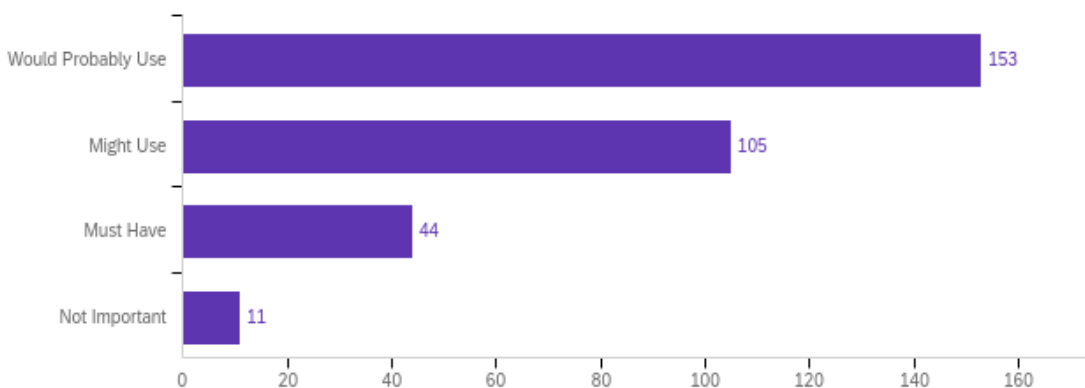
The participants were also asked about *additional features that could be potentially added to the existing video conferencing platforms* and how they would rate these features based on their potential use case.

### Sharing multiple windows

Participants were briefed about a potential feature that would let individuals use multiple windows at the same time (e.g., a browser window and a Presentation file and tile them next to each other on other participants' screens) and were given the following options to respond with:

- i. Not important
- ii. Might use
- iii. Would probably use
- iv. Must have

Of the 312 participants that answered this question, 3.5% responded with option [i] (“Not Important”), 33.6% responded with option [ii] (“Might Use”) [ii], 48.7% participants responded with option [iii] (“Would Probably Use”) while 14.1% responded with option [iv] (“Must Have”).



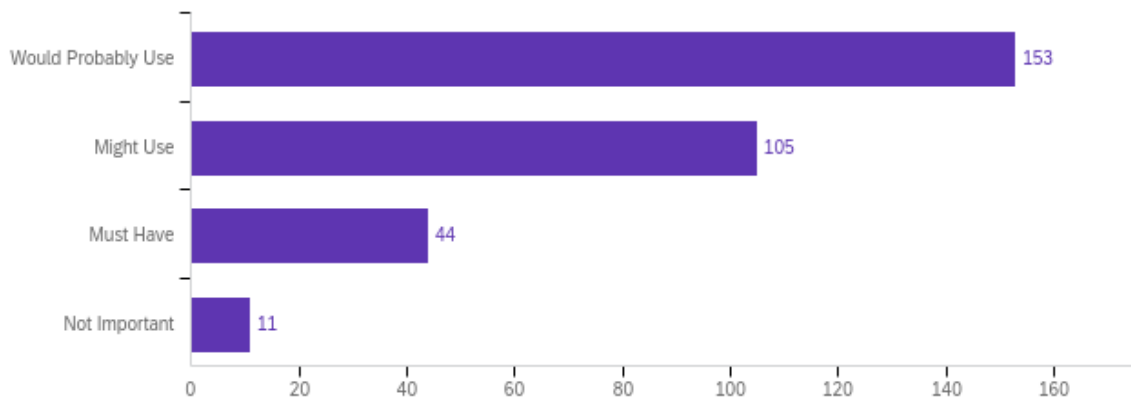
**Figure 13:** Question from the Survey: "Share multiple windows: This feature would enable you to share multiple windows at the same time, e.g., a browser window and a Presentation file and tile them next to each other on other participants' screens."

## Email Participants

Participants were briefed about a potential feature that would let students email other participants and/or the instructor directly from the video conferencing window instead of opening a mail client/application/browser window. They were requested to respond with:

- i. Not important
- ii. Might use
- iii. Would probably use
- iv. Must have

Of the 312 participants that answered this question, 9.9% of the participants responded with option [i] (“Not Important”), 28.2% responded with option [ii] (“Might Use”), 45.1% responded with option [iii] (“Would Probably Use”), and 16.6% of the participants responded with [iv] (“Must Have”).



**Figure 14:** Question from the Survey: "Email a participant: This feature would enable you to click an email icon next to participant's name and email the person (including the instructor) directly."

## Fixed Seating and Attendance

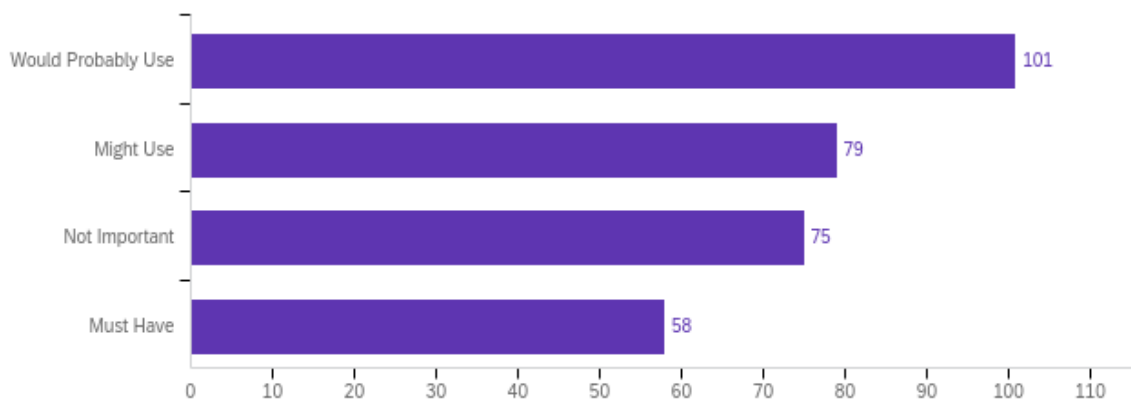
Participants were briefed about a potential feature that would assign individual fixed screen windows/tiles to each participant in alphabetical order (leaving blank windows for absent



students) and also provide an option for the instructor to take attendance easily. They were given the following options to respond with:

- i. Not important
- ii. Might use
- iii. Would probably use
- iv. Must have

Of the 312 participants that answered this question, 24.0% of the participants responded with option [i] (“Not Important”), 25.3% responded with option [ii] (“Might Use”), 32.0% participants responded with option [iii] (“Would Probably Use”) and 18.5% participants responded with option [iv] (“Must Have”).



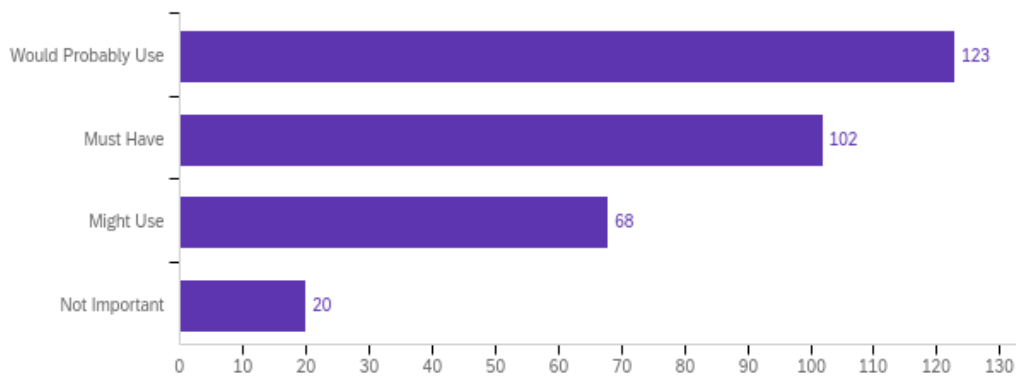
**Figure 15:** Question from the Survey: "Fixed Seating & Attendance: This feature would fix participant windows/tiles on the screen in alphabetical order (with absent students having a blank window) so that everyone has a fixed screen position and can see who's present/absent, and the instructor could easily take attendance."

### **Instructor/Speaker Spotlight (Figure 16):**

Participants were briefed about a potential feature that would highlight the window/tile of the instructor or of the speaker and dim other participant windows and tiles to help users focus on the speaker. The participants were asked to respond with the following options:

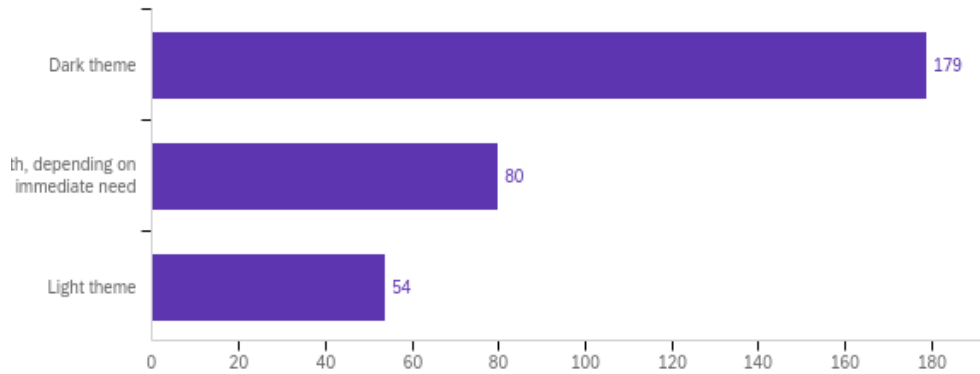
- i. Not important
- ii. Might use
- iii. Would probably use
- iv. Must have

Of the 313 participants that answered this question, 6.3% of the participants responded with option [i] (“Not Important”), 21.7% responded with option [ii] (“Might Use”), 39.3% participants responded with option [iii] (“Would Probably Use”) and 32.5% participants responded with option [iv] (“Must Have”).



**Figure 16:** Question from the Survey: " Instructor/Speaker Spotlight: When using a gallery view for participant videos, this feature will keep the instructor/speaker's video in focus, dimming all the other participant videos."

The survey asked participants to share their preference between a light theme, a dark theme and having the option to toggle between both for a video conferencing platform. Out of the 313 participants who answered this question, 57.1% of participants suggested they would use a dark theme, compared to 25.5% participants who wanted an option to toggle between the both and 17.2% participants who preferred a light theme.



**Figure 17:** Question from the Survey: " What theme do you prefer for your video calling platform

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### Analyzing Student User Interface Preference

Lastly, participants were provided a list of four video conferencing platforms

- [Cisco WebEx](#)
- [Google Meet](#)
- [Microsoft Teams](#)
- [Zoom](#)

They were then asked to select one or more video conferencing platforms that they use for their academic coursework, following which they were shown the video calling screen of the chosen platform/s (using a screenshot). The screenshots contained clickable/selectable icons and asked the participants to answer the following user interface questions:

- i. Click and select the 5 features you use the most
- ii. Select the icons that successfully convey the feature well (click once to add a green checkmark) and select the icons that do not convey the feature well (click twice to add red cross mark)

Their responses were as follows:

**Cisco WebEx:** The 271 participants who responded with Cisco WebEx had the following response:

- i. Click and select the 5 features you use the most:

**Table 1.** Response for “Click and select the 5 features you use the most” for Cisco WebEx

#	Feature	Selected	No. of Participants
1	Microphone	98.5%	267
10	Chat	90.7%	246
2	Video	88.9%	241
5	Share	50.1%	136
9	Participants	46.8%	127
8	Reactions	35.4%	96
7	Breakout Sessions	28.0%	76
3	Settings	27.3%	74
6	Record	9.9%	27
12	Polling	8.1%	22
4	Virtual Background	6.6%	18
13	Meeting Info	5.9%	16
11	Notes	3.3%	9

- ii. Select the icons that successfully convey the feature well (click once - green checkmark) and select the icons that do not convey the feature well (click twice - red cross mark):

**Table 2.** Response for “Select the icons that successfully convey the feature well and select the icons that do not convey the feature well” for Cisco WebEx.

---

#	Dislike		Feature	Like		Total
1	1.4%	4	Microphone	92.6%	251	271
2	2.2%	6	Video	90.4%	245	271
10	4.4%	12	Chat	75.2%	204	271
5	16.2%	44	Share	62.3%	169	271
6	10.7%	29	Record	54.2%	147	271
7	19.9%	54	Breakout Sessions	48.7%	132	271
3	8.1%	22	Settings	48.3%	131	271
9	21.0%	57	Participants	45.7%	124	271
8	22.1%	60	Reactions	44.2%	120	271
12	16.9%	46	Polling	36.1%	98	271
4	15.1%	41	Virtual Background	33.9%	92	271
11	20.3%	55	Notes	27.3%	74	271
13	2.5%	7	Meeting Info	11.0%	30	271

**Google Meet:** The 21 participants who responded with Google Meet for this question had the following response:

- i. Click and select the 5 features you use the most:

**Table 3.** Response for “Click and select the 5 features you use the most” for Google Meet.

---

#	Feature	Like		Total
2	Microphone ON/OFF	100.0%	21	21
4	Video ON/OFF	100.0%	21	21
3	End Call	71.4%	15	21
10	Chat	61.9%	13	21
7	Present now/Screenshare	52.3%	11	21
9	Participants	38.1%	8	21
5	Raise Hand	23.8%	5	21
8	More Options	23.8%	5	21
1	Meeting Details	14.2%	3	21
6	Turn on Captions	14.2%	3	21

- ii. Select the icons that successfully convey the feature well (click once - green checkmark and select the icons that do not convey the feature well (click twice - red cross mark):

**Table 4.** Response for “Select the icons that successfully convey the feature well and select the icons that do not convey the feature well” for Google Meet.

---

#	Dislike		Features	Like		Total
2	0.0%	0	Microphone ON/OFF	100.0%	21	21
4	0.0%	0	Video ON/OFF	100.0%	21	21
3	28.5%	6	End Call	71.4%	15	21
10	38.1%	8	Chat	61.9%	13	21
7	47.6%	10	Present now/Screenshare	52.3%	11	21

**Table 4.** Continued

#	Dislike		Features	Like		Total
9	61.9%	13	Participants	38.1%	8	21
5	76.1%	16	Raise Hand	23.8%	5	21
1	85.7%	18	Meeting Details	14.2%	3	21
6	85.7%	18	Turn on Captions	14.2%	3	21

**Microsoft Teams:** The 43 participants who responded with Microsoft Teams for this question had the following response:

- i. Click and select the 5 features you use the most:

**Table 5.** Response for “Click and select the 5 features you use the most” for Microsoft Teams.

---

#	Features	Like		Total
16	Microphone	93.0%	40	43
15	Video	90.7%	39	43
2	Chat	76.7%	33	43
17	Share screen	48.8%	21	43
1	Participants	46.5%	20	43
5	Device Settings	34.8%	15	43
3	Gesture	34.8%	15	43
9	Gallery View	23.2%	10	43
8	Meeting Details	11.6%	5	43
6	Meeting Options	9.3%	4	43
12	Screen Recording	9.3%	4	43
4	Breakout Room	6.9%	3	43
7	Meeting Notes	6.9%	3	43
11	Live Captions	4.6%	2	43

**Table 5.** Continued

#	Features	Like		Total
10	Background Effects	2.3%	1	43
13	Dial Pad	0.0%	0	43
14	Turn off video	0.0%	0	43

- ii. Select the icons that successfully convey the feature well (click once – green checkmark) and select the icons that do not convey the feature well (click twice – red cross mark):

**Table 6.** Response for “Select the icons that successfully convey the feature well and select the icons that do not convey the feature well” for Microsoft Teams.

---

#	Dislike		Features	Like		Total
15	0.0%	0	Video	90.7%	39	43
16	0.0%	0	Microphone	88.3%	38	43
2	11.6%	5	Chat	69.7%	30	43
1	11.6%	5	Participants	62.7%	27	43
3	13.9%	6	Gesture	55.8%	24	43
17	27.9%	12	Share screen	51.1%	22	43
12	2.3%	1	Screen Recording	48.8%	21	43
5	9.3%	4	Device Settings	46.5%	20	43
11	9.3%	4	Live Captions	34.8%	15	43
14	6.9%	3	Turn off video	32.5%	14	43
9	20.9%	9	Gallery View	32.5%	14	43
8	13.9%	6	Meeting Details	30.2%	13	43
10	18.6%	8	Background Effects	30.2%	13	43
6	23.2%	10	Meeting Options	27.9%	12	43



**Table 6.** Continued

#	Dislike		Features	Like		Total
7	20.9%	9	Meeting Notes	25.5%	11	43
13	20.9%	9	Dial Pad	20.9%	9	43
4	41.8%	18	Breakout Room	13.9%	6	43

**Zoom:** The 220 participants who responded with Zoom for this question had the following response:

- i. Click and select the 5 features you use the most:

**Table 7.** Response for “Click and select the 5 features you use the most” for Zoom.

---

#	Features	Likes		Total
2	Microphone	98.1%	216	220
9	Chat	95.0%	209	220
3	Video	94.5%	208	220
10	Participants	67.2%	148	220
8	Share Screen	64.0%	141	220
12	Breakout Rooms	27.7%	61	220
11	Reactions	24.0%	53	220
6	Video Settings	10.9%	24	220
13	Screen Record	7.2%	16	220
4	Virtual Background	5.4%	12	220
1	Region #1	3.1%	7	220
7	Security	1.3%	3	220
5	Video Filter	0.9%	2	220

- ii. Select the icons that successfully convey the feature well (click once - green checkmark) and select the icons that do not convey the feature well (click twice - red cross mark):

**Table 8.** Response for “Select the icons that successfully convey the feature well and select the icons that do not convey the feature well” for Zoom.

---

#	Dislike		Feature	Like		Total
2	1.3%	3	Microphone	95.0%	209	220
3	0.9%	2	Video	94.5%	208	220
9	3.1%	7	Chat	91.8%	202	220
10	5.9%	13	Participants	81.3%	179	220
8	9.5%	21	Share Screen	76.8%	169	220
13	8.1%	18	Screen Record	62.7%	138	220
11	15.9%	35	Reactions	60.4%	133	220
12	23.1%	51	Breakout Rooms	51.3%	113	220
4	8.6%	19	Virtual Background	32.7%	72	220
6	13.1%	29	Video Settings	29.5%	65	220
7	33.1%	73	Security	28.6%	63	220
5	20.4%	45	Video Filter	20.0%	44	220
1	10.0%	22	Region #1	5.4%	12	220

### Additional feature requests

Some of the features requested by the study participants to be incorporated into the new user interface design include:

- i. an improved chat window for participants (11 participants)
- ii. easier screen sharing (27 participants)

- iii. sharing video only with the instructor (8 participants)
- iv. a discreet way to tell participants if their microphone/camera is on/off (15 participants)
- v. note-taking/whiteboard to write on (14 participants)
- vi. more react buttons (7 participants)
- vii. insert polling for students (6 participants), and
- viii. real-time close captioning (14 participants)

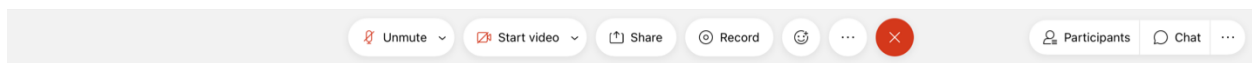
## CHAPTER 6. COMPARING EXISTING VIDEO CONFERENCING PLATFORMS

Considering the different video conferencing platforms in use in academia and their different feature sets and user interface design, certain facets can be zeroed in on when attempting to make these platforms more student-friendly. One of this study's goals is to primarily understand the student needs concerning the most-used features and their design, implementation, and ease of use.

As per the user survey, Cisco WebEx (48.3%) and Zoom (39.2%) appeared to be the two most used video conferencing platforms for daily course work. The survey also reveals that the five most-used features on these platforms are:

- Microphone
- Video
- Participants
- Chat
- Screen Share

We can compare the primary dock for both of these platforms as they house all of the above features and see how the two video conferencing platforms have designed their layout:



**Figure 18:** Primary dock design for Cisco WebEx



**Figure 19:** Primary dock design for Zoom

Here are some of the significant differences in the dock design between Cisco WebEx and Zoom concerning the five features highlighted above:

- **Microphone:** While Cisco WebEx houses the Microphone at the center of the primary dock, Zoom nestles them on the left of the primary dock.
- **Video:** While Cisco WebEx houses the Microphone at the center of the primary dock, Zoom nestles them on the left of the primary dock.
- **Chat:** Cisco WebEx places the Chat button at the primary dock's far-right, completely separating it from the Microphone and Video button. Zoom sets the Chat button more towards the center of the primary dock, housing it next to the Screen Share button.
- **Participants:** Cisco WebEx places the Participants on the right of the primary dock, away from Microphone and Video buttons. Zoom, however, sets the Participants button closer to the center, grouping it with the Chat and Share button.
- **Screen Share:** Both Cisco WebEx and Zoom have “Screen Sharing” centered on their primary dock.

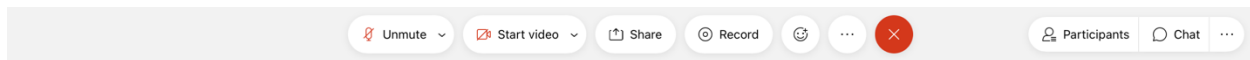
It is also interesting to note that while Cisco WebEx uses outline icons for all of its buttons, Zoom uses filled buttons with solid colors. Lastly, Cisco WebEx has a mixture of labeled and unlabeled icons (with labels always appearing on the icons' right). At the same time, Zoom ensures all its icons are labeled in the primary dock, with the label appearing below the icons.

To understand the implementation of these five features within the user interface, we can now compare these five features from Cisco WebEx and Zoom individually and understand how these platforms have approached implementing these features, and what more needs to be done

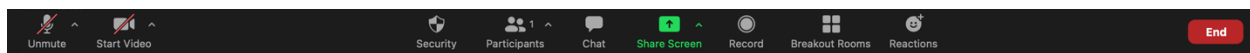
to make these features more student-friendly in the user interface design that this study aims to recommend.

## Microphone

Both Cisco WebEx and Zoom have one-click buttons for Microphone, which allow users to mute or unmute themselves. However, their placement, as discussed earlier, is different. While Cisco WebEx places the Microphone button as the left-most button on the primary dock, Zoom places it on the left-most end. It is also important to note that while Cisco WebEx uses a microphone icon with a stroke, Zoom uses a filled solid color icon for its microphone button. Both, however, clearly show a “strike” on the icon when switched off and not when switched on, clearly indicating their ON/OFF state visually.



**Figure 20:** Microphone button a one-click button, and the left-most button on the primary dock.

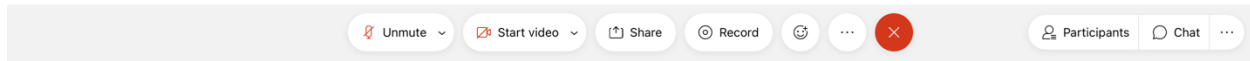


**Figure 21:** Microphone button a one-click button, and placed at the extreme left-end of the primary dock.

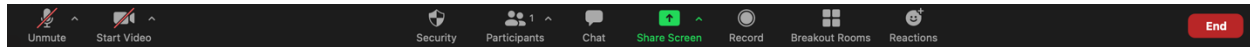
## Video

Both Cisco WebEx and Zoom have one-click buttons for Video, too, allowing users to switch ON/OFF their video feed if and whenever needed. Its placement is similar to that of the Microphone button on these two platforms. Cisco WebEx has its Video button as the second button from the left, while Zoom places it as the second button on the extreme left of its primary dock. Here again, Cisco Webex uses an outline icon with no fill, whereas Zoom uses a filled

solid color icon for its Video button. Both, again, clearly show a “strike” on the icon when switched off and not when switched on, clearly indicating their ON/OFF state visually.



**Figure 22:** Video button a one-click button, and the left-most button on the primary dock.



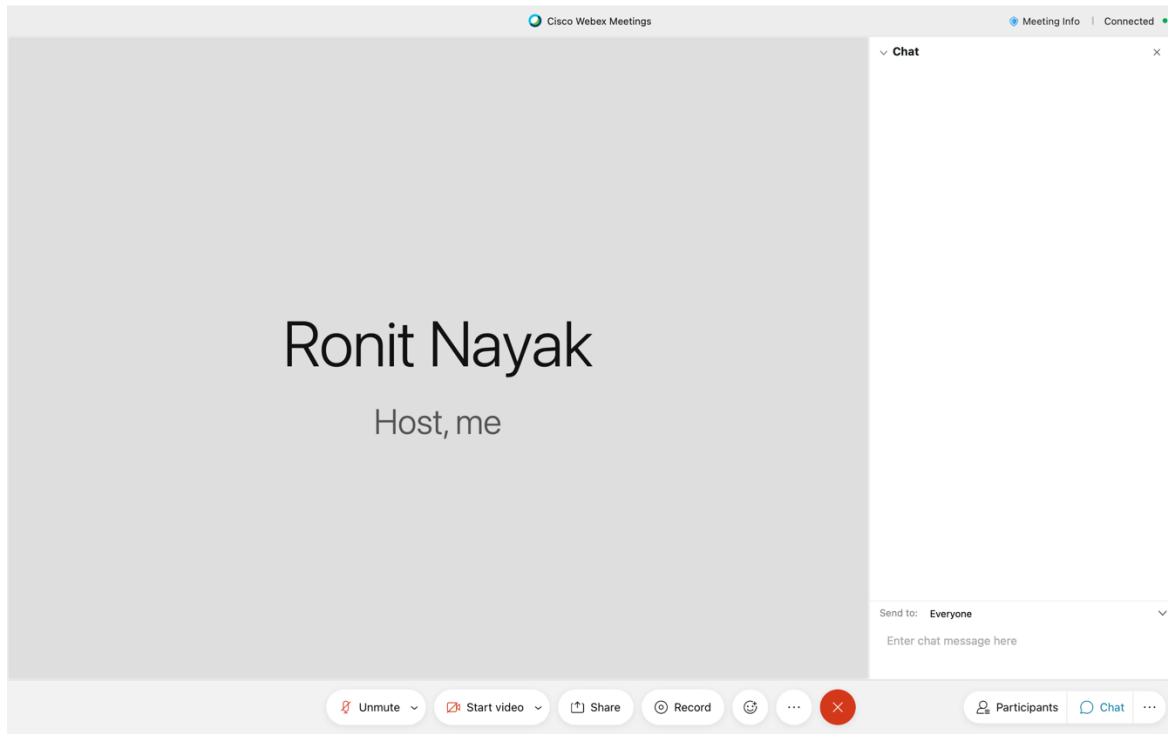
**Figure 23:** Video button a one-click button and placed at the extreme left-end of the primary dock.

## Chat

Cisco WebEx and Zoom differ in the placements of their Chat icon in the primary dock. The prior houses the Chat button on the right of the primary dock, whereas the latter houses it more towards the screen's center. It's also interesting to note the way the Chat feature has been implemented on both platforms. Clicking on the Chat button on Cisco WebEx opens it as a side panel on the right. Zoom, however, opens it as a pop-up window instead, which is initially centered on the screen, covering the video pane. None of the platforms have the option to respond to participants using emotions within the Chat window, as emoticons can only be used directly in video sessions to show an expression.

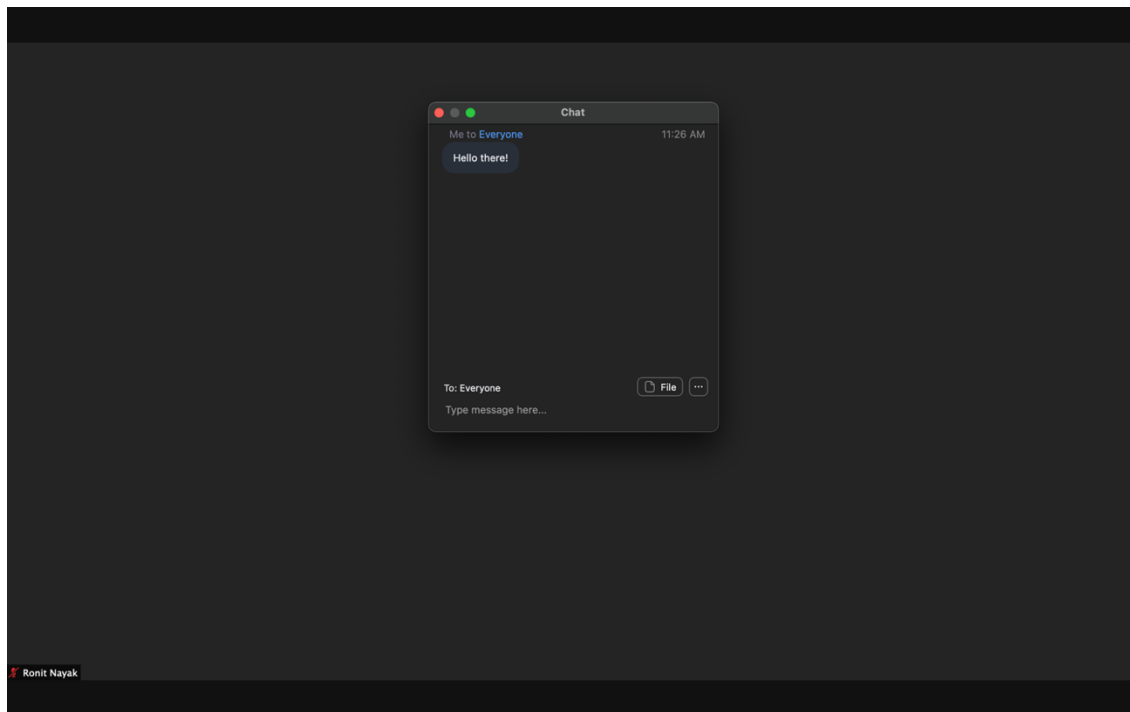
## Participants

Cisco WebEx and Zoom differ the placements of their Participants icon in the primary dock as well. While Cisco WebEx places the Participants button towards the left of the primary dock, Zoom places it on the right end. Their implementation differs as in the case of Chat. Cisco WebEx opens the Participants panel as a fixed side panel on the right, whereas Zoom opens as a pop-up window on the center of the screen.



**Figure 24:** The Chat feature on Cisco WebEx opens as a side panel.

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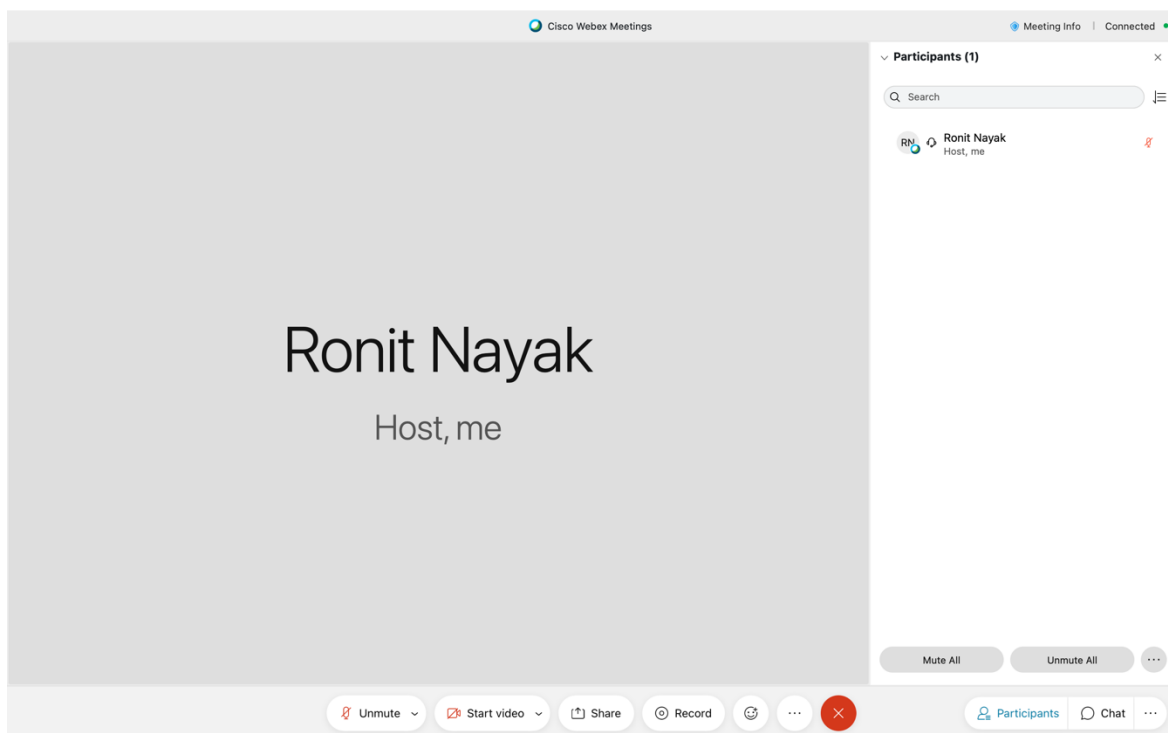
**Figure 25:** The Chat feature on Zoom opens as a pop-up window, covering the video panel.

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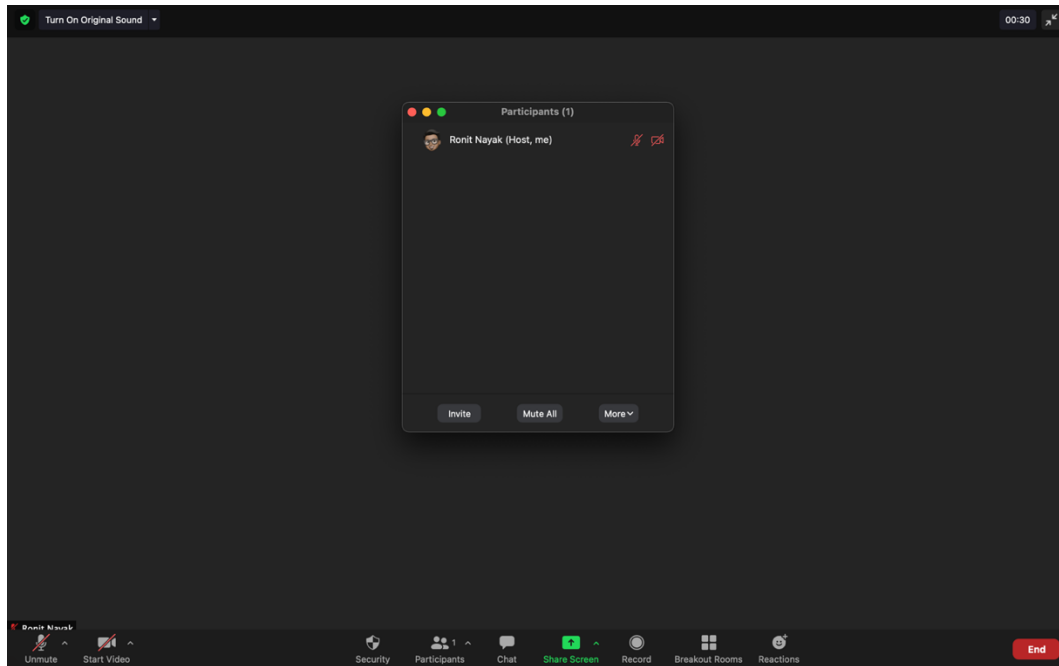
One significant difference worth noting between these two platforms is that Cisco WebEx lets users search for Participants from the participants list and allows the user to sort the participants by “Name” and “Raised Hand.” Zoom, however, lacks the ability of sorting individuals based on their Names and reactions.

When comparing the ease of sharing video conferencing-related information, Zoom gives a user the ability to copy of a “meeting invite link” from the participants panel directly along with muting and unmuting all (only for hosts). In contrast, Cisco does on the last two, leaving out the “invite” option altogether.

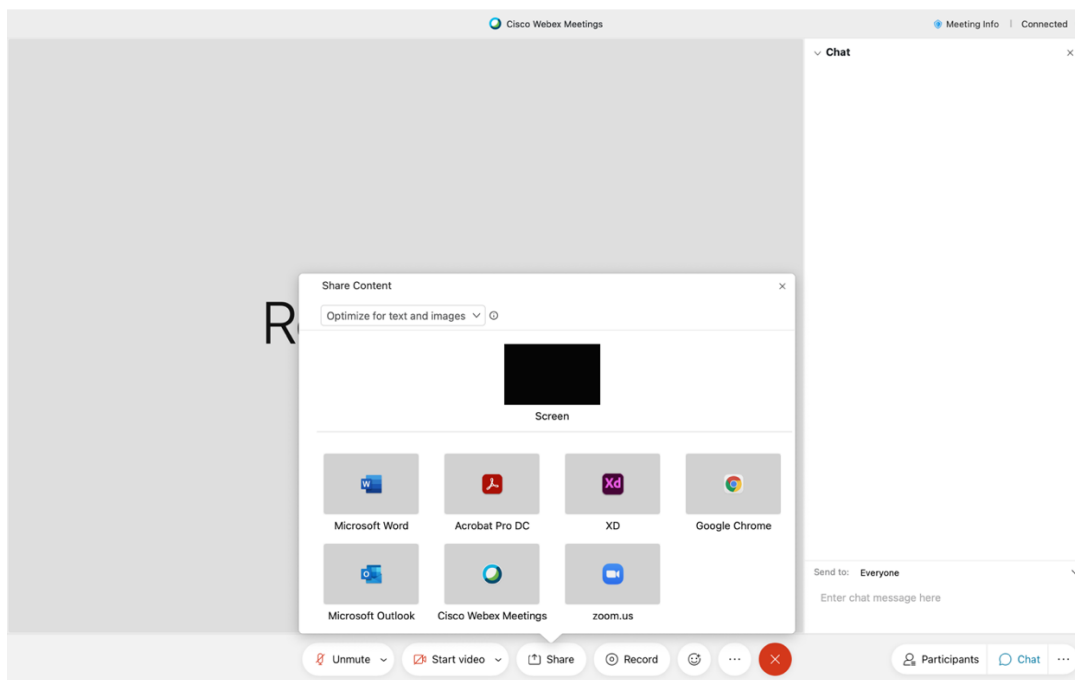


**Figure 26:** The Participants feature on Cisco WebEx opens as a side panel, and has the option to search for participants and sort them by “Raised Hands” and “Name.”

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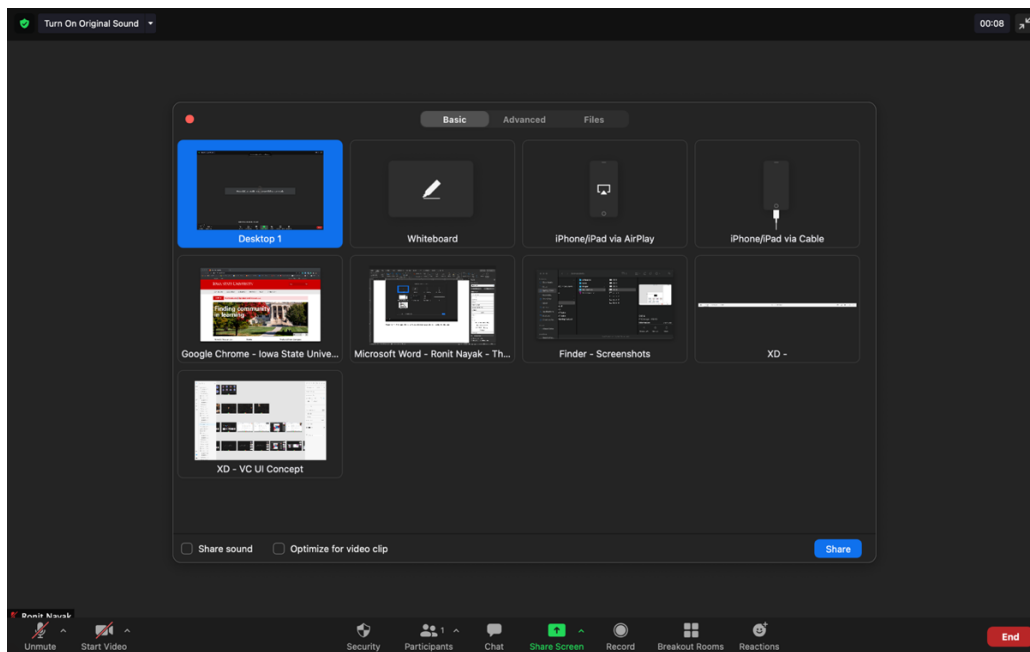
**Figure 27:** The Participants feature on Zoom opens as a pop-up window, covering the video panel.



**Figure 28:** Screen sharing in Cisco WebEx initially shows only the windows/application/program name and their primary logo, while the content is hidden.

## Share Screen

Both Cisco WebEx and Zoom have the same button positioning regarding the primary dock's Share Screen button. The Share Screen button is centered on the primary dock for both and is clearly labeled. Both platforms allow the user to share only one window/application and require users to completely quit screen sharing and restart the sharing again if a new window/application needs to be shared during a video conference. The significant difference between the two platforms, however, is their implementation. While Cisco WebEx only shows you a thumbnail of the available windows with just their application/brand logo on them, Zoom previews the available windows with the exact content they have on the screen at that given time. Lastly, while Cisco WebEx ensures only the name of the window/application/program is visible on the Share Screen pop-up (hiding the actual content of the window/application in the preview), Zoom names the windows/application or programs in much more detail, even going to the extent of naming the tab of browser that is active on a browser.



**Figure 29:** Screen sharing in Zoom shows a preview of the windows/application available for sharing.

## CHAPTER 7. ANALYSIS

The study's 313 participants' responses are instrumental in shedding light on the various aspects related to the use of video conferencing platforms in academia. It helps us identify the platforms being used the most, understand the frequency of use of such platforms in academic coursework, and comprehend the participating students' likes, dislikes, and challenges associated with using these video conferencing platforms for their regular coursework. It also gives us a good sense of design direction that may be undertaken to improve the existing video conferencing user interface by incorporating the needs highlighted by the student participants in this study.

This survey has helped established that Cisco WebEx and Zoom are the two top-most used video conferencing platforms among the student participants. While the majority of the student participants agreed that they are using these platforms 2-3 times a week for their class/academic course work, it was closely followed by a near equal number of students who used these platforms for 4-5 times a week. It is likely that the pre-pandemic student-use of Cisco WebEx and Zoom pre-pandemic was not nearly as high as it is today. And with 99.0% of the participants claiming to have used video conferencing for their academic coursework in the past 12 months, it speaks volumes of the impact that COVID-19 has had on the conventional ways of imparting education to students in academia.

The survey participants have also shared their preferences concerning the user interface design of these video conferencing platforms, which may be used to aid in design a more student-centered video conferencing user interface aimed at educational use. When considering the design of the most important and most-used user interface element of these video conferencing platforms, the primary dock, almost half (50.8%) of the students prefer an always

visible fixed-dock. However, the remaining half of the participants have almost equally preferred to choose a hidden dock that appears on mouse-over/hover or a collapsible dock that collapses into a single icon when closed (at 25.7% and 23.7% respectively). This finding makes it essential for these video conferencing platforms to give students the ability and option to toggle between a fixed, hidden, and/or a collapsible primary dock design instead of enforcing a one-implementation-fits-all approach. It is also important to note here that while a little over half of the student participants in this study (50.4%) have expressed their need for a user interface that has clearly labeled icons (as used in platforms like Zoom), a close 47.5% of the participants have expressed their will to have icons that show text labels only when hovered on—again clearly implying that it is essential for these video conferencing platform to give students the option to toggle between the two implementations instead of enforcing one design over the other. It's interesting to note here that the two most used platforms as per this survey (Cisco WebEx and Zoom) are in line with student's preference of having labeled icons. However, as discussed earlier, while Zoom has all its icons labeled, Cisco WebEx has a mix of labeled and unlabeled icons in its user interface design.

When considering the various concerns faced by students with the current user interface design of the video conferencing platforms being used in academia, we find that a staggering 58.1% of the students participating in this study have collectively agreed to muting/unmuting their microphones by accident either a little, sometimes or a lot during video calls. Similarly, 35.3% of students collectively have agreed to have switched ON/OFF their video mistakenly during a video call session. All the video conferencing platforms use a single-click implementation to switch ON/OFF the microphone or video during a video conference session. This brings up the vital need for implementing a mechanism that prevents students from such

mistaken clicks and presses, leading to the unintentional and unwanted use of the microphone and camera or the lack thereof. This survey also brings to light the privacy concerns that students have when sharing their desktop screen with the instructor/class as 86.9% of the student participants collectively claim to be a little/sometimes/a lot concerned about their privacy when sharing their screen. This echoes the need to upgrade existing features like screen-sharing and enable students to share multiple programs/application windows simultaneously compared to the present arrangement of choosing either between sharing one application window or the entire screen. The ability to share multiple programs/application windows simultaneously will also eliminate the need for sharing the whole screen or desktop with the instructor/class unless required by the student. As seen in the user interface comparison, both Cisco WebEx and Zoom let the user share only one screen at a time and force them to quit screen share to share a new window/application. Another implementation to address this privacy concern can be the use of selective blurring. In this approach, everything beyond the selected window can be blurred for the viewers, ensuring that nothing other than the shared window is visible even when sharing the entire screen/desktop.

When using the survey results to compare the video calling platforms like Cisco WebEx, Google Meet, Microsoft Teams, and Zoom based on their most-used features and icon design, we can draw a certain pattern between the way students in academia use all these platforms. Firstly, the most used feature in all of these platforms is the microphone. This is then followed by a tie between the Chat feature and the Video feature, with the prior being used as the second most important feature in Cisco WebEx and Zoom (with Video being the third most important feature) and the latter being used as the second most important feature in Google Meet and Microsoft Teams (with Chat being the third most important feature). Secondly, all the platforms

excluding Microsoft Teams show the screen sharing feature as the third most used feature after either Chat or Video. Zoom is the only platform that shows Participants as the fourth most used feature after Video, only to have Screenshare right after fifth. For the other platforms except for Zoom, Screen sharing appears as the fourth most used feature, followed by Participants.

Considering that majority of the student participants use Cisco WebEx and Zoom as their everyday choice, the top five video conference features used during class/for academic coursework are:

- i. Microphone
- ii. Chat
- iii. Video
- iv. Screen Share, and
- v. Participants

When considering the easiest vs. the most difficult-to-understand icons for all these video conferencing platforms, we see Microphone, Video, Chat, Participants, and Screen Share as the easiest to understand icons. However, when considering the most difficult to understand icons, we have Reactions, Participants and Notes for Cisco WebEx; Meeting Details, Captions and Raise Hands for Google Meet; Breakout Room, Share Screen and Meeting Options for Microsoft Teams, and Security, Breakout Room and Video Filter for Zoom.

When designing a new student-centered video conference user interface, it is vital to take all of the above findings into consideration. Firstly, the new user interface should have the features of Microphone, Video, Chat, Participants, and Screen Share as the primary features placed prominently on the primary dock. Secondly, the primary dock should have the option to collapse when needed. Thirdly, all the icons should have a visible text label. Fourthly, there

should be a clear indication of the ON/OFF state for microphone and video features, along with a two-step switch ON/OFF implementation to avoid accidental toggles. Lastly, screen sharing should address students' privacy concerns and enable multiple window screen sharing.

Another essential angle to consider in the user interface design is that while students in this study are interested in having a collapsible/hidden primary dock design for their user interface, they also show a clear interest in having visible text labels on the icons. Adding to it their concern about muting/unmuting their microphone and/or turning ON/OFF their camera by mistake when on a video call (which highlights the need for clear indication of the ON/OFF state of the microphone and the camera, respectively), the new primary dock design, to meet these demands, will not only have to be versatile enough to collapse and expand when prompted to but also have clear visualization/indication of the microphone and camera ON/OFF state even when the dock is in the collapsed form. Finally, the new user interface design should also include the additional feature requests made by the participants.



## CHAPTER 8. CREATIVE COMPONENT

The creative component for this study is a redesigned User Interface prototype for a hypothetical video conferencing platform. The design for this user interface incorporates the knowledge gained by reviewing existing literature and the analysis of the Qualtrics survey responses. The prototype was made using Adobe XD and was set up to be demonstrated using as a local Adobe XD file or shared with individuals for testing using a shareable weblink.

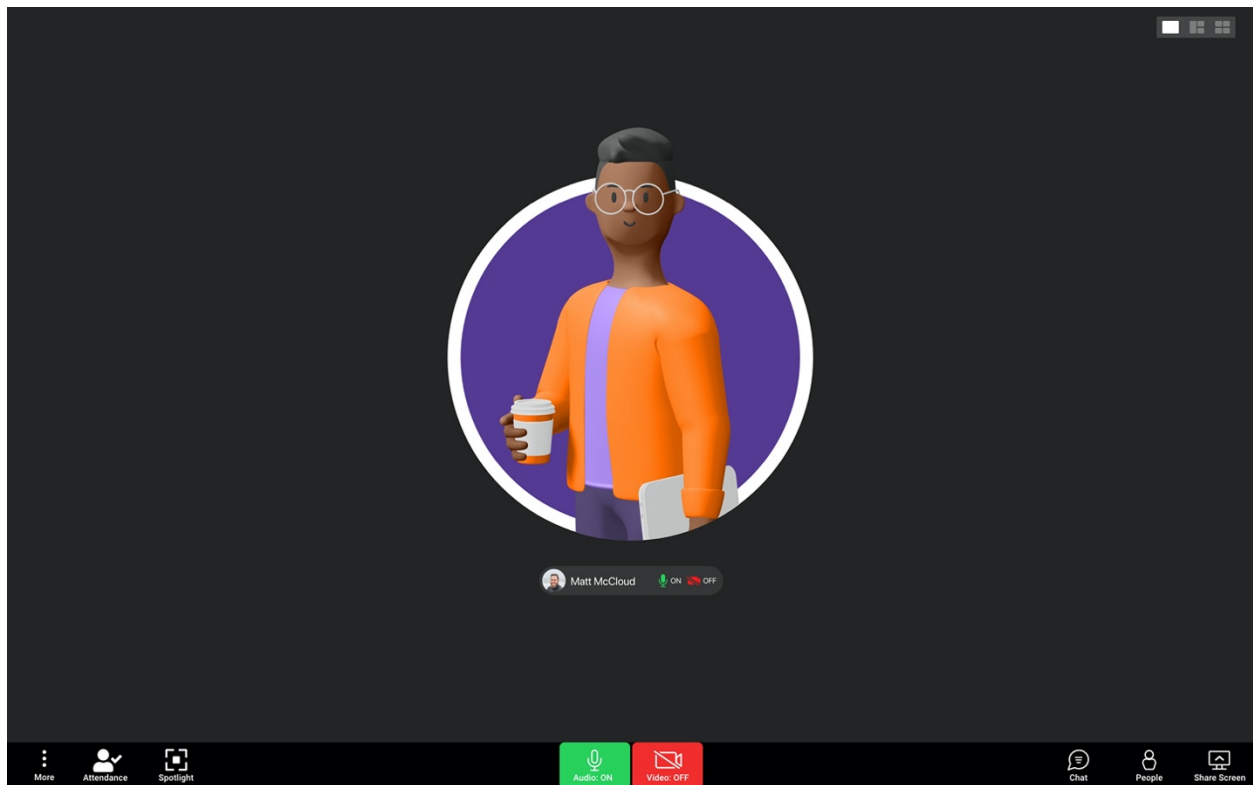
### **Redesigned Primary Dock:**

The recommended user interface has the potential to improve the primary dock's existing designs in video conferencing platforms like Cisco WebEx, Google Meet, Microsoft Teams, and Zoom. This user interface design attempts to address the participating students' video conferencing preferences and concerns by suggesting design changes and modifications.

### **Easy access to most-used features**

With the survey responses highlighting the Microphone and Video as the two most used features in a video conferencing session, these two features have been housed at the center of the primary dock in the redesigned user interface. This ensures that the Microphone and Video features are centered on the primary dock's horizontal plane, always helping individuals clearly understand the ON/OFF state of these two features. The third, fourth and fifth most student-used features Chat, Screenshare, and Participants, respectively, are placed on the right edge of the primary dock, away from the Microphone and Video features. The left of the primary dock has an "Extra" pop-up menu which houses all features of a general video conferencing platform that

students reported not using much in their daily academic sessions. It also houses the “Attendance” and “Spotlight” features, which we will discuss further in this section.



**Figure 30:** The primary dock houses the Microphone, Video, Chat, Participants, Share Screen, Attendance, Spotlight and additional feature buttons.

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### Easy recognizability of the Button ON/OFF State

The ON/OFF state of the Microphone and Video buttons have two distinct visual cues to it that makes the button state easily distinguishable between being ON or OFF:

- i. When in ON state, the color of these buttons is Green, and the icons of the buttons are regular icons.
- ii. When in OFF state, these buttons are Red, in color and the icons have a line crossing it off

This ensures that students with difficulty recognizing/differentiating between colors can still distinguish between an ON and OFF state of a particular feature.



**Figure 31:** Primary dock with Microphone and Video (most-used features) button centered in the user interface.

Unlike the Microphone and the Video button, which are either Green or Red in color at any given point of time, other features housed in the primary dock such as Chat, Participants, and Screen Share are designed as regular transparent buttons with white icons and without any default solid background color. These buttons, however, change to a grey shade on hover, and when selected, turn into a grey button with a green highlighted icon



**Figure 32:** Primary dock with Microphone: ON, Video: OFF.



**Figure 33:** Primary dock with Microphone: ON, Video: OFF, Chat: ON



**Figure 34:** Primary dock with Microphone: ON, Video: OFF, Participants: ON



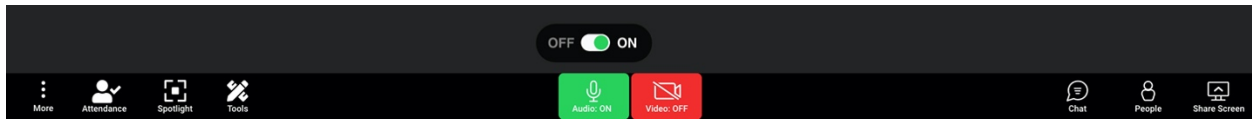
**Figure 35:** Primary dock with Microphone: ON, Video: OFF, Screen Share: ON

### **Preventing accidental Microphone and/or Video ON/OFF**

With 58.15% and 35.35% of the survey participants agreeing to have mistakenly switched ON/OFF their microphone and video unknowingly at least once during a video conferencing session, the button design for these two features was one of the primary focus for this creative component. Multiple iterations of the button design were tried and tested internally to find a solution and prevent accidental clicks. Three crucial points that were taken into consideration for designing these buttons included:

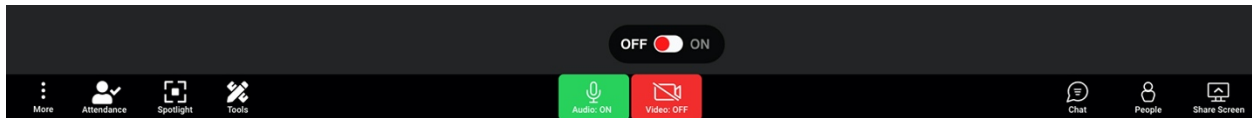
- Retaining the Microphone and Video button's simple design and ensuring no directly visible visual changes were made to them that would make the buttons stand out beyond the original intention of having their ON/OFF states be easily comprehensible.
- Ensuring the implemented design change was not intrusive to the video conferencing experience.
- The least number of steps were added to an already existing one-click ON/OFF process when trying to prevent a an accidental click.

The new recommended design for the Microphone and Video button for the new user interface makes use of a simple pop-up toggle, which requires an additional user-click to change the state of the Microphone and Video button between the ON and OFF states. On clicking the buttons for these two features in the primary dock, the user is given a localized pop-up toggle button (appearing just above the button they have initially clicked on), asking them to confirm their action of changing the state of the feature (microphone or video) they are interacting with. This simple intervention can ensure a further reduction in accidental clicks by students that result in their microphone and video being turned ON/OFF without their knowledge.



**Figure 36:** In this example, when the user clicks on the Microphone button, a pop-up toggle appears above it, asking the user to confirm the action of “switching off Microphone” by toggling from ON state to OFF state.

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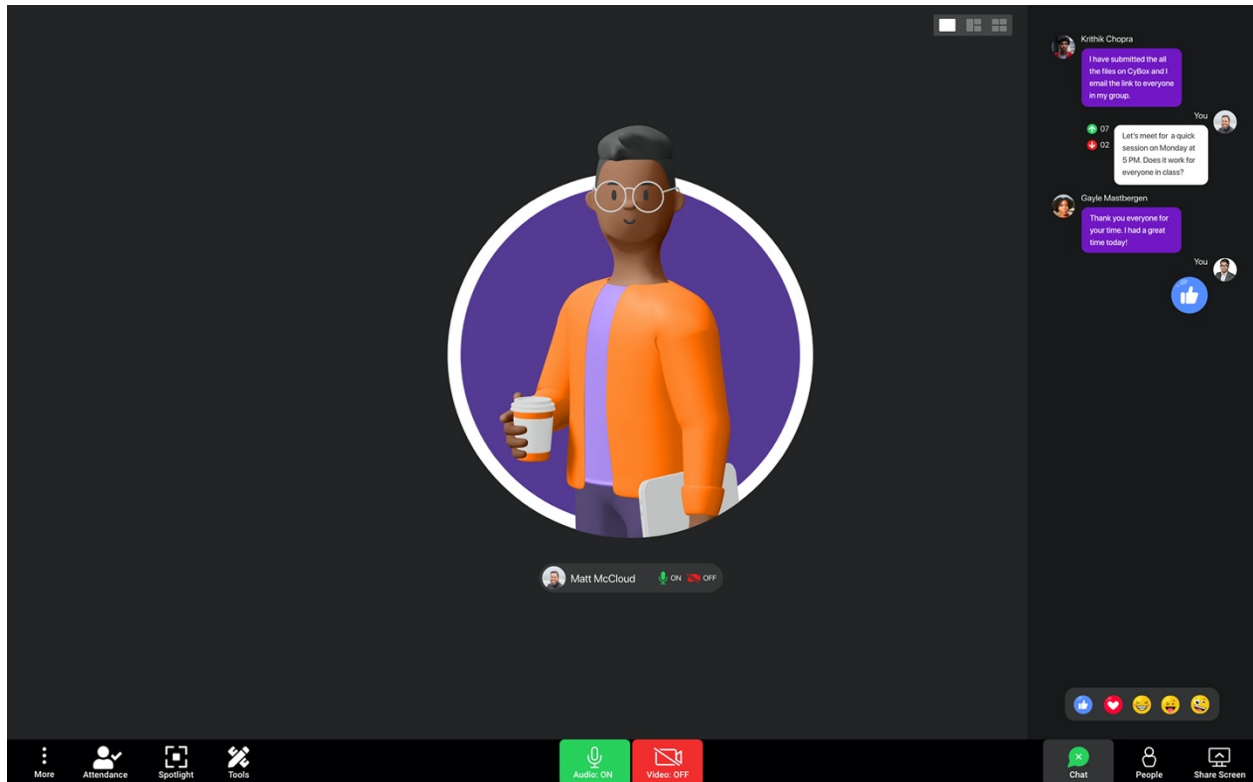
**Figure 37:** In this example, when the user clicks on the Video button, a pop-up toggle appears above it, asking the user to confirm the action of “switching on Video” by toggling from OFF to ON state.

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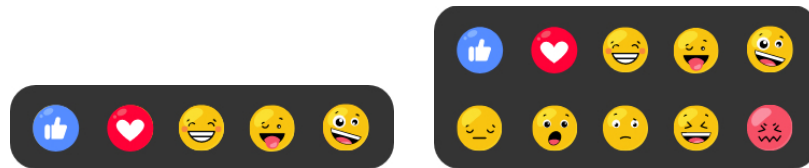
### Redesigned Chat Panel

The redesigned chat window features the use of chat bubbles, as seen in modern text messaging services. The messages sent by the user are shown as a grey chat bubble, while the incoming messages from the rest of the participants are purple in color. The user's messages are also right-aligned in the chat windowpane compared to the left-aligned incoming messages from the other participants, further adding a visual hierarchy between sent and received chat messages. Lastly, the users' names in the chat window are accompanied by the sender's profile picture instead of just the prior, letting users associate messages to specific senders more efficiently and effectively in cases where two or more users share the same name.

The chat window also houses “reaction” emoticons that students can use to respond visually to other users during a video conferencing session. Users can either choose to use the most used reactions or hover on the “reaction” pane to show additional reactions.



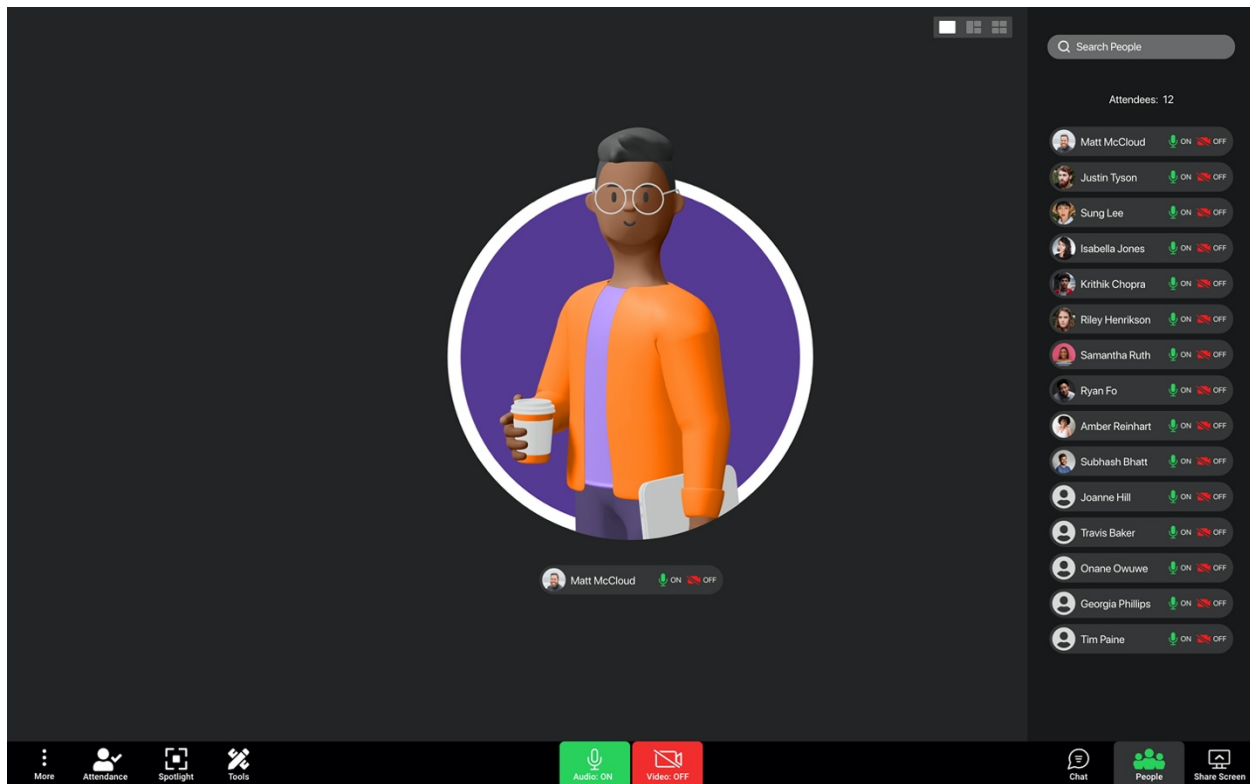
**Figure 38:** The redesigned chat for the new user interface incorporates the use of user profile pictures, chat bubbles and message alignment.



**Figure 39:** Hovering over “Reactions” in the Chat panel expands it to show additional Reaction emoticons.

### Redesigned Participants Panel

The “Participants” panel lists the participants of the video conferencing session. The participants panel has been designed to ensure that the participant's microphone and video status is always visible.



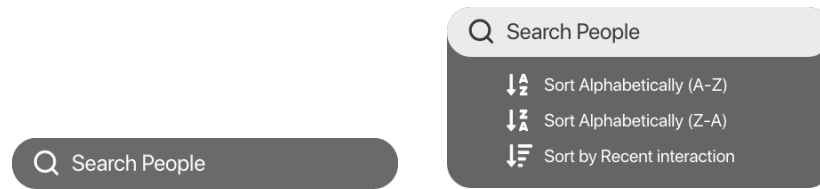
**Figure 40:** Redesigned Participants panel showing participants and their microphone and video status.

The survey found 90.06% of student participants interested in emailing a participant directly from within the video conference session instead of using a separate email client. The redesigned Participants panel lets students hover on a fellow participant's name to gain access to additional communication features other than exchanging audio and video. Hovering over a participant enables the user to send a direct private chat message to the participant and/or send an email directly from within the session.



**Figure 41:** Hovering over a participant in the Participants panel gives access to private chat and email.

The participant panel also houses a Search bar. Individuals can use this search bar to search for a particular participant to interact with when the video session has hundreds of students (for example, in the case of a seminar/webinar). When clicked, the search bar expands to give users filtering options, allowing them to sort participants alphabetically in ascending and descending order or based on the recent interaction.



**Figure 42:** Clicking on the “Search” bar in the Participants panel lets user search for a specific participant or sort the list of participants alphabetically (A to Z or Z to A) or by recent interaction.

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## Screen Share

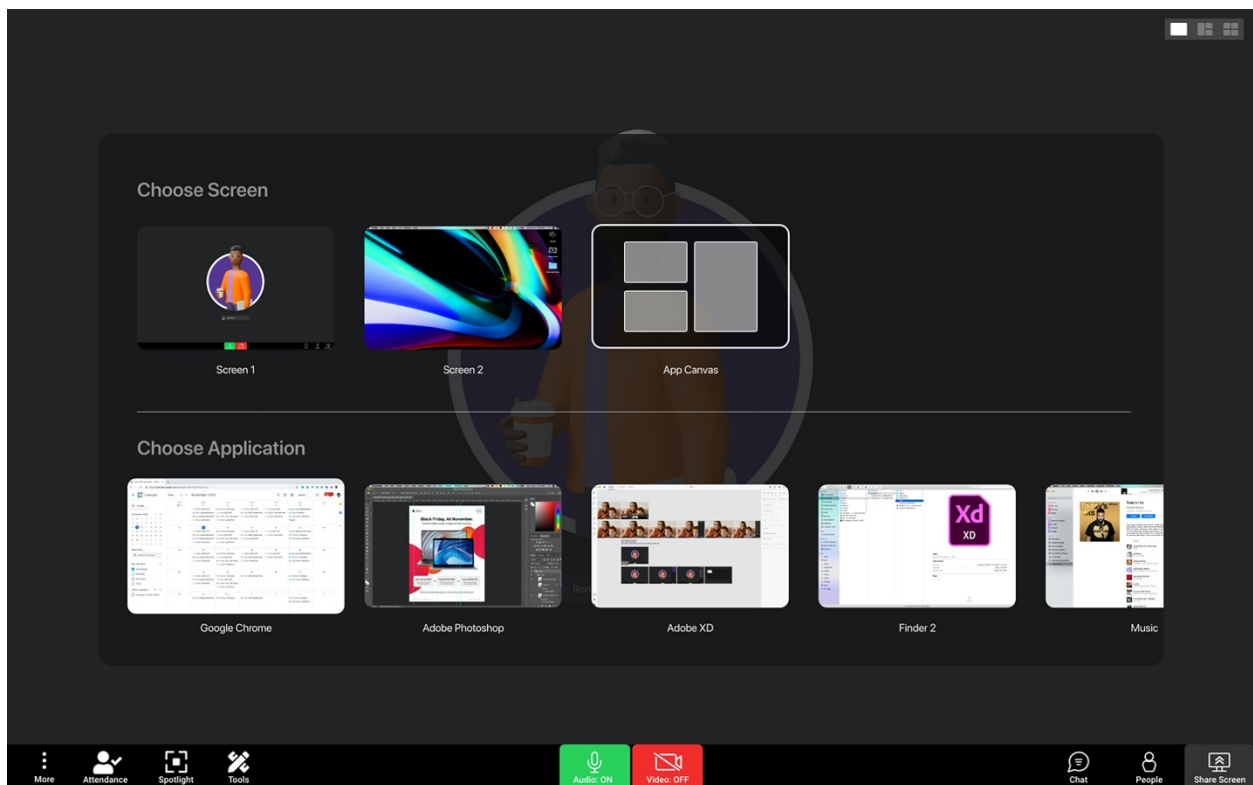
As discussed in the software review section, the current implementation of screen sharing across all video conferencing platforms requires a user (who is sharing a single application/window) to stop sharing the screen before sharing another application/window with fellow participants.

This study recommends an implementation that lets users switch between different windows/applications without ending the current screen sharing session. To initiate it, the user can:

- Step 1: Click on the Screen Share button on the right end of the primary dock.
- Step 2: From the screen share window, select a window/application of their choice.



- Step3: With screen sharing on, simply swipe left on a trackpad (when using a laptop) or click on the arrow button on the top right of the window to bring up the list of available screens.
- Step 4: Click on the window/application of choice to bring it into the primary window as a picture-in-picture (mini-screen) window.
- Step 5: Click on the mini-screen window to swap with the existing screen.
- Step 6: Repeat process to add and swap other available screens in the side bar to the primary screen



**Figure 43:** Click on the Screen Share button on the right end of the primary dock.

Iowa State University - Calend x +

https://calendar.google.com/calendar/u/0/r/month?tab=mc1

Calendar

Today < > November 2020

Create

November 2020

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5
6	7	8	9	10	11	12

Meet with...

Search for people

My calendars

- ☒ Ronit Nayak
- ☐ Birthdays
- ☐ Reminders
- ☐ Tasks

Other calendars

- ☐ Holidays in United States

SUN	MON	TUE	WED	THU	FRI	SAT
Nov 1	2	3	4	5	6	7
	7:45am ArtGr 273 12pm Julia/Bella/Ronit 1pm Stephen/Ronit Pre- 2:15pm ArtGr 620	10:30am UI Review 11am Ind D 387 2:10pm ALC Lab Group 6:10pm ArtId 551A	7:45am ArtGr 273 11am SDAT Update We 2:15pm ArtGr 620	11am Ind D 387 2:25pm Test Test 6:10pm ArtId 551A	9am Gr St 588 Bi-Weekl 11am UI Review 12pm Prof. Call/Ronit - 3 more	
8	9	10	11	12	13	14
	7:45am ArtGr 273 12pm Julia/Bella/Ronit 1pm Stephen/Ronit Pre- 2:15pm ArtGr 620	10:30am UI Review 11am Ind D 387 2:10pm ALC Lab Group 6:10pm ArtId 551A	7:45am ArtGr 273 11am SDAT Update We 2:15pm ArtGr 620	11am Ind D 387 6:10pm ArtId 551A	9am Optional 588: Proj 10:30am UI Review 12pm Prof. Call/Ronit -	
15	16	17	18	19	20	21
	7:45am ArtGr 273 1pm Stephen/Ronit Pre- 2:15pm ArtGr 620	10:30am UI Review 11am Ind D 387 2:10pm ALC Lab Group 6:10pm ArtId 551A	7:45am ArtGr 273 11am SDAT Update We 2:15pm ArtGr 620	11am Ind D 387 6:10pm ArtId 551A	9am Gr St 588 Bi-Weekl 10:30am UI Review 12pm Prof. Call/Ronit -	
22	23	24	25	26	27	28
	7:45am ArtGr 273 1pm Stephen/Ronit Pre- 2:15pm ArtGr 620	10:30am UI Review 11am Ind D 387 2:10pm ALC Lab Group 6:10pm ArtId 551A	11am SDAT Update We		10:30am UI Review 12pm Prof. Call/Ronit -	
29	30	Dec 1	2	3	4	5
	1pm Stephen/Ronit Pre-	10:30am UI Review	11am SDAT Update We		10:30am UI Review 12pm Prof. Call/Ronit -	

More Attendance Spotlight Tools

Audio: ON Video: OFF

Chat People Stop Share

**Figure 44:** From the list of available windows/applications in the screen share window, select a window/application of your choice to

The screenshot displays a Google Calendar interface for November 2020. The calendar is overlaid on a background of various application windows, including Adobe Photoshop, Adobe XD, and Finder. The calendar shows events for each day, with a sidebar on the right containing navigation and sharing options.

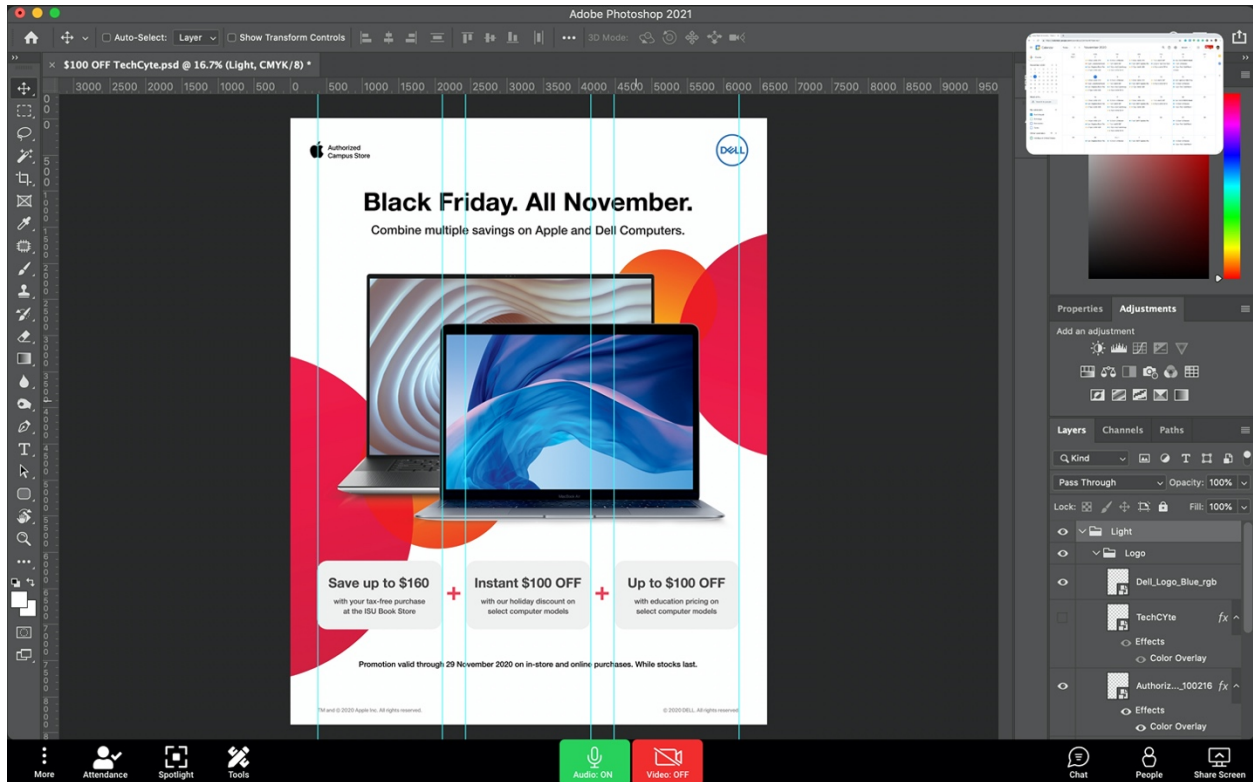
SUN	MON	TUE	WED	THU	FRI	SAT
Nov 1	2	3	4	5	6	7
	<ul style="list-style-type: none"> <li>7:45am ArtGr 273</li> <li>12pm Julia/Bella/Ronit</li> <li>1pm Stephen/Ronit Pre</li> <li>2:15pm ArtGr 620</li> </ul>	<ul style="list-style-type: none"> <li>10:30am UI Review</li> <li>11am Ind D 387</li> <li>2:10pm ALC Lab Group</li> <li>6:10pm ArtId 551A</li> </ul>	<ul style="list-style-type: none"> <li>7:45am ArtGr 273</li> <li>11am SDAT Update Wei</li> <li>2:15pm ArtGr 620</li> </ul>	<ul style="list-style-type: none"> <li>11am Ind D 387</li> <li>2:25pm Test Test</li> <li>6:10pm ArtId 551A</li> </ul>	<ul style="list-style-type: none"> <li>9am Gr St 588 Bi-Weekl</li> <li>11am UI Review</li> <li>12pm Prof. Call/Ronit -</li> <li>3 more</li> </ul>	
8	9	10	11	12	13	14
	<ul style="list-style-type: none"> <li>7:45am ArtGr 273</li> <li>12pm Julia/Bella/Ronit</li> <li>1pm Stephen/Ronit Pre</li> <li>2:15pm ArtGr 620</li> </ul>	<ul style="list-style-type: none"> <li>10:30am UI Review</li> <li>11am Ind D 387</li> <li>2:10pm ALC Lab Group</li> <li>6:10pm ArtId 551A</li> </ul>	<ul style="list-style-type: none"> <li>7:45am ArtGr 273</li> <li>11am SDAT Update Wei</li> <li>2:15pm ArtGr 620</li> </ul>	<ul style="list-style-type: none"> <li>11am Ind D 387</li> <li>6:10pm ArtId 551A</li> </ul>	<ul style="list-style-type: none"> <li>9am Optional 588: Projk</li> <li>10:30am UI Review</li> <li>12pm Prof. Call/Ronit -</li> </ul>	
15	16	17	18	19	20	21
	<ul style="list-style-type: none"> <li>7:45am ArtGr 273</li> <li>1pm Stephen/Ronit Pre</li> <li>2:15pm ArtGr 620</li> </ul>	<ul style="list-style-type: none"> <li>10:30am UI Review</li> <li>11am Ind D 387</li> <li>2:10pm ALC Lab Group</li> <li>6:10pm ArtId 551A</li> </ul>	<ul style="list-style-type: none"> <li>7:45am ArtGr 273</li> <li>11am SDAT Update Wei</li> <li>2:15pm ArtGr 620</li> </ul>	<ul style="list-style-type: none"> <li>11am Ind D 387</li> <li>6:10pm ArtId 551A</li> </ul>	<ul style="list-style-type: none"> <li>9am Gr St 588 Bi-Weekl</li> <li>10:30am UI Review</li> <li>12pm Prof. Call/Ronit -</li> </ul>	
22	23	24	25	26	27	28
	<ul style="list-style-type: none"> <li>7:45am ArtGr 273</li> <li>1pm Stephen/Ronit Pre</li> <li>2:15pm ArtGr 620</li> </ul>	<ul style="list-style-type: none"> <li>10:30am UI Review</li> <li>11am Ind D 387</li> <li>2:10pm ALC Lab Group</li> <li>6:10pm ArtId 551A</li> </ul>	<ul style="list-style-type: none"> <li>11am SDAT Update Wei</li> </ul>		<ul style="list-style-type: none"> <li>10:30am UI Review</li> <li>12pm Prof. Call/Ronit -</li> </ul>	
29	30	Dec 1	2	3	4	5
	<ul style="list-style-type: none"> <li>1pm Stephen/Ronit Pre</li> </ul>	<ul style="list-style-type: none"> <li>10:30am UI Review</li> </ul>	<ul style="list-style-type: none"> <li>11am SDAT Update Wei</li> </ul>		<ul style="list-style-type: none"> <li>10:30am UI Review</li> <li>12pm Prof. Call/Ronit -</li> </ul>	

The sidebar on the right includes navigation buttons (Today, Previous, Next, Month), a search bar, and a list of available screens (More, Attendance, Spotlight, Tools). At the bottom, there are buttons for Audio ON, Video OFF, Chat, People, and Stop Share.

**Figure 45:** With screen sharing on, simply swipe left on a trackpad or click on the arrow button on the top right of the window to bring up the list of available screens.

The screenshot shows the Google Calendar interface on a desktop. A mini-screen is overlaid on the top-right corner of the calendar grid, displaying a video call interface with a "Stop Share" button. The calendar shows the month of November 2020, with events listed for each day. The interface includes a sidebar with navigation options like "Calendar", "Today", and "Create", and a bottom bar with icons for "More", "Attendance", "Spotlight", "Tools", "Video OFF", "Audio ON", "Chat", and "People".

**Figure 46:** Click on the new window to bring it into the primary screen a mini-screen on the top-right corner.



**Figure 47:** When the mini window is clicked, the original screen gets swapped with the mini-screen.

The new redesign screen share works like a basic screen share feature but allows students to swap screens instead of having to stop screen sharing and re-share a new application/window all over again.

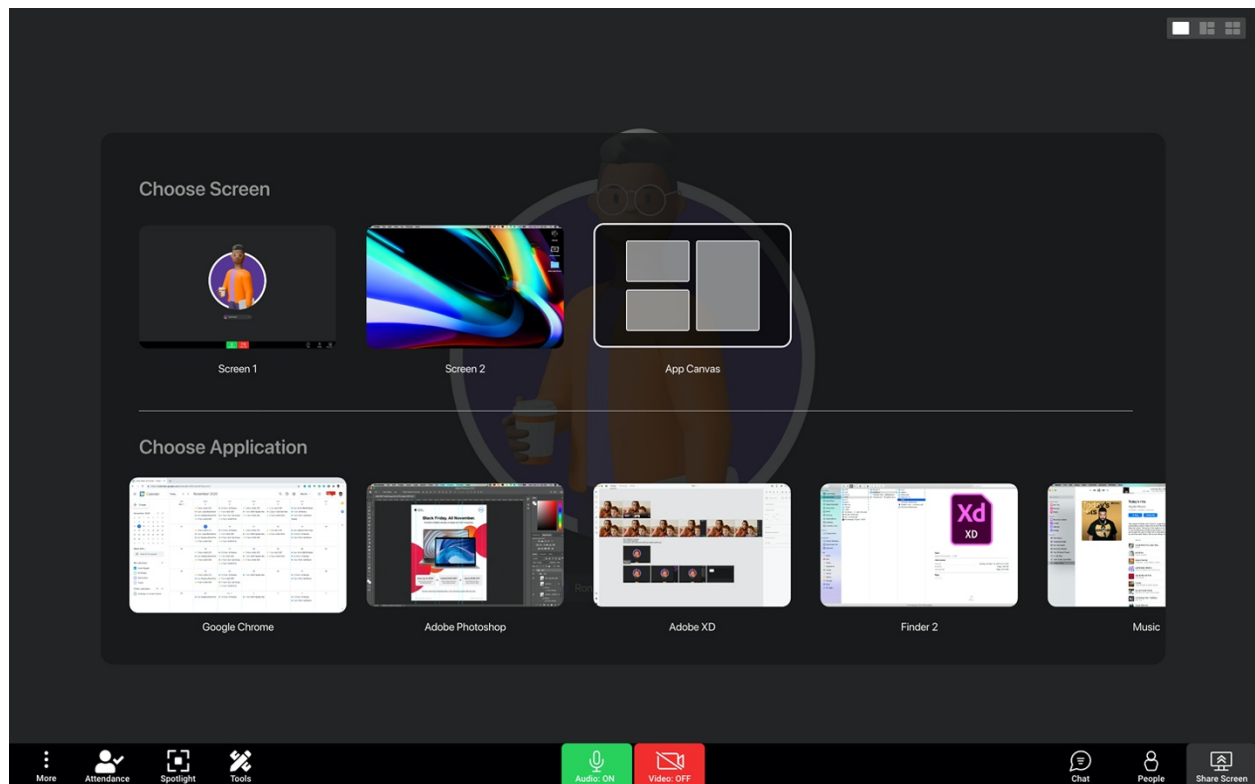
### Application Canvas

The survey shows that 96.47% of the student participants agree that they would like to have the ability to share multiple applications/windows with fellow participants without having to share their entire computer screen or desktop. The Application Canvas feature helps students achieve that when using this suggested user interface.

The participants can use the Application Canvas by following the steps:

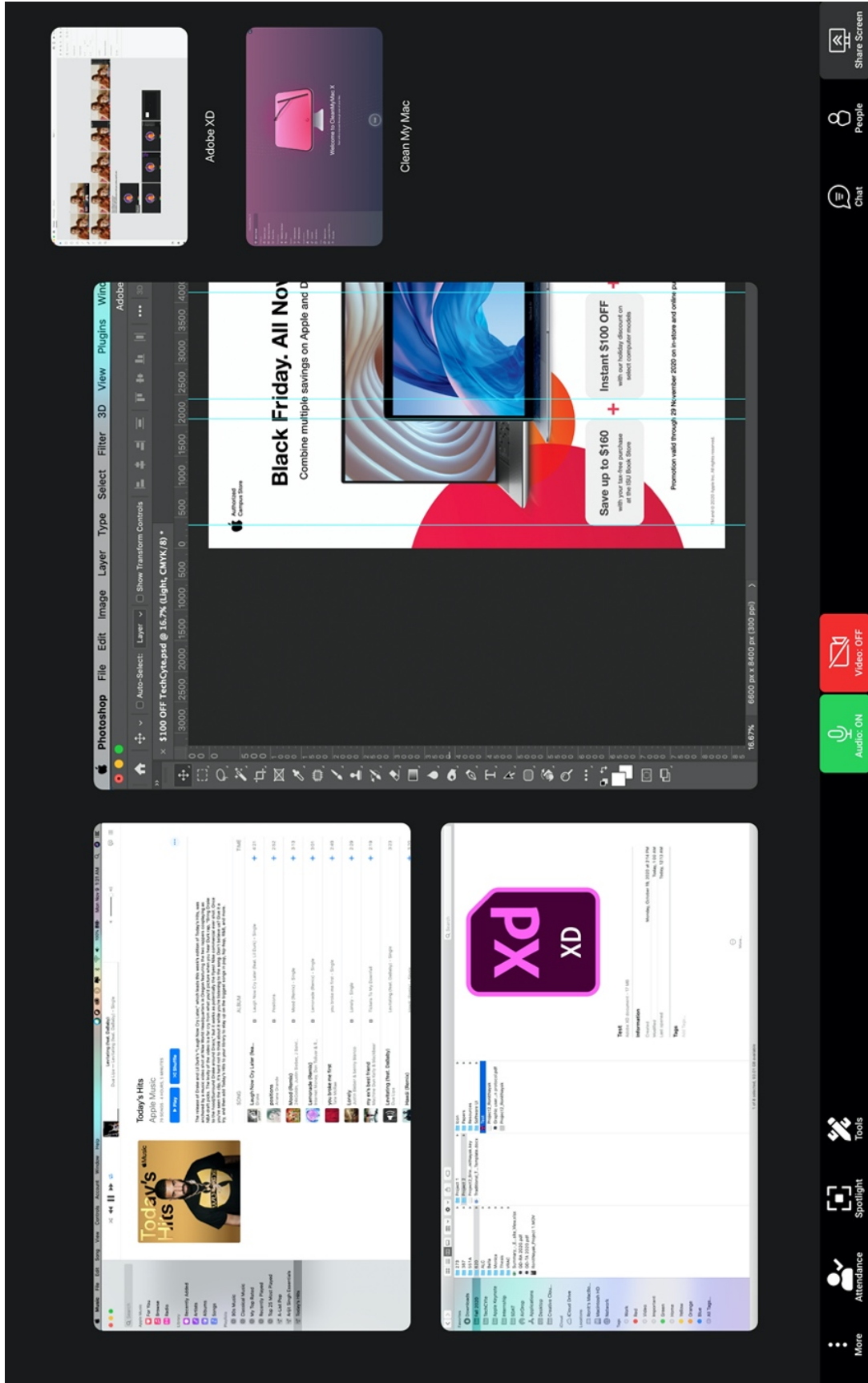
- Step 1: Click on the Screen Share button on the right end of the primary dock.

- Step 2: From the screen share window, select “App Canvas.”
- Step3: On the App Canvas screen, use the available windows/applications from the side panel to select all the windows/application you want to share.
- Step 4: Drag and move the windows to position them within the grid structure as needed. Resize windows as needed to fit the need best.
- Step 5: Repeat process to add and swap other available screens in the side bar to the primary screen

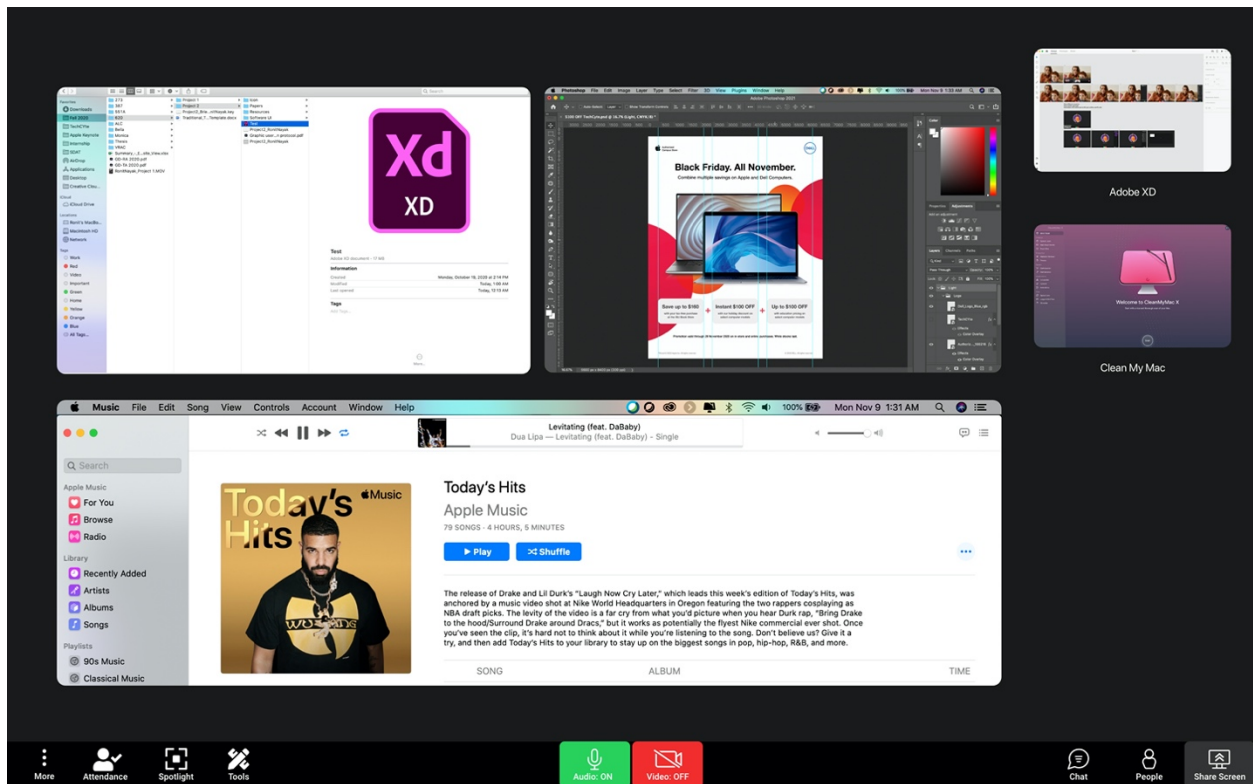


**Figure 48:** Click on the Screen Share button on the right end of the primary dock.





**Figure 49:** On the App Canvas screen, use the available windows/applications from the side panel to select all the windows/application you want to share.




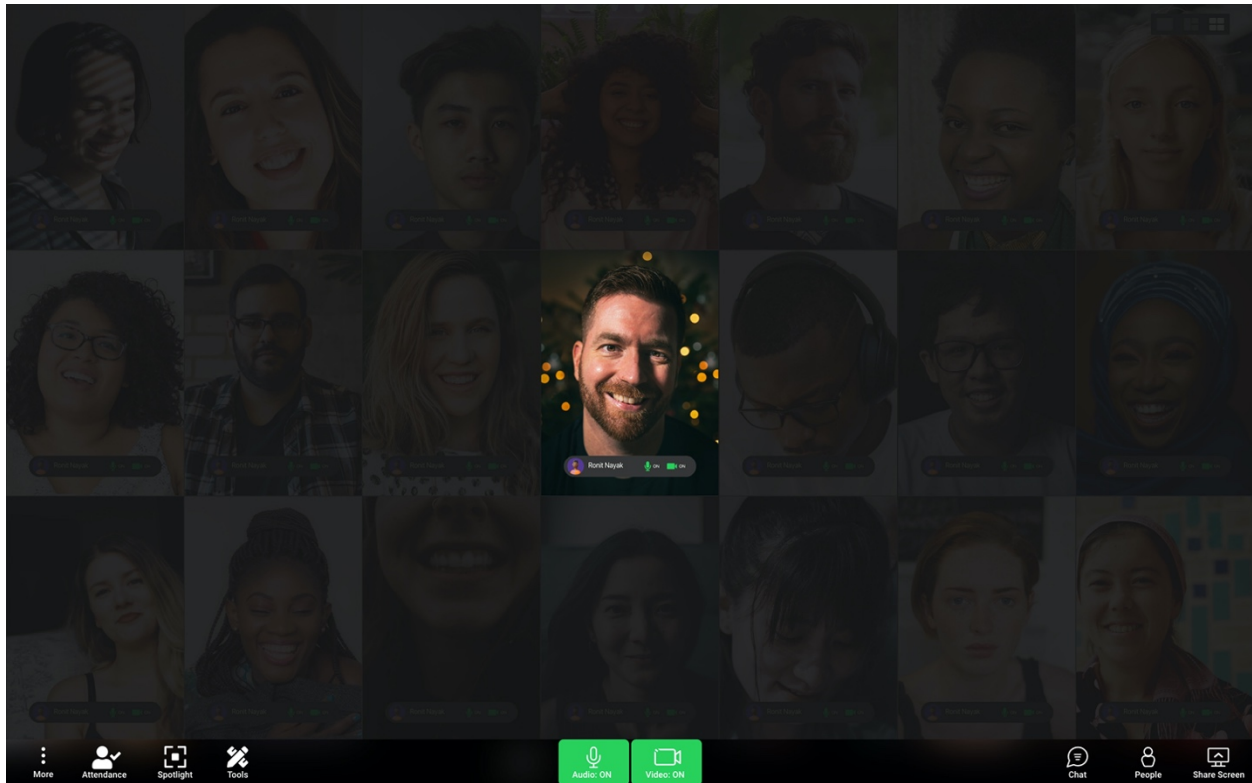
**Figure 50:** Drag and move the windows to position them within the grid structure as need. Resize windows as needed to fit the need best.

### Instructor/Speaker Spotlight

In the student survey, 93.61% of the student participants expressed their interest in using this feature to focus on the video feed of the speaker/instructor in a large video gallery format. When multiple video feeds from multiple participants are available on the screen simultaneously, this feature can help students focus on the speaker/instructor by dimming the brightness of all the participant video feeds and highlighting only the speaker/instructor's video feed. This can help students focus on the speaker/instructor and lessen their possibility of being distracted by the accompanying video feeds. This feature can also aid in reducing the fatigue caused by constantly




watching multiple video feeds simultaneously during a video conferencing session. The “Spotlight”  button on the left of the primary dock can be used to activate/deactivate this feature from within a video conference session. Once selected, only the speaker/instructor’s video tile will be highlighted while all the other video feeds are dimmed.



**Figure 51:** Drag and move the windows to position them within the grid structure as need. Resize windows as needed to fit the need best.

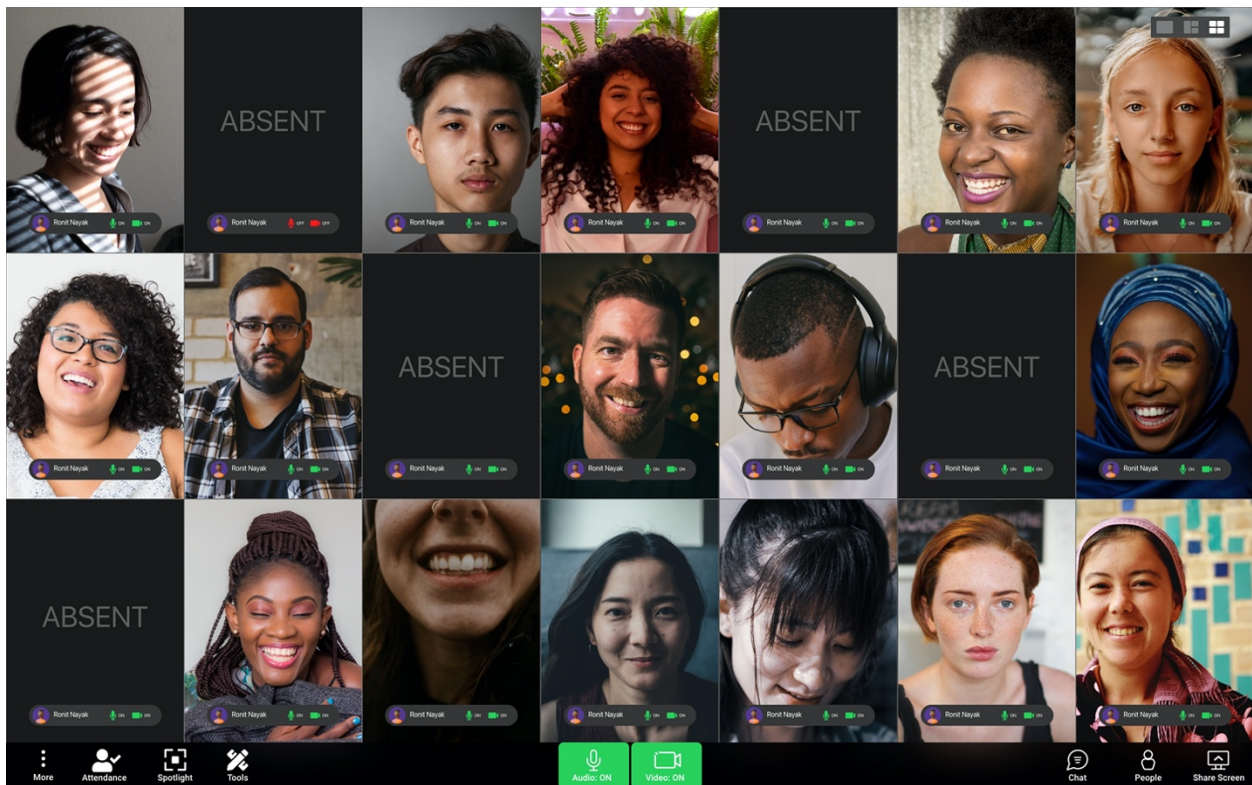
### Attendance/Roll Call

When asked in the survey about a feature that would facilitate fixed seating for participants (i.e., fixed positioning of individual video tiles on the screen arranged in alphabetical order) and the ability to register attendance, 75.96% of the participants collectively approved of this potential feature. The new user interface implements this feature using the “Attendance”

feature. The “Attendance” button  is on the left side of the primary dock. Clicking on this button will let the user either:

- Take attendance and lock the room
- Take attendance and keep the room open

The user (in this case, a host/co-host – a student teaching assistant) can choose either one of the following options and proceed to receive an email with the attendance sheet attached in the email as a .pdf document. In this arrangement, all the student’s video tiles will be fixed on the screen, leaving a blank “ABSENT” tile for the absent participants for the remainder of the session.



**Figure 52:** The Attendance button when used takes attendance for all the available students and emails the information as a .pdf file to the host/co-host. It also helps the host/co-host fix positions of the student video tile on the screen in alphabetical order, placing ABSENT tiles for unavailable students.

## Tools

The “Tools” button on the left of the primary dock houses the different in-session tools students can use during a virtual class to take notes, use the whiteboard, or make use of close-captioning.



**Figure 53:** The “Tools” button on the left of the primary dock houses the different in-session tools like Notes, Whiteboard, and Captions.

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These tools are neatly grouped and hidden as “Tools,” ensuring the primary dock is clutter-free and is visually non-chaotic in design. The features in this section are as follows:

### Notes

The “Notes” feature lets students take text notes within the video conference session. The note contents can then be either shared to the local drive as a text file or be shared with all the other participants via file attachment or email. This will help students take notes during their virtual classes and enable students to maintain minutes of the different meetings they attend as a student, student lead, teaching assistant, or research assistant.

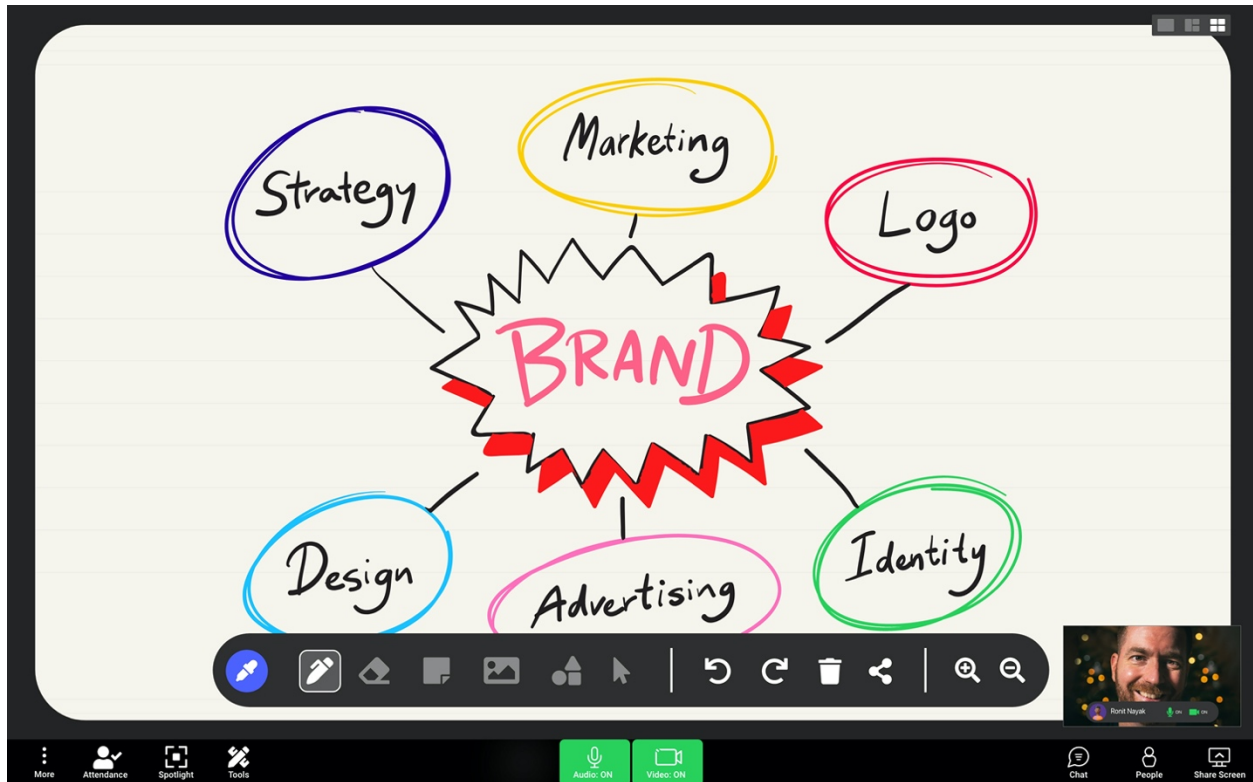
### Whiteboard

The whiteboard is a suggested feature that enables participants of a video conference session to write, scribble and draw basic shapes on, using a provided toolbar with different input options. The host/co-host can open the whiteboard to the rest of the class for simultaneous use or

choose to make it available only to the host/co-host—a situation ideal for instructors and student assistants to share additional information with the class without worrying about screen sharing or using the chat section of the application.

The whiteboard feature also lets the host/co-host have the information available throughout the session as other participants come and go, ensuring that every participant has access to the same information irrespective of their time or entry to the room. As discussed earlier, when comparing the Chat sessions of Cisco WebEx and Zoom, the participants joining a session after a piece of certain information has been shared in the Chat section do not have access to it. Finally, the whiteboard can be exported to a .pdf file for sharing with the class in a formal email later if needed.

To access the Whiteboard feature, a user has to first click on the “Tools” button available in the right half of the primary dock. This will provide the user with a tool menu. This tool menu has the “Whiteboard” button, which the user can click to access the Whiteboard feature. Once clicked, it provides the host and other participants with a swappable screen (much like the earlier discussed screen share feature) available on the page's lower right corner. Initially, the host's video will be made available as the primary swappable screen, but it can then be changed based on the active speaker in the session. This feature thus gives all the participants the independent ability to swap between the view of the instructor's video panel and the whiteboard if needed, based on the information being shared. The host/co-host can also access the additional pop-up menu whiteboard menu options to decide if other participants can save the whiteboard as a local file while the program is in progress.



**Figure 54:** The Whiteboard feature can be accessed using the Whiteboard button on the left of the primary dock within the “Tools” button. Once clicked on, it provides the host and other participants with a swappable screen (much like the earlier discussed screen share feature) available on the page's lower right corner.

## Captions

Captions enable students to see real-time captions for the active speaker in the session. The Captions feature can be enabled from the Tools section, and once activated, it will convert the primary active audible voice to closed captions for the students to see. The captions can also be downloaded at the end of the session as a text file, with the instructor/students can add/remove time-stamps from the captions file.

## One-tap Microphone/Video OFF switch

The majority of the student participants voted the Microphone and Video as the two most-used educational video conferencing features. When coupled with their privacy concerns, it

becomes essential for the study to implement a functionality that enables students to mute their microphones and cut their video at the click of a single button or via the use of a single-key keyboard shortcut. This feature can be used by simply tapping on the “X” key on the keyboard once. Pressing the “X” key during a video call session can directly mute the participant and switch off the video feed. It’s also worth considering that since the majority of the video conferencing sessions are being hosted by teachers, where students are expected to talk and share-screen for a comparatively smaller amount of time (with regular switching ON and OFF of microphone and video feed if and when needed), such a feature will allow students to ensure quick and easy hand-off to other students/instructor once the student has finished talking/sharing their work with the rest of the class.

## CHAPTER 9. CONCLUSION

Video conferencing platforms have played a significant role in the way educators have managed academic expectations in the months leading after the pandemic, bringing an alternative to in-person classes and opening up the option of video conferencing to millions of students around the world. While we have a long way to go in making the use of video conferencing in education equitable (given that a large population of students still do not have access to internet connectivity and/or affordable internet), this does open the doors to providing an alternate method of imparting education to non-distance learning students in comparison to in-person classes. The COVID-19 pandemic and the accompanying social distancing health guidelines, along with the temporary shutdown of schools and educational institutions, has catapulted the use of technology in everyday coursework, acting as a catalyst in providing teachers and students with alternatives when considering the mode of delivering information. As the world recovers and moves towards resuming in-person classes in the coming months, video conferencing will remain a viable option for schools and universities that plan a staggered-opening approach with some classes being taught in-person and some being conducted online.

While video conferencing has been a much-needed go-to for institutions and instructors worldwide, this study shows that a lot more can be done to make these video conferencing platforms more student-friendly. Students have special needs when it comes to using such platforms for their everyday coursework as compared to professional businesses using them for industrial purposes. While a one-solution-fits-all approach does not work here, the study highlights different ways in which such a platform can be made more academia-ready, while also adding features that will help the . Like most of the initially developed video conferencing features were designed to replace face-to-face client/group meetings for businesses and

companies worldwide, students and institutions also require different feature sets to help mimic certain in-person class activities completely replace them. As brought to light in this study, an academic-focused video conferencing platform will have to cater to the student's needs and understand how specific experiences possible only during in-person classes can be made available digitally and virtually. The user interface design for such platforms also plays an essential role in how successful such platforms can be in education. From the way the icons are designed, to the way they are positioned within the user interface, every design decision has to be made considering students and their immediate academic needs. Such platforms also have to work actively towards addressing student privacy and stay a step ahead in understanding the possible concerns that students may have when using certain features (like screen-sharing, chat, etc.), and address them in the best way possible while balancing the needs of the teacher and the students alike.

While video conferencing can now be formally considered as a second alternative to in-person education and a parallel mode of education. It is only when such platforms are actively designed towards working more like real classrooms (having a fixed seating arrangement, taking attendance, highlighting the instructor, etc.), and provide technological solutions to digitally reinvent time-tested teaching methods (using a whiteboard, in-class polling on ideas, etc.), that video conferencing will become a powerful tool in the hands of educators around the world and be enjoyable to the students being taught by them.



## **CHAPTER 10. FUTURE WORK**

This study has attempted to understand students' valuable perspective and their video conferencing needs arising from its use in their everyday coursework. This study and creative component provide the basis for future research in this area. This will include but may not be limited to:

### **Expanding the survey to include students in classes K through 12**

With state and federal government public safety regulations resulting in the closure of elementary, middle, and high schools between March 2020 to March 2021, the use of video conferencing platforms enabled these institutions to impart education to students even with their physical premises closed. As projected for the Fall 2020 session, elementary, middle, and high schools in the United States account for the enrollment of 56.4 million students across the country, i.e., 50.7 million students in public schools and 5.7 million students in private schools (National Center for Education Statistics, 2021). This makes it essential to understand how the present video conferencing offerings fare in such environments. This will ensure that students' perspectives from these three academic categories are surveyed and understood to tabulate their different virtual needs and demands.

### **Expanding the survey to include teachers and educators**

Along with students, teachers and educators form a vital part of the academic equation. As per 2017-2018 reports, the United States has around 3.5 million full and part-time public-school teachers (National Center for Education Statistics, 2021), and 378,865 full-time faculty members in universities across the country (AAUP, 2018). Given that most video conferencing sessions are hosted and conducted by teachers in a virtual class setting, understanding and tabulating their

virtual/video conferencing needs becomes critical in the development of a platform that is not only student-friendly but also academic-friendly.

### **Expanding the survey to include graduate teaching assistants**

As of May 2018, universities across the United States employed 131,490 graduate teaching assistants in their programs (U.S. Bureau of Labor Statistics, 2021). Given that graduate assistants experience virtual classrooms as both students and assistants/instructors, their inclusion in future studies will help leverage this unique perspective concerning the use of video conferencing platforms in academia.

### **Designing universal icons for academia-focused video conferencing platforms**

Existing video conferencing platforms can strongly benefit from using universally designed icons in its operations and user interface. A focus on designing universal icons for academic video conferencing platforms in the United States, especially the top five most used features like microphone, video, chat, participants, screen sharing, can help standardize the user interface for the different video conferencing platforms being used in schools and universities around the country. This can, in turn, ensure that all video conferencing platforms being used in academia are similar to one another in terms of visual language, making navigating their feature sets easier for students irrespective of which video conferencing platform their instructor/university uses/recommends to use for its classes/coursework.

### **User testing the suggested user interface (creative component) mockup**

Testing the redesigned user interface mockup with the survey participants and/or additional undergraduate and graduate students will help us understand the recommended changes' effectiveness. Given that the suggested user interface incorporates features and feedback from the survey student, it will also enable the latter to try out the features they recommended earlier,

putting them in a position of giving additional feedback and/or suggestions focusing on the implementation of these features in the redesigned user interface.

- **In-person interview/user-testing and /or focus group studies:**

Owing to COVID-centered restrictions on in-person interactions with study participants, future studies in a post-pandemic period can highly benefit from in-person user testing of the redesigned user interface. This can be achieved through one-on-one user testing interviews or by working with focus groups. The ability to gauge user's body language, facial expressions, attention span, etc., can prove critical to designing a successful academia-focused video conferencing platform.

- **Follow-up survey with questions based on new interface redesign.**

Post-user-testing the newly redesigned user interface (which incorporates the student-requested features), future studies can benefit from an additional follow-up survey that collects feedback concerning the new user interface. Participants can be asked additional user-interface based questions, which may include and not be limited to:

- How likely are you (Not at all, Likely, Definitely) to use such a video conferencing platform that has all the features included in this prototype?
- Would you like the “Spotlight” feature to freeze-frame other video participants when focusing on the instructor/speaker (to reduce distraction and internet bandwidth use)?
- On a scale of 1 to 5, with 1 being the lowest and 5 being the highest, how will you rate the “ON/OFF implementation” for Microphone and Video in the new user interface?
- Does this user interface re-design address your privacy concerns?

- On a scale of 1 to 5, with 1 being the lowest and 5 being the highest, how will you rate the “ease of use” of the new user interface.
- On a scale of 1 to 5, with 1 being the lowest and 5 being the highest, how will you rate the “ease of understanding” of the new user interface.
- On a scale of 1 to 5, with 1 being the lowest and 5 being the highest, how will you rate “Application Canvas” feature in the user interface
- On a scale of 1 to 5, with 1 being the lowest and 5 being the highest, how will you rate “Application Canvas” feature in the user interface
- What additional features would you want to see in the “Whiteboard” section of the video conferencing platform?

#### **Evaluate additional video conferencing/discussion platforms**

The evaluation of additional video conferencing platforms like AnyMeeting, BigBlueButton, BlueJeans, ClassDojo, GoTo Meeting, mmhmm, Skype, etc., is needed to expand further the list of possible features that an academic-friendly video conferencing platform might include. And given that these virtual classrooms are trying to mimic and possibly replace in-class discussions within a virtual space, the exploration and evaluation of digital distribution/collaboration platforms like Discord, Reddit, Miro, etc., can also benefit the design of an academic-friendly video conferencing platform.

#### **Possible implementations of this user-interface prototype:**

The implementation of an academia-friendly video conferencing platform can follow multiple strategies, including being developed as:

- A stand-alone video conferencing platform,
- A web-based video conferencing platform, or

- A plugin integration with the existing video conferencing platforms, enabling a regular mode and an academic/class mode.

Future studies can benefit from understanding which of the above implementations would prove most suitable for students and teachers in an academic setting.

## REFERENCES

- AAUP. (2018). *The Annual Report on the Economic Status of the Profession*. The American Association of University Professors. Retrieved from [https://www.aaup.org/sites/default/files/ARES\\_2017-18.pdf](https://www.aaup.org/sites/default/files/ARES_2017-18.pdf)
- Attentiv. (2021, April 21). *America Meets a lot. An analysis of meeting length, frequency and cost*. Retrieved from Attentiv: <http://attentiv.com/america-meets-a-lot/>
- CNN Money. (2016, June 16). *Dell really wants you to work from home ... if you want*. Retrieved from CNN Money: <https://money.cnn.com/2016/06/09/pf/dell-work-from-home/index.html>
- Coventry, L. (1995). Video conferencing in higher education. . *Support Initiative for Multimedia Applications*. .
- Delaney, G., Jacob, S., Iedema, R., Winters, M., & Barton, M. (2004). Comparison of face-to-face and videoconferenced multidisciplinary clinical meetings. *Australasian Radiology*, 487–492.
- Denstadli, J. M. (2004). Impacts of videoconferencing on business travel: The Norwegian experience. *Journal of Air Transport Management*, 371–376.
- Denstadli, J. M., Julsrud, T. E., & Hjørthol, R. J. (2012). Videoconferencing as a Mode of Communication: A Comparative Study of the Use of Videoconferencing and Face-to-Face Meetings. *Journal of Business and Technical Communication*, 65–91.
- Forbes Insights. (2021, April 5). *The Visual Advantage: Harnessing Video-led Unified Communications To Drive a More Agile, Connected And Effective Culture*. Retrieved from Zoom: [https://zoom.us/docs/doc/ForbesInsights\\_Zoom\\_The\\_Visual\\_Advantage.pdf](https://zoom.us/docs/doc/ForbesInsights_Zoom_The_Visual_Advantage.pdf)
- Gartner. (2021, April 6). *Gartner HR Survey Shows 86% of Organizations Are Conducting Virtual Interviews to Hire Candidates During Coronavirus Pandemic*. Retrieved from Gartner: <https://www.gartner.com/en/newsroom/press-releases/2020-04-30-gartner-hr-survey-shows-86--of-organizations-are-cond>
- Gladović, P., & Deretić, N. (2020). Video Conferencing and its Application in Education. *JTTTP - JOURNAL OF TRAFFIC AND TRANSPORT THEORY AND PRACTICE*, 47.
- Global Market Insights: Video Conferencing Market Size By Component*. (2020, April 11). Retrieved from Global Market Insights: <https://www.gminsights.com/industry-analysis/video-conferencing-market>
- Gough, M. (2006). *Video Conferencing Over IP Configure, Secure, and Troubleshoot*. Syngress Publishing, Inc.

- Hackman, M. Z., & Walker, K. B. (1990). Instructional communication in the televised classroom: The effects of system design and instructor immediacy on student learning and satisfaction. *Communication Education*, 196–206.
- Harley, A. (2020, December 19). *Usability Testing of Icons*. Retrieved from NNGroup: <https://www.nngroup.com/articles/icon-testing/>
- Henderson, S., & Yeow, J. (2012). iPad in Education: A Case Study of iPad Adoption and Use in a Primary School. *45th Hawaii International Conference on System Sciences*, (pp. 78-87). Maui.
- Hourcade, P., Beitler, F., Cormenzana, & Flores, P. (2009). Early OLPC Experiences in a Rural Uruguayan School. *Mobile Technology for Children*.
- John Hopkins University. (2021, April 22). *COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU)*. Retrieved from John Hopkins University: <https://coronavirus.jhu.edu/map.html>
- Knipe, D., & Lee, M. (2002). The quality of teaching and learning via videoconferencing. *British Journal of Educational Technology*, 301–311.
- Koceski, S., & Koceska, N. (2013). Challenges of videoconferencing distance education-a student perspective. *International Journal of Information, Business and Management*, 274.
- Leichtenstern, K., André, E., & Vogt, T. (2007). Role assignment via physical mobile interaction techniques in mobile multi-user applications for children. *European Conference on Ambient Intelligence*, 32-33.
- Lu, J. L., & Peeta, S. (2009). Analysis of the factors that influence the relationship between business air travel and videoconferencing. *Transportation Research Part A*, 709–721.
- Motamedi, V. (2001). A critical look at the use of videoconferencing in United States distance education. *Education*, 386–394.
- Nardi, B., & Whittaker, S. (2002). The place of face-to-face communication in distributed work. *In Hinds*, 83–111.
- National Center for Education Statistics. (2021, April 11). Retrieved from NCES: <https://nces.ed.gov/fastfacts/display.asp?id=372#:~:text=What%20are%20the%20demographics%20of,14.0%20million%20Hispanic%20students>
- National Center for Education Statistics. (2021, April 11). Retrieved from NCES: <https://nces.ed.gov/fastfacts/display.asp?id=372#:~:text=What%20are%20the%20demographics%20of,14.0%20million%20Hispanic%20students>
- Nielson, J. (2020, December 19). *Icon Classification: Resemblance, Reference, and Arbitrary Icons*. Retrieved from NNGroup: <https://www.nngroup.com/articles/classifying-icons/>

- Nohria, N., & Eccles, R. G. (1991). Face-to-face: Making network organizations work. *Networks and organizations: Structure, form, and action*, 288–308.
- Parra, O., & Granda Fernanda, M. (2021). Evaluating the Meeting Solutions Used for Virtual Classes in Higher Education during the COVID-19 Pandemic. *SciTePress*.
- Stefanile, A. (2020). The Transition From Classroom to Zoom and How it Has Changed Education. *JOURNAL OF SOCIAL SCIENCE RESEARCH*.
- The Verge. (2020, April 28). *Google's Meet teleconferencing service now adding about 3 million users per day*. Retrieved from The Verge: <https://www.theverge.com/2020/4/28/21240434/google-meet-three-million-users-per-day-pichai-earnings>
- The Verge. (2020, April 29). *Microsoft Teams jumps 70 percent to 75 million daily active users*. Retrieved from The Verge: <https://www.theverge.com/2020/4/29/21241972/microsoft-teams-75-million-daily-active-users-stats>
- The Verge. (2021, April 2). *Zoom admits it doesn't have 300 million users, corrects misleading claims*. Retrieved from The Verge: <https://www.theverge.com/2020/4/30/21242421/zoom-300-million-users-incorrect-meeting-participants-statement>
- U.S. Bureau of Labor Statistics. (2021, April 11). *Occupational Employment and Wages, 25-1191 Graduate Teaching Assistants*. Retrieved from U.S. Bureau of Labor Statistics: <https://www.bls.gov/oes/2018/may/oes251191.htm>
- UNESCO. (2021, April 12). *Education: From disruption to recovery*. Retrieved from UNESCO: <https://en.unesco.org/covid19/educationresponse#schoolclosures>
- United Nations. (2020, August). *Policy Brief: Education during COVID-19 and beyond*. Retrieved from United Nations: [https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/sg\\_policy\\_brief\\_covid-19\\_and\\_education\\_august\\_2020.pdf](https://www.un.org/development/desa/dspd/wp-content/uploads/sites/22/2020/08/sg_policy_brief_covid-19_and_education_august_2020.pdf)
- Wilson, R. (2003). Ebook readers in higher education. *Journal of Educational Technology & Society*, 8-17.
- Wlodarczyk, J. R., Wolfswinkel, E. M., & Carey, J. N. (2020). Coronavirus 2019 Video Conferencing: Preserving Resident Education with Online Meeting Platforms, Plastic and Reconstructive Surgery. *Plast Reconstr Surg*.



## APPENDIX A [QUALTRICS SURVEY]

### Start of Survey

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#### INFORMED CONSENT

**Title of Study:** How can we optimize existing video conferencing platforms to enhance the learning experience for students in academia

**Investigator/s:** Ronit Nayak

This form describes a research project. It has information to help you decide whether or not you wish to participate. Research studies include only people who choose to take part—your participation is completely voluntary. Please discuss any questions you have about the study or about this form with the project staff before deciding to participate.

**Introduction:**

The purpose of this study is to:

- **Understand** present day video conferencing needs of students,
- **Identify** user video-conferencing-related pain points in an academic setting, and
- **Propose** a student-friendly user interface for video conferencing platforms for use in academia.

You are being invited to participate in this study. You must be 18 or older to participate.

**Description of Procedure:**

If you agree to participate, you will be asked to answer a few user interface/user experience-related questions with respect to your video conferencing use. It will take approximately 15 minutes to complete the survey.

**Risks or Discomforts:**

There are no foreseeable risks from participating in this study.

**Benefits:**

If you decide to participate in this study, there will be no direct benefit to you. It is hoped that the information gained in this study will benefit society by gaining a better understanding of how video conferencing platforms can be made more user-friendly for students in an academic

setting.

**Costs and Compensation:**

You will not have any costs from participating in this study. You will not be compensated for participating in this study.

**Participant Rights:**

Participating in this study is completely voluntary. You may choose not to take part in the study or to stop participating at any time, for any reason, without penalty or negative consequences. You can skip any questions that you do not wish to answer. The survey is completely anonymous and no identifying information will be collected.

If you have any questions about the rights of research subjects or research-related injury, please contact the IRB Administrator, (515) 294-4566, [IRB@iastate.edu](mailto:IRB@iastate.edu), or Director, (515) 294-1516, Office for Responsible Research, 2420 Lincoln Way, Suite 202, Ames, IA 50014.

**Confidentiality:**

Records identifying participants will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies, auditing departments of Iowa State University, and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy study records for quality assurance and data analysis. These records may contain private information. To ensure confidentiality to the extent permitted by law, the following measures will be taken: no names or identifying information will be collected. All data will be kept in University approved electronic storage (Cybox), on Qualtrics servers, or on password protected and encrypted computers. All data will be presented in aggregate when results are shared. De-identified information may be shared with other researchers or used for future research studies. We will not obtain additional informed consent from you before sharing the de-identified data.

**Questions:**

You are encouraged to ask questions at any time during this study. For further information about the study, contact Ronit Nayak ([ronit@iastate.edu](mailto:ronit@iastate.edu)). If you intend to print a copy of this informed consent document for your records, kindly download it using the following

link:<https://iastate.box.com/s/webuej5y3tl1g280pqn36uo296srz0uq>

---

Please choose from the following:

- ☐ I agree to participate in this study (1)
- ☐ I do not agree to participate in this study (2)
-

Page Break

---

Q1 I am a:

- ☐ Undergraduate Student (1)
- ☐ Graduate Student (2)

-----

Q2 My current gender identity is:

- ☐ Male (1)
- ☐ Female (2)
- ☐ Non-binary (3)
- ☐ Transgender (4)
- ☐ Prefer not to answer (5)
- ☐ Prefer to self-describe (6)

-----

Q53 My current gender is: (Prefer to self-describe):

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---

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---

---

Q3 I belong to the age group:

- ☐ 18-30 (3)
- ☐ 31-59 (4)
- ☐ 60 and above (8)

-----

Page Break

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Q54 Have you used video conferencing for attending an academic class in the last 12 months?

- ☐ Yes (1)
- ☐ No (2)

-----

Q4 How often do you use video conferencing for your classes/academic coursework/homeowrk?

- ☐ 2-3 times a week (1)
- ☐ 4-5 times a week (2)
- ☐ Every weekday (3)
- ☐ More than 5 times a week (4)

-----

Page Break

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Q5 Which Video conferencing platform/s do you use the most for your online classes and/or group projects? (Choose multiple if applies)

☐

Cisco WebEx (1)

☐

Google Meet (6)

☐

Microsoft Teams (7)

☐

Zoom (8)

☐

Others (9)

---

5.1 Please specify the software name.

---

---

Page Break



6 On the Cisco WebEx video calling screen below, click and select the 5 features you use the most:

	Off (1)	On (2)
Microphone (10)		
Video (11)		
Settings (12)		
Virtual Background (13)		
Share (14)		
Record (15)		
Breakout Sessions (16)		
Reactions (17)		
Participants (18)		
Chat (19)		
Notes (20)		
Polling (21)		
Meeting Info (22)		

Cisco Webex Meetings

Meeting Info | Connected

Ronit Nayak

Host, me

Camera

✓ FaceTime HD Camera

⚙ Settings...

🔄 Change Virtual Background

Notes

Polling

Unmute

Start video

Share

Record

Breakout sessions

---

Page Break



7 On the same Cisco WebEx video calling screen, select the icons that successfully convey the feature well (click once - green check mark) and select the icons that do not convey the feature well (click twice - red cross mark)

	Dislike (1)	Neutral (2)	Like (3)
Microphone (10)			
Video (11)			
Settings (12)			
Virtual Background (13)			
Share (14)			
Record (15)			
Breakout Sessions (16)			
Reactions (17)			
Participants (18)			
Chat (19)			
Notes (20)			
Polling (21)			
Meeting Info (22)			



Cisco Webex Meetings

Meeting Info | Connected

Ronit Nayak

Host, me

Camera

✓ FaceTime HD Camera

⚙ Settings...

🔄 Change Virtual Background

Notes

Polling

Unmute

Start video

Share

Record

Breakout sessions

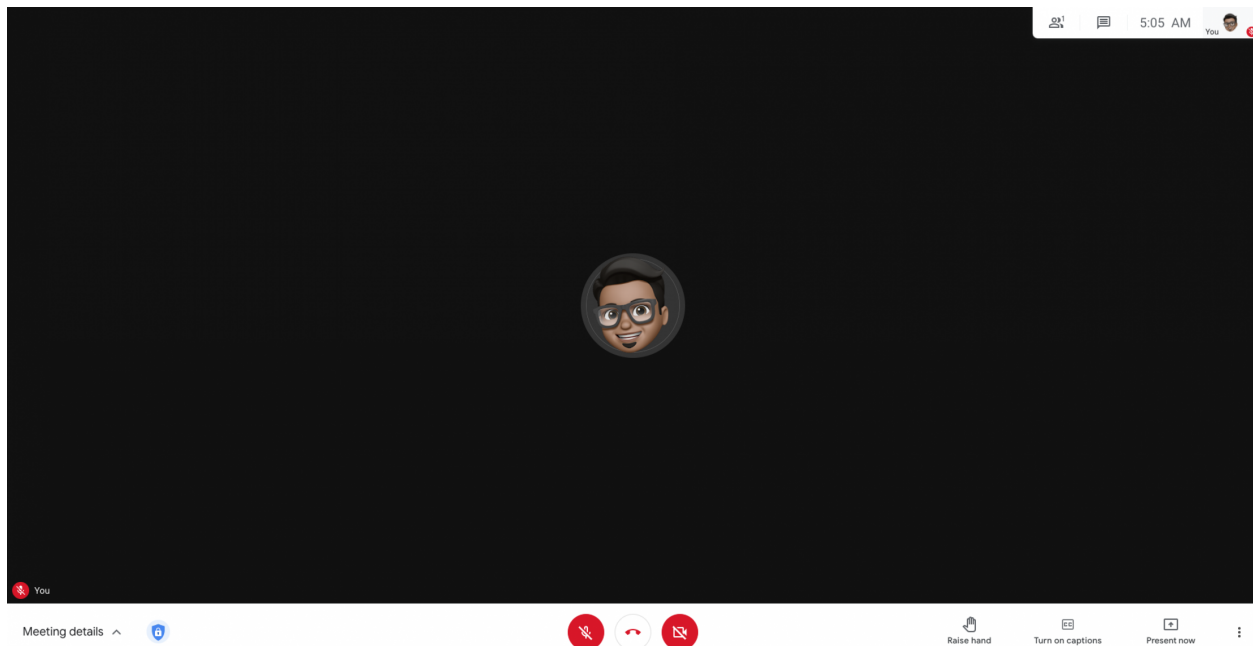
---

Page Break



8 On the Google Meet video calling screen below, click and select the 5 features you use the most:

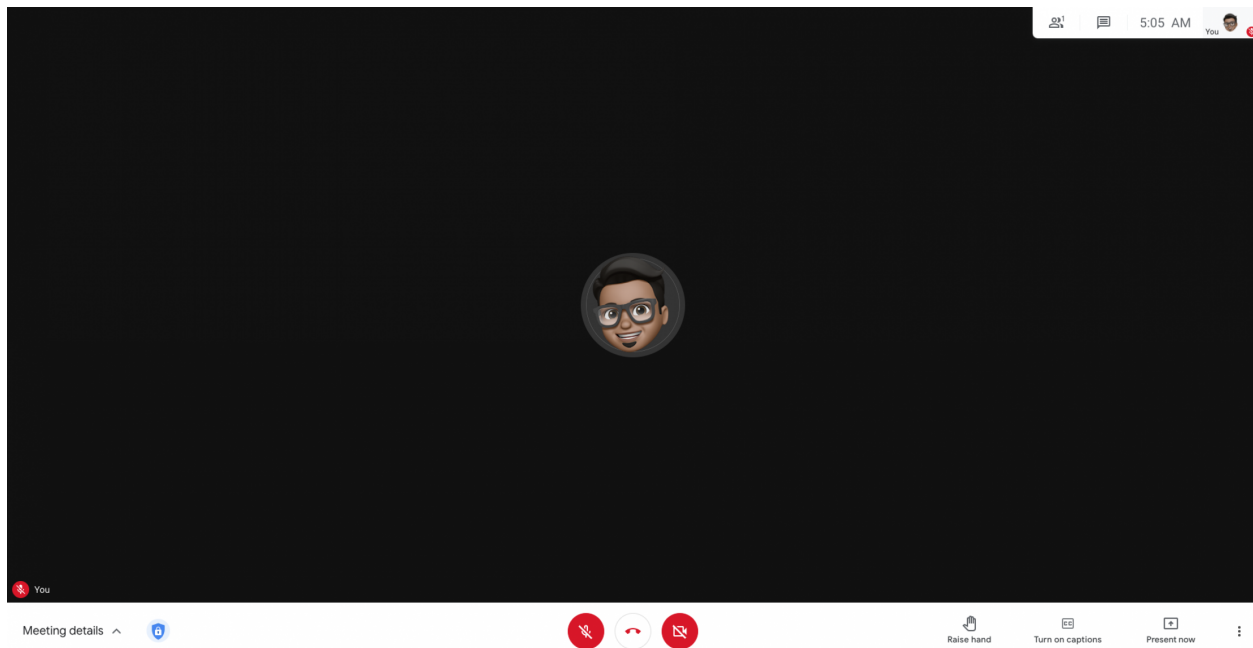
	Off (1)	On (2)
Meeting Details (7)		
Microphone ON/OFF (8)		
End Call (9)		
Video ON/OFF (10)		
Raise Hand (11)		
Turn on Captions (12)		
Present now/Screenshare (13)		
More Options (14)		
Participants (15)		
Chat (16)		



Page Break

9 On the same Google Meet video calling screen, select the icons that successfully convey the feature well (click once - green check mark) and select the icons that do not convey the feature well (click twice - red cross mark)

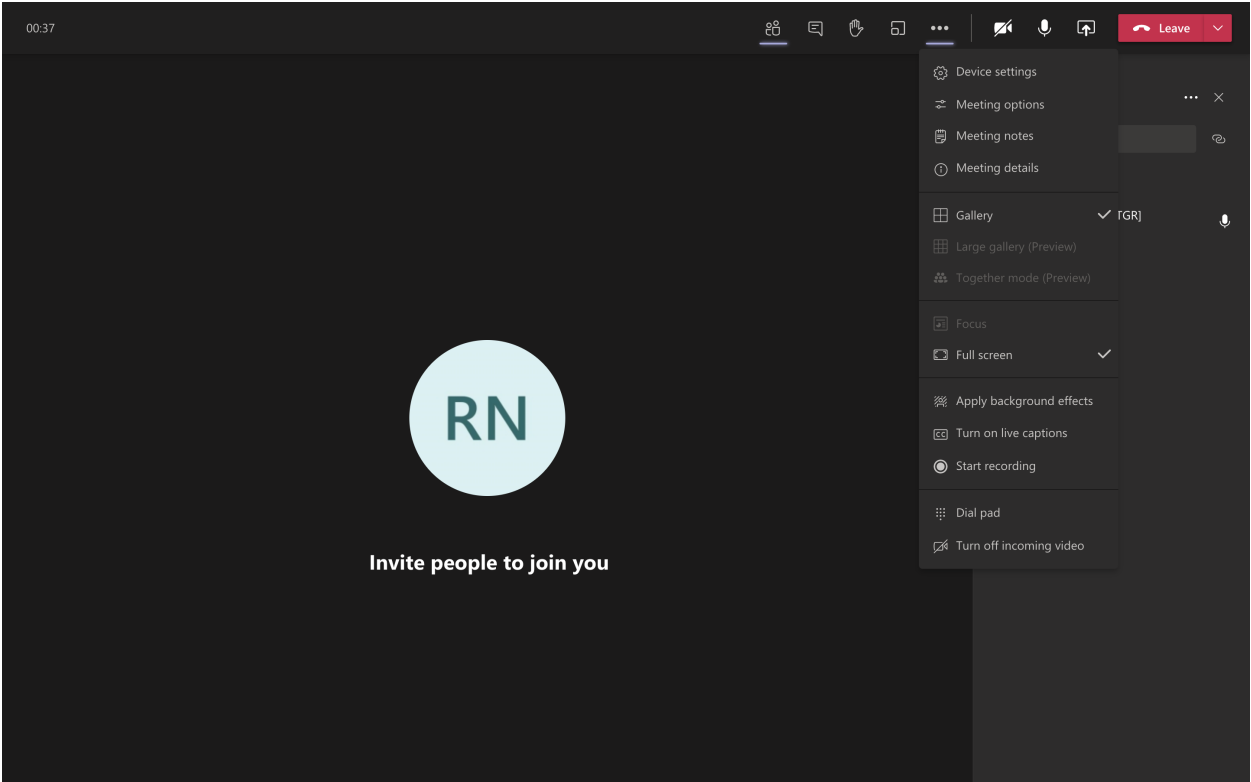
	Dislike (1)	Neutral (2)	Like (3)
Meeting Details (7)			
Microphone ON/OFF (8)			
End Call (9)			
Video ON/OFF (10)			
Raise Hand (11)			
Turn on Captions (12)			
Present now/Screenshare (13)			
More Options (14)			
Participants (15)			
Chat (16)			





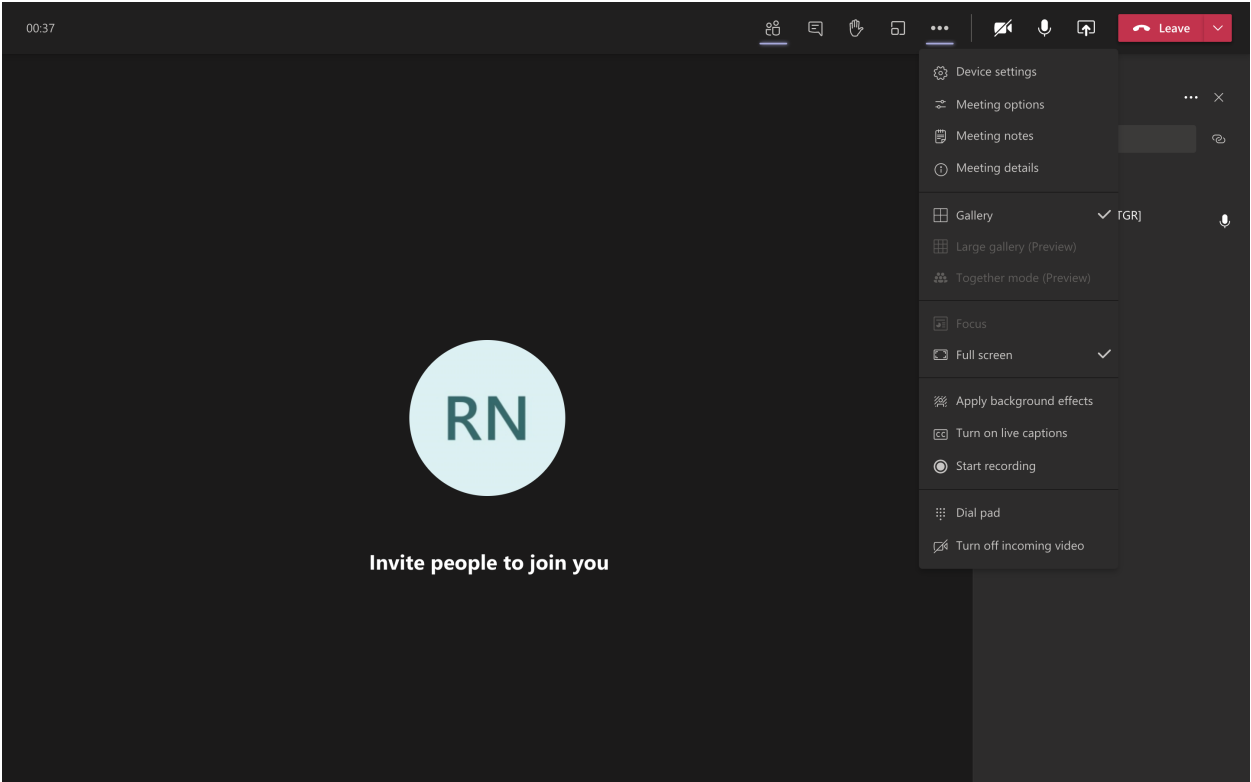
10 On the Microsoft Teams video calling screen below, click and select 5 icons that represent the features you use the most:

	Off (1)	On (2)
Participants (7)		
Chat (8)		
Gesture (9)		
Breakout Room (10)		
Device Settings (11)		
Meeting Options (12)		
Meeting Notes (13)		
Meeting Details (14)		
Gallery View (15)		
Background Effects (16)		
Live Captions (17)		
Screen Recording (18)		
Dial Pad (19)		
Turn off video (20)		
Video (21)		
Microphone (22)		
Share screen (23)		



11 On the same Microsoft Teams video calling screen, select the icons that successfully convey the feature well (click once - green check mark) and select the icons that do not convey the feature well (click twice - red cross mark)

	Dislike (1)	Neutral (2)	Like (3)
Participants (7)			
Chat (8)			
Gesture (9)			
Breakout Room (10)			
Device Settings (11)			
Meeting Options (12)			
Meeting Notes (13)			
Meeting Details (14)			
Gallery View (15)			
Background Effects (16)			
Live Captions (17)			
Screen Recording (18)			
Dial Pad (19)			
Turn off video (20)			
Video (21)			
Microphone (22)			
Share screen (23)			



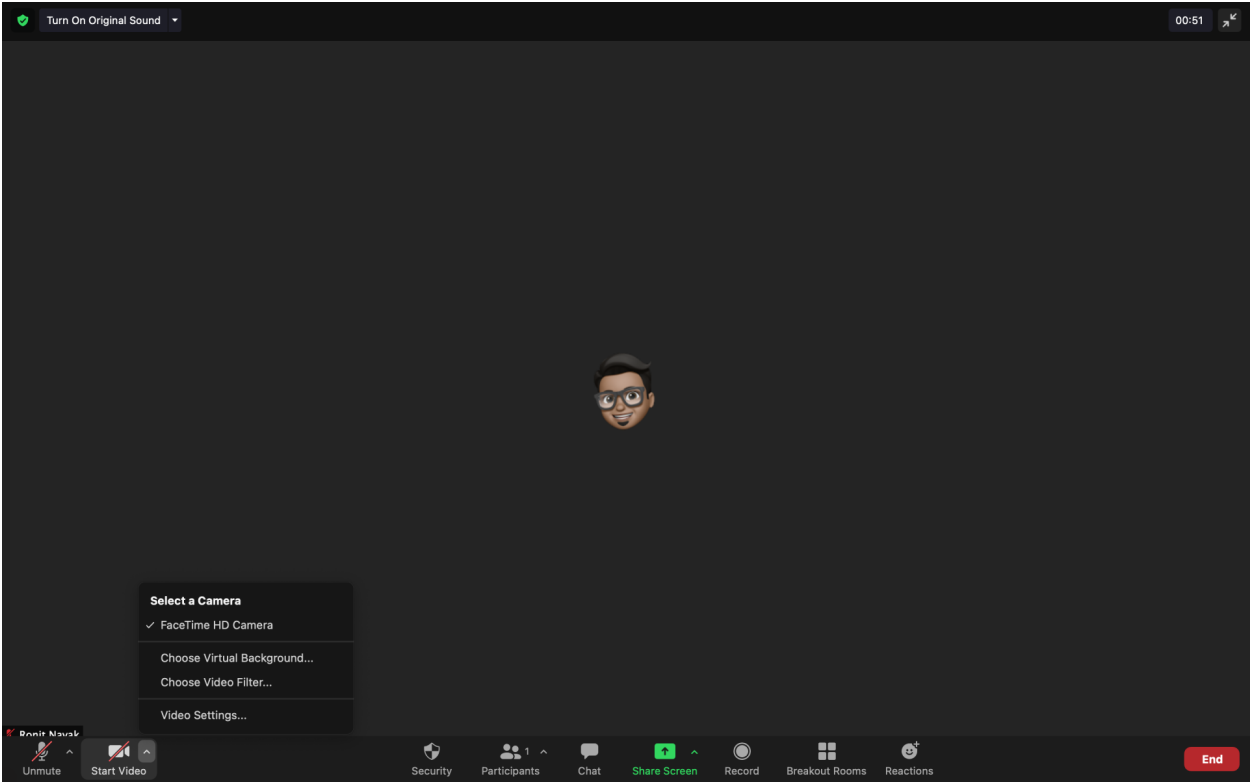
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Page Break



12 On the Zoom video calling screen below, click and select the 5 features you use the most:

	Off (1)	On (2)
Region #1 (7)		
Microphone (8)		
Video (9)		
Virtual Background (10)		
Video Filter (11)		
Video Settings (12)		
Security (13)		
Share Screen (14)		
Chat (16)		
Participants (17)		
Reactions (18)		
Breakout Rooms (19)		
Screen Record (20)		



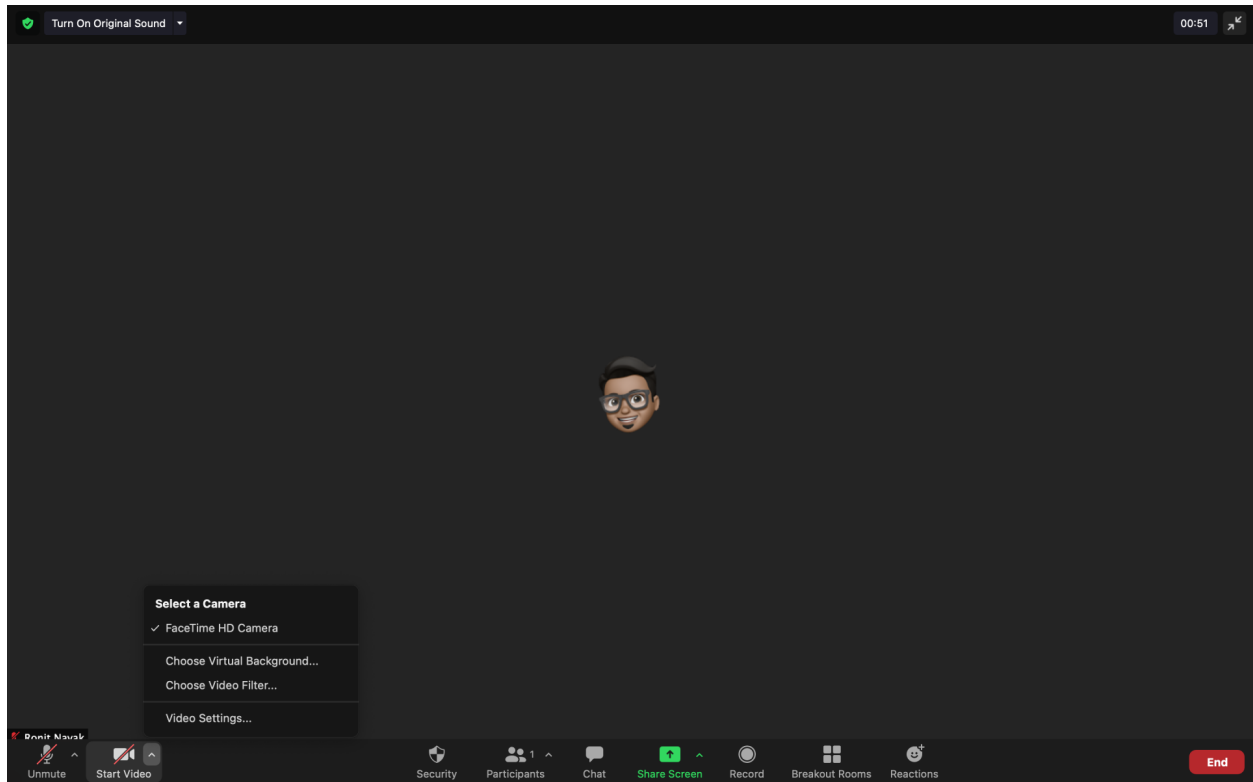


Page Break



13 On the same Zoom video calling screen, select the icons that successfully convey the feature well (click once - green check mark) and select the icons that do not convey the feature well (click twice - red cross mark)

	Dislike (1)	Neutral (2)	Like (3)
Region #1 (7)			
Microphone (8)			
Video (9)			
Virtual Background (10)			
Video Filter (11)			
Video Settings (12)			
Security (13)			
Share Screen (14)			
Chat (16)			
Participants (17)			
Reactions (18)			
Breakout Rooms (19)			
Screen Record (20)			



Page Break

14 For the following questions, please choose the option that applies.

15 With respect to the primary dock (which houses all the video, audio, chat, etc. feature icons), which of the following do you prefer?

- ☐ An always-visible fixed dock (1)
- ☐ A collapsible dock (that collapses to a single icon when closed) (2)
- ☐ A hidden dock that appears on hover/mouseover (3)

Q44 With respect to the user interface icons (video, microphone, chat, etc), which of the following do you prefer?

- ☐ Icons without text labels (1)
  - ☐ Icons with visible text labels (2)
  - ☐ Icons with hidden text label (where text labels appear only on hover/mouse-over) (3)
- 

17 How often do you mute/unmute your microphone unintentionally during a video call?

- ☐ Never (1)
  - ☐ Only a little (2)
  - ☐ Sometimes (3)
  - ☐ A lot (4)
- 

18 How often do you switch on/off your video/camera unintentionally during a video call?

- ☐ Never (1)
  - ☐ Only a little (2)
  - ☐ Sometimes (4)
  - ☐ A lot (3)
-

19 Do you have privacy concerns when sharing your desktop/entire screen with the instructor or class?

- ☐ Never (1)
- ☐ Only a little (2)
- ☐ Sometimes (3)
- ☐ A lot (5)

Q61 What theme do you prefer for your video calling platform?

- ☐ Light theme (1)
- ☐ Dark theme (2)
- ☐ Both, depending on my immediate need (3)

Q20 "The video conferencing platform/s being used in my school/university are easy to use, understand and navigate."

	Select the option that applies				
	Strongly Agree (1)	Somewhat Agree (2)	Neither agree nor disagree (3)	Somewhat disagree (4)	Strongly disagree (5)
Easy to use (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Easy to understand (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Easy to navigate (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

21 "The video conferencing platform/s being used most frequently in my classes meet my academic needs."

- ☐ Strongly agree (4)
- ☐ Somewhat agree (5)
- ☐ Neither agree nor disagree (6)
- ☐ Somewhat disagree (7)
- ☐ Strongly disagree (8)

---

Page Break

Q22 Name/mention/suggest features that you want to see in a video conferencing platform designed for students in academia (that is missing at present):

---

Feature 1

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Q59 Feature 2

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Page Break

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Q55 Below are some features I am considering in my user interface design for a better video conferencing tool for students. Kindly share your thoughts on the inclusion of the following features.

Q57 **Share multiple windows:** This feature would enable you to share multiple windows at the same time, e.g., a browser window and a Presentation file and tile them next to each other on other participants' screens.

- ☐ Not Important (1)
- ☐ Might Use (2)
- ☐ Would Probably Use (3)
- ☐ Must Have (4)

**Email a participant:** This feature would enable you to click an email icon next to participant's name and email the person (including the instructor) directly.

- ☐ Not Important (4)
- ☐ Might Use (6)
- ☐ Would Probably Use (7)
- ☐ Must Have (8)

Q58 **Fixed Seating & Attendance:** This feature would fix participant windows/tiles on the screen in alphabetical order (with absent students having a blank window) so that everyone has a

fixed screen position and can see who's present/absent, and the instructor could easily take attendance.

- ☐ Not Important (1)
  - ☐ Might Use (2)
  - ☐ Would Probably Use (3)
  - ☐ Must Have (4)
- 

**Q60 Instructor/Speaker Spotlight:** When a using a gallery view for participant videos, this feature will keep the instructor/speaker's video in focus, dimming all the other participant videos.

- ☐ Not Important (1)
- ☐ Might Use (2)
- ☐ Would Probably Use (3)
- ☐ Must Have (4)

End of Block: Thesis Survey

---



## APPENDIX B [INSTITUTIONAL REVIEW BOARD APPROVAL]

**IOWA STATE UNIVERSITY**  
OF SCIENCE AND TECHNOLOGY

Institutional Review Board  
Office of Research Ethics  
Vice President for Research  
2420 Lincoln Way, Suite 202  
Ames, Iowa 50014  
515 294-4566

**Date:** 03/03/2021

**To:** Ronit Nayak Anson Call

**From:** Office of Research Ethics

**Title:** A survey to understand how we can optimize existing video conferencing platforms to enhance learning experience for students in academia?

**IRB ID:** 21-103

**Submission Type:** Initial Submission **Exemption Date:** 03/03/2021

The project referenced above has been declared exempt from most requirements of the human subject protections regulations as described in 45 CFR 46.104 or 21 CFR 56.104 because it meets the following federal requirements for exemption:

2018 - 2 (i): Research that only includes interactions involving educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures, or observation of public behavior (including visual or auditory recording) when the information obtained is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained, directly or through identifiers linked to the subjects.

The determination of exemption means that:

- **You do not need to submit an application for continuing review. Instead, you will receive a request for a brief status update every three years. The status update is intended to verify that the study is still ongoing.**
- **You must carry out the research as described in the IRB application.** Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any *modifications to the research procedures* (e.g., method of data collection, nature or scope of information to be collected, nature or duration of behavioral interventions, use of deception, etc.), any change in *privacy or confidentiality protections*, modifications that result in the *inclusion of participants from vulnerable populations*, removing plans for informing participants about the study, any *change that may increase the risk or discomfort to participants*, and/or any change such that the revised procedures do not fall into one or more of the [regulatory exemption categories](#). The purpose of review is to determine if the project still meets the federal criteria for exemption.
- All **changes to key personnel** must receive prior approval.

## APPENDIX C [INSTITUTIONAL REVIEW BOARD APPROVAL 21-103]



View xForm - IRB Application

## IRB Application - v21.1 Sand Cat

## Application Data Entry

- Submitted 03/03/2021 12:54 AM ET by Nayak, Ronit

## Basic Study and PI Information

## IMPORTANT NOTICE

**!** After a temporary halt, Iowa State has implemented a phased approach to safely resume research that requires face-to-face interactions with research participants. Information about the current phase and planning resources can be found on the [COVID-19 & Research](#) web page. Please also carefully review [IRB Guidance - Special Considerations During Covid-19](#).

Please be aware that the IRB will not assess whether your research is permitted under the current phase. Instead, research will be approved with the condition that only activities permitted during the current phase may proceed. This allows proactive submission and approval of future projects.

If you wish to begin your study soon, please review the requirements associated with the current phase and ensure this IRB application reflects relevant phase criteria (e.g., remote procedures whenever possible). Researchers are responsible for ensuring congruence between IRB applications and applicable elements of your COVID-19 Risk Mitigation Plan. **Any face-to-face procedures included in this application can proceed only when all criteria for the current allowable phase are met.**

## This application applies to the following:

- A Human Subjects Research Project overseen by the ISU IRB.
- Creating/Maintaining a Recruitment Registry AND/OR Data or Specimen Repository.
- Request to Rely on an External IRB for oversight of a Human Subjects Research Project.
- Request for Preliminary IRB Determination only for funded projects that lack definite plans for the involvement of human subjects because time after the award is needed to develop the final protocol and related study materials.

## Please select the application type below.

Human Subjects Research Project

## Note about Recruitment Registries or Data/Specimen Repositories:

- A stand-alone IRB protocol is required when establishing a recruitment registry AND/OR data or specimen repository.
- If you are obtaining data from an existing repository, or using an existing recruitment registry as part of a Human Subjects Research Project, check "Human Subjects Research Project".

## Basic Study Information

## Submitter

Nayak, Ronit

Email: ronit@iastate.edu

Phone:

## Title of Project (If funded, use proposal/award title.)

A survey to understand how we can optimize existing video conferencing platforms to enhance learning experience for students in academia?

## Please enter the email address of the principal investigator.

If you are the principal investigator, please enter your own email address.

Nayak, Ronit

Email: ronit@iastate.edu

Phone:

CITI Human Subjects Training Expiration

09/09/2119

### Additional PI and Study Information

Eligibility to serve as principal investigator (PI) depends on an individual's position classification. In order to serve as PI, your position must align with one of the following selections. Note that a Supervising Investigator may be required for certain positions. Refer to the [Principal Investigator Eligibility Guidelines](#) and [P&S Eligible Job Profiles](#) for details.

#### Select your position at ISU.

Undergraduate or Graduate Student

#### Please click "add contact" and enter the investigator who will supervise this research.

Call, Anson

Email: ansonc@iastate.edu

Phone:

*Students or persons in certain other position classifications are not eligible to serve as PI without a Supervising Investigator. The Supervising Investigator must be Tenured, Tenure-Eligible and Research Track Faculty (Category 1) or Professional and Scientific (P&S) staff with an eligible job profile (Category 2), or be granted a PI waiver from the OVP. Please see the [PI Eligibility Guidelines](#) for more information.*

#### Co-I CITI Human Subjects Training Expiration

Contact	Expires (as of 03/03/2021)
Call, Anson	01/28/2121

#### Type of Project

Thesis/Dissertation

#### Has your Major Professor or POS Committee reviewed and approved the proposed procedures for this thesis/dissertation?

Yes

#### Supervising Investigator's Department Chair

Bruski, Paul

Email: bruski@iastate.edu

Phone:

### Select the Department overseeing this research.

*This is typically the department of the PI unless the study requires a Supervising Investigator. In that instance, it should be the Supervising Investigator's department.*

Graphic Design

#### Department Chair

Bruski, Paul

Email: bruski@iastate.edu

Phone:

*The following fields will auto-populate when applicable. If an individual's name appears in either field, your IRB application will route to that person for departmental review.*

Alternative Department Chair

*No answer provided.*

Designee for Department Chair Review

### Is or will the project be externally funded?

No

*External funding may come from federal funds, state or local government agencies, non-profit institutions, or for-profit businesses. Internal department funding is not considered "external" funding.*

### Will researchers at other institution(s) be involved in any human subjects research activities?

No

Select **"yes"** if individuals at other institutions will be involved as **researchers** on the project who do one or more of the following:

- Direct recruitment of research participants,
- Obtaining informed consent from research participants,
- Interacting with research participants to collect data,
- Administering any research interventions, tests, procedures, etc., or
- Access to identifiable research data.

Select **"yes"** if:

- You wish to have an IRB at another institution oversee the project.

Select **"no"** if:

- You are conducting research at a collaborating site, but the only role of persons at that site is to **serve as research participants**, or
- Activities of collaborating researchers do not involve human subjects (e.g., contributing to methodology, analysis of de-identified data, etc.).

### Key Personnel

Key personnel include any individuals who will be involved with collecting data from participants, involved with recruitment or obtaining informed consent, or who have access to their private and identifiable data. For details about who must be listed as key personnel, please see [Human Subjects – Persons Required to Obtain IRB Training](#).

All key personnel other than the PI and/or Supervising Investigator working on this study will need to be listed in response to one of the two questions below. This information is intended to inform the committee of the training and background related to the specific procedures that each person will perform on the project.

Please be sure to select the appropriate table for the personnel:

- **Table 1** - ISU Faculty and P&S Staff **ONLY**, OR
- **Table 2** - All Other Personnel (i.e., ISU research assistants, ISU student personnel, hourly staff, transcribers, coders, non-ISU investigators, etc.)

**NOTE:** All ISU Faculty and P&S Staff listed on this application will receive an automated email from IRBManager after the PI or Supervising Investigator Signature stages instructing them to indicate if they have any Significant Financial Interest(s) related to this study. All will be prompted to verify with electronic signature prior to the form moving to the Department Chair Signature stage.

### Do you have any personnel other than the PI and Supervising Investigator who are responsible for the design, conduct, reporting of the human subjects aspects of this research, or are involved in any human subjects research activities?

*Note: The "submitter" who initiates this form is not automatically identified as study personnel unless they are also the PI or Supervising Investigator. If the submitter will be involved in human subjects research activities, select "yes".*

No

### General Overview - Purpose and Expected Benefits

**Research Objectives** - Briefly explain in language understandable to a layperson the purpose and specific aim(s) of the study.

*Note: If copying text from any other sources or programs into the field below, please right-click and only "paste as plain text" to avoid inclusion of any code (e.g., html, css, etc.) that may affect visibility of your response in this web-based form.*

Conduct a survey among students to understand the pain points/concerns they have with respect to the existing video conferencing platforms being used in academia for online/hybrid classes, and how we can optimize the existing video conferencing platforms to enhance their learning experience.

**Broader Impacts/Significance** - Explain in language understandable to a layperson why this research is important and how the information gained in this study is expected to advance knowledge and/or serve the good of society.

*Be sure to include justification as to why this study is necessary.*

*Note: If copying text from any other sources or programs into the field below, please right-click and only "paste as plain text" to avoid inclusion of any code (e.g., html, css, etc.) that may affect visibility of your response in this web-based form.*

This study will help us determine the video conferencing needs of students better, and help us propose a new student-centric user interface design for video conferencing platforms that will cater more towards students' needs in academia.

**Benefits to Participants - Are there any expected direct benefits to research participants from participation in the research?**

*Compensation (i.e., monetary, course credit, etc.) is not considered to be a benefit of participation in research.*

No

**Research Plan - Participant Characteristics**

**Inclusion Criteria - Describe the specific characteristics of persons that will be included in your study, and provide justification for these requirements.**

Undergraduate and Graduate students at University (since this study is aimed at better understanding their academic video conferencing needs.  
Faculty

**Exclusion Criteria - Describe the characteristics of any persons who will not be allowed to participate in your study, and provide justification for their exclusion.**

We will exclude students under the age of 18 because

- the study is limited to University students
- the focus of the survey is to understand how undergraduate/graduate students use video-conferencing software in the context of higher education
- the creative component will respond to the answers provided in the survey.

**Do you intend, or is it likely that your study will include any persons from the following populations? Please check all that apply.**

*No answer provided.*

**Participant Enrollment**

Please indicate the maximum number of participants you expect to enroll in your study. This number should include the total number of participants across all groups and account for any enrollment that may be needed due to attrition, withdrawals, screen failures, etc. 2000

Please include details about the planned enrollment numbers such as how many you expect to include in any groups or conditions, how many you expect to screen versus fully enroll in the study, etc.  
I plan to send the survey out to Iowa State Graduate and Undergraduate students and exclude the individuals in my Graphic Design MFA program (my peers)

**Research Plan - Data Collection Procedures**



### Research Procedures

Using *layperson's terminology*, please describe in detail your plans for collecting data from participants. Include a description of *all* procedures, tasks, and/or interventions participants will be asked to complete during the research (e.g., random assignment, any conditions or treatment groups into which participants will be divided, mail survey or interview procedures, observation protocols, sensors to be worn, amount of blood drawn, etc.).

*Please ensure that references to materials attached throughout the application are clear. We recommend that attachments (i.e., surveys, interview protocols, copies of stimuli, instructions for tasks, etc.) are clearly named, and when mentioning them in this section, those names are used.*

*Note: If copying text from any other sources or programs into the field below, please right-click and only "paste as plain text" to avoid inclusion of any code (e.g., html, css, etc.) that may affect visibility of your response in this web-based form.*

A Qualtrics survey will be sent out to graduate and undergraduate students. This survey will be anonymized so as to not collect any personally identifiable information. The participants will be simply asked to complete the survey keeping in mind their experience with the various video conferencing platforms being used for their coursework.

The demographic questions will be only including gender, age group, and student status (undergraduate/graduate)

Some examples of demographic questions are:

- I am a:
  - Undergraduate student
  - Graduate student
- My current gender identity is:
  - Female
  - Male
  - Non-Binary
  - Transgender
  - Prefer not to answer
  - Prefer to self-describe
- I belong to the age group:
  - 18-30
  - 31-59
  - 60 and above
- How often do you use video conferencing for your classes/academic coursework/homework?
  - every weekday
  - 2-3 times a week
  - 4-5 times a week
  - More than 5 times a week
- Which Video conferencing platform/s do you use the most for your online classes and/or group projects? (Choose multiple if applies)
  - Cisco WebEx
  - Google Meet
  - Microsoft Teams
  - Zoom
  - Others (please specify)
- "The video conferencing platform/s being used in my school/university are easy to use, understand and navigate."
  - Strongly agree
  - Somewhat agree
  - Neither agree nor disagree
  - Somewhat disagree
  - Strongly disagree
- Name/mention/suggest two features that you want to see in a video conferencing platform designed for students in academia (that is missing at present):
  - Feature 1:
  - Feature 2:

**Will your research include any types of recordings that may capture private or identifiable information?**

*These selections must be described in detail in the research procedures above.*

No - none of the above

### Secondary Use of Data or Information from Records, Repositories, Databases, or Similar Sources

**Does your study involve obtaining information or data about people from records, (e.g., student records, medical records, etc.), repositories (e.g., tissue banks, biospecimen repositories, etc.), or other similar sources (e.g., government databases, data from other studies, etc.)?**

No

#### Use of Digital Tools on Participant Devices

Will participants need to download any software or apps on their personal devices to participate in the study?

No

Will any devices be used for data collection (i.e., eye trackers, activity monitors, heart rate monitors, EEG, MRI, DEXA, other sensors, etc.)?

No

Does the research involve collection of data from observation of people's behaviors or activities?

No

Will participants be *deceived or misled* about anything during the study, and/or do you plan to *intentionally withhold* information from participants, such as the full purpose of the study, a full description of procedures, etc.? Check all that apply.

NO - ALL participants will be fully informed about the study.

Will your participants consume any substances for purposes of your research (e.g., food, beverage, dietary supplements, drugs, vitamins, etc.)?

No

Does this project involve prospective collection of human biospecimens (e.g., blood components, body fluids, excreta, tissues, hair, teeth, etc.)?


No

Do you expect to generate any clinically relevant results from your research (e.g., from blood or urine tests, scans, diagnostic assessments, etc.)?

No

Will the research take place in an international setting?

No

Do you believe your study may qualify for exemption? 

Yes

Please provide justification as to why you feel your study falls into one or more of the categories of exempt research.

The research (and the survey) presents little to no risk of harm to participants as it simply requests their feedback on software platforms being used in academia. The Qualtrics survey using which data is being collected is anonymized, and no personal identifiable data is being requested.

#### Data Collection Materials

Data Collection materials are **OPTIONAL** for Exempt studies. You may attach these materials if you feel it will help the IRB office with the review your study. - **DO NOT** attach recruitment and consent materials for Exempt studies.

Attach any materials related to the data collection and screening procedures (e.g., survey questions, interview questions, medical history questionnaire, focus group protocols, descriptions of stimuli, descriptions of tasks, etc.) you will use for this study.

- DO NOT attach recruitment and informed consent materials here. If required, you will be asked to attach these items in later sections of the form.
- If you have already attached data collection materials (i.e. observation protocol, etc.) as a response to another question, you do not need to upload it here.

Thesis\_Survey.docx Surveys/Questionnaires

#### Discomfort or Risk to Participants

**Discomfort or Risk**

**Are there any foreseeable discomforts or risks to participants from taking part in your research?**

No

**Please explain why you believe there are no foreseeable discomforts or risks to participants.**

*Note: If copying text from any other sources or programs into the field below, please right-click and only "paste as plain text" to avoid inclusion of any code (e.g., html, css, etc.) that may affect visibility of your response in this web-based form.*

The participants will be asked to fill a Qualtrics survey that will ask for their feedback on the different video calling software they are using for their academic coursework.

**Data and Safety Monitoring**

**Is a data safety and monitoring plan required for this study?** (This relates primarily to Clinical Trials.)

No

**Recruitment and Informed Consent****Informed Consent for Exempt Research**

Although your research may be "exempt" from many regulatory requirements, it is not exempt from important ethical considerations such as informing potential participants about the research and allowing that they voluntarily agree to take part. If children are included in the study, it is important to obtain their agreement and that of a parent.

Use of a formal informed consent document containing all of the elements of consent is not required for exempt research. However, the Iowa State University IRB expects investigators to provide, at minimum, the following information to prospective participants (and their parent/legal guardian) prior to enrollment in the study:

- The project involves research;
- A general description of the study procedures and time commitment;
- Any potential discomfort or risk related to participation (e.g., discomfort responding to sensitive or personal questions, privacy concerns, disclosure risks);
- A statement that participation is voluntary and that they may skip any questions they do not feel comfortable answering in an interview or survey;
- How their privacy and confidentiality will be protected;
- Plans for data-sharing or future research use of their information.

When applicable, describe:

- Information about participants obtained from records (e.g., student coursework, medical information, data from a prior study);
- Plans to audio/video record or photograph participants and how recordings/images will be used and retained;
- Information about participants' use of software or apps, including any privacy issues, costs, etc.;
- Any plans for capturing information via screen-recording, key-stroke-logging, etc.;
- If deception about the purpose or nature of the study is planned, prospective subjects are informed that they will be unaware of or misled about the nature or purposes of the research, and agree to proceed.



The IRB understands that obtaining informed consent may not be feasible in some situations, such as obtaining large data sets from existing records where contacting persons is not possible or practicable. However, researchers should be aware that informed consent may be required for data governed by regulations (e.g., FERPA, HIPAA, etc.), particularly if the data includes identifiers (as defined by either FERPA or HIPAA regulations).

**Please confirm that you will implement a consent process that addresses all of the following:**

- **Participants will receive the information above in a manner that facilitates their voluntary consideration;**
- **Participants will have an opportunity to agree before research procedures begin; and**
- **If the study involves deception or incomplete disclosure, participants will be explicitly informed prior to taking part in the study that they will be unaware of or misled regarding the nature or purposes of the research.**

Yes

**Translation****Translation of Information or Materials**

In order to facilitate meaningful informed consent, recruitment and informed consent materials must be in a language understandable to the participants. If your study will include individuals who do not read or speak English, recruitment and consent materials must be translated into the appropriate languages.

**Please check the following to describe your plans.**

All participants are expected to be fluent in English. Translation is not required.



### Compensation

#### Compensation

**Will participants receive any compensation (i.e., monetary, course credit, etc.) for their participation in your research?**

No

### Privacy

#### Privacy and Confidentiality Guidance

*As you prepare your privacy and confidentiality plans for working remotely and the use of MTurk, please review the following guidance:*

- [Working Remotely with Human Subjects Research: Privacy and Confidentiality Considerations](#)
- [Research Using Mechanical Turk](#)

#### Describe how participants' privacy will be protected during recruitment and data collection.

*For example, discussions/procedures will be conducted in private locations, messages regarding the research will not be left on answering machines without permission of participant, how documents or recordings will be kept secure while in the field and during transmission, etc.*

The participants will be asked to fill an "anonymized" Qualtrics survey that will not collect any personally identifiable information from the participants.

- Data will be stored according to ITS Minimum Security Standards.
- Iowa State IT Security-approved digital tools will be used for conducting the survey and the subsequent research
- All digital tools (like Qualtrics) will be accessed using iastate.edu credentials.
- No private non-ISU accounts will be used at any point in time to conduct research.
- Data copies will not be stored locally on devices not managed by Iowa State.
- No shared/public devices will be used for conducting the survey and research
- Only private/password-protected public Wi-Fi networks will be used to conduct the research.
- Data will be accessed or shared via CyBox, Remote Desktop, Okta cloud platforms, etc.
- No data sets will be sent to any individual via email.
- Research will only use IT Security approved technology tools accessed using iastate.edu log-on credentials.
- Participants will be informed of steps they can take to protect privacy (e.g., closing their web browser after survey completion, avoid using shared devices, finding a private location to complete interviews, etc.).

### Data Security

### Minimum Data Security Standards

Iowa State University established a [data security policy](#) in 2015, which establishes minimum security standards. The policy has established four classifications of data (Restricted, High, Moderate, Low). Research data is classified as "moderate", as such, [security standards](#) outlined for moderate level data apply – unless the research data includes information that falls into one of the higher levels of classification (e.g. FERPA protected, HIPAA protected, etc.) Investigators should follow the [Minimum Security Standards](#) appropriate for the classification of their data.

You will first select the classification level that applies to your research. Appropriate classification is based on the nature and sensitivity of the data. You will next be asked to confirm your agreement to implement the applicable minimum security standards that apply to the data classification level selected for your research project. **Principal Investigators and Supervising Investigators are responsible for ensuring correct implementation of these standards.** You are strongly encouraged to work with departmental, college, or University IT staff as needed.

**Please select from the options below to indicate the sensitivity level/data classification that applies to your study.**

MODERATE - Includes: all research data, unless High or Restricted

**I agree to implement the [Minimum Security Standards](#) required for the Moderate Classification specified by ISU Policy for all [electronic data/records](#) for this research. I will consult with IT staff, as needed, to ensure these standards are implemented properly.**



Examples of minimum security standards include, but are not limited to:

- **Maintaining system patches and updates** to reduce the risk of security threats. Removing default passwords and configurations supplied by vendors.
- **Restricting user access.** Using multi-factor authentication when available. Controlling access and limiting to minimum necessary approved study personnel. Using least-privileged user accounts when possible.
- Implementing **encryption protection** (at rest and in transit) for research data. Encryption is required for Cloud storage, mobile or portable devices (e.g., laptops, tablets, flash drives, external hard drives, cell phones, etc.).
- Use **ISU-controlled cloud storage** such as Cybox, OneDrive, and Google Drive.
- Providing **awareness and training** to all personnel to safeguard system and information.
  - Ensuring personnel using shared devices (e.g., personal devices, devices in labs or public settings, etc.) understand and follow procedures to prevent unauthorized or unintentional access (e.g., log out of the system immediately after use, close browsers, etc.).
- Performing a risk assessment and providing contingency planning - including scheduled backups.
- **Labeling external media** (such as optical disks, flash drives, external hard drives) with contact information, in order to protect data.
- Reporting any Incident to the Solution Center of ITS within 24 hours.
- Enabling session timeouts and screen locks.

I agree.

**I agree to implement the following security measures for all identifiable [physical data or records](#)**

- Secure storage methods that prevent unauthorized access (e.g., locked cabinets, safes, drawers, freezers, etc.), except when being directly used by a member of the research team.
- Access is controlled and limited solely to the minimum necessary IRB-approved research team members or professional service providers (i.e., transcriptionists, translators, etc.)
- Identifying information (including "keys" linking identifiers to codes) must be securely and effectively destroyed as soon as it is no longer needed to complete the research or meet regulatory record keeping requirements.

I agree.

#### Use of ISU-Supported Digital Tools

Any digital tools (email, data/information collection platforms, apps, cloud storage, software, programs, videoconferencing, communication, analysis tools, etc.) used during direct interactions/communication with participants or for data collection must satisfy ISU IT Services data security requirements, including:

- Access using iastate.edu credentials. Private non-ISU accounts may NOT be used to conduct research, unless granted an exception by IT Security
- Any tool with a cloud component (those that effectively allow access to data/information by the software vendor) must be approved by IT Security for the data classification level for which it will be used.
  - IT Security maintains a list of [Approved Software and Vendors](#), and a mechanism to request review of tools not on the list or not at the data classification level appropriate for this study.
  - IT Security approval is NOT required for passive use of digital tools when no personal information is collected/shared (e.g., posting a recruitment flyer on social media).
- Stand-alone software without a cloud component can be used without IT Security approval, but must be used in compliance with terms and conditions for the tool.
- Any tools that deviate from the above requirements (e.g., non-ISU supported tools, tools not approved for study data classification, etc.) must be evaluated by appropriate IT personnel (department, college, or University IT) and deemed acceptable for use during this project.

**Please click below to indicate that you have read, understand, and will adhere to the requirements outlined above during the course of this project.**

I agree.

#### Confidentiality

##### Identifiers

**Will you obtain any of the following identifiers about participants at any stage of the research (e.g., recruitment, informed consent, data collection, from existing records, to provide compensation, etc.)? Please select from the list below.**

No identifying information will be used at any stage of the research (uncommon)

##### Indirect Identifiers

**Will you collect any information that, when combined, could be used to identify subjects?** For example, age, zip code, and biological sex can be enough to identify an individual depending on the study context. Similarly, unique characteristics and traits might allow someone familiar with the study setting to deduce or infer participant identities.

No

### Preventing Indirect Identification in Study Results

For most research, ensuring participants are not identifiable when results are reported is a key ethical obligation. Excluding direct identifiers (names, addresses, etc.) is a necessary but insufficient step. Deductive disclosure of identity - identifying an individual using known characteristics about them - must be addressed. Deductive disclosure risk varies depending on study context, information collected about participants, and level of detail or specificity shared with results.

Research with a small or unique sample (e.g., persons with a rare disease or unique hobby) or in specific settings (e.g., a school district, workplace, small community) is particularly prone to deductive disclosure risk - basic demographic information such as age, gender, ethnicity, etc. is enough to identify persons in some settings.

Researchers must carefully assess deductive disclosure potential given the specific context of the study, and design effective methods to protect participant confidentiality. General tips include, but are not limited to the following:

- Ensure results do not include obvious identifiers (names, addresses, images, dates of birth, etc.).
- Avoid identifying the specific research setting or location - use generic descriptors and avoid geographic/location details (e.g., state/region instead of city).
- Use generic or broad descriptors for personal characteristics (e.g., administrator instead of principal).
- Present demographic or background information using ranges or broad groupings - avoid sharing specific, detailed, or unique demographic or background information.
- Recode to collapse outlying values into categories with sufficient numbers of cases.

The IRB recognizes that confidentiality is not feasible or desirable in some research. Identifying participants in published results, either directly or indirectly, is generally acceptable if:

- disclosure of identity does not present significant risk to participants or third parties, and
- participants are informed their identity will or may be disclosed when results are shared, and they prospectively agree to these plans.

**What specific steps will you take to ensure participants are not identifiable (directly or indirectly via deductive disclosure) when research results are reported?** If you cannot or do not plan to maintain confidentiality, please explain.

Since the Qualtrics survey is anonymized, no personal identifying information such as names, addresses, images, dates of birth, IP Addresses, etc. is recorded. And with respect to questions collecting demographic information, the survey requests information like the age group of participants (ages 18-30, 31-59, 60 & above), gender, and if a student is a graduate or undergraduate student. This data, if and when presented together, will not result in indirect identification of the participants.

### Access to Study Data or Records

**Will anyone other than those on the research team have access to any identifiable study data or records?**

No

### Certificate of Confidentiality

Certificates of Confidentiality (CoC) are designed to protect identifiable research records against forced disclosure (e.g., subpoena), and may be important to protect certain types of information (e.g., data on illegal behaviors, genetic information, certain kinds of diseases or mental health conditions, etc.). When a CoC is in place, there are restrictions on how identifiable information about research participants may be disclosed or shared. Researchers must comply with these restrictions.

**CoCs are obtained in one of two ways:**

- 1. For research funded by NIH or CDC** - Research that involves collection or use of individually identifiable, sensitive information is automatically issued a CoC, and is subject to the corresponding disclosure restrictions outlined in [NIH Policy](#) or [CDC Policy](#).
- 2. For other research** - CoCs can be sought from the National Institutes of Health (NIH) or Centers for Disease Control and Prevention (CDC) in certain circumstances. Visit the [Certificates of Confidentiality Kiosk](#) for more information.

**Have you or will you obtain a Federal Certificate of Confidentiality for this study?**

No

### Data Sharing or Future Use

Open science and data sharing is becoming the norm. For example:

- Journals and funding agencies increasingly require that de-identified individual-level research data be made broadly accessible.
- You may wish to share de-identified data and/or biospecimens with other researchers for secondary analysis or provide data for inclusion in a data or biospecimen repository.
- You or your research team may wish to use the data for a future study.

The IRB supports responsible sharing of individual-level data in a manner that maintains confidentiality of participants and third parties, honors assurances made to participants during informed consent, and complies with applicable data privacy regulations (e.g., HIPAA, FERPA, Certificates of Confidentiality, NIJ Privacy Certificates, etc.) or contractual obligations (e.g., terms of data use agreements, etc.).

Planning for data sharing at the beginning of the project ensures participants are appropriately informed and gives researchers flexibility if plans change over time.

**Please select one of the following to indicate plans for sharing or using individual level data beyond the current research project.** *Selecting that data will NEVER be shared or used in the future is strongly discouraged, unless doing so is necessary to ensure participant privacy or adhere to regulatory or contractual obligations (e.g., HIPAA requirements, terms of data use agreements, etc.).*

Individual-level data or biospecimens (including de-identified data or biospecimens) obtained during this study will NEVER be shared. Data/biospecimens will be used solely for the current research project.

### Optional - Additional Considerations

**Optional:** Please share any information that you feel would be appropriate in assisting the IRB with review of your study. Examples may include historical background that is relevant to this study, important information about the research site(s), etc.

**Please do not include information that should be included in prior questions within this application.**

I have attached a doc file of the survey questions in the "Data Collection Materials" section

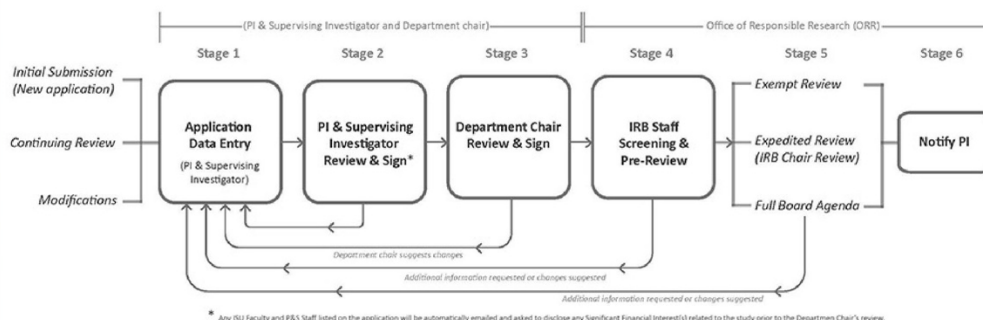
**Optional:** Attach any documents that you wish to share with the IRB to assist with the review of your study. Examples may include permission letters from research sites, supporting literature, etc.

No answer provided.

### Human Subjects Training CITI Check Summary

All current as of 02/04/2021 8:28 PM ET

### Overview of the IRB Application Process:



**Note:** Please be sure to add [irb@iastate.edu](mailto:irb@iastate.edu) to your safe sender list to ensure emails sent from IRBManager are received and not directed to your spam folder.

### PI Assurances and Signature for Self-Submission



In most cases, IRB review proceeds much more smoothly and quickly when submitted applications are complete, internally consistent, and clear. Before submitting, principal investigators should verify that the application meets these criteria and that human subjects protection issues are addressed.

#### Principal Investigator Assurances:

##### By electronically signing this application, I attest to the following:

The information provided in this application is complete, accurately represents all research plans, and is consistent with any proposal(s) submitted to external funding agencies. Misrepresentation of the research described in this or any other IRB application may constitute noncompliance with federal regulations and/or academic misconduct.  
I agree.

I will provide proper oversight of this project and of project staff to ensure that the rights and welfare of the human subjects are protected and that the research is conducted in accordance with the IRB-approved protocol. I have the necessary qualifications to carry out this study in a manner that protects the rights and welfare of human subjects. If the project is subject to FDA regulations, I will follow all FDA requirements as required of the investigator or sponsor-investigator, as applicable.  
I agree.

No human subjects research activities will take place without prior review and approval by the IRB. The research activities proposed in this application will not begin until I receive written notification of IRB approval.  
I agree.

Any problems or noncompliance will be promptly reported to the IRB. For reporting requirements, see Reporting Adverse Events and Unanticipated Problems and Policy on IRB Review of Protocol Deviations and Noncompliance for Non-exempt Research.  
I agree.

Any changes to non-exempt research will receive IRB approval prior to implementation, unless the change is necessary to prevent an immediate hazard to subjects. If this research is granted exempt status, I agree that no changes will be made without prior IRB review that may increase risk to subjects or that could alter the exempt status of the study. I have or will review the document Modifications to Exempt Research, and will follow the specified guidelines.  
I agree.

If my formal affiliation with ISU ends, I will either ensure that the project is formally closed to IRB oversight, or I will notify the IRB of my intent to relinquish the role of principal investigator to another eligible researcher by sending a modification form with a change of principal investigator.  
I agree.

The IRB will be promptly informed of any addition of or change in federal funding for this study. I understand that approval of this application extends only to funding sources that are specifically referenced within and will not be used as documentation of approval for other funding sources.  
I agree.

The research will not take place without the receipt of permission from cooperating institutions, when applicable. I understand that IRB approval of this project does not grant access to any facilities, materials, or data on which this research may depend. Such access must be granted by the unit with the relevant custodial authority.  
I agree.

When appropriate for the study, approval will be obtained from other appropriate committees, such as the IACUC (if the research includes animals), the IBC (if the research involves biohazards), the Radiation Safety Committee (if the research involves DXA, x-rays or other radiation producing devices or procedures), etc.; background checks for staff will be obtained when the research involves working with children.  
I agree.

When the human subjects research is complete, I will formally "close" the project to IRB oversight.  
I agree.

I will retain research records for at least three years after the study is complete as required by federal regulations.  
I agree.

All activities will be performed in accordance with all applicable regulations and policies at the federal, state, local, and Iowa State University levels.  
I agree.

##### By entering my username and password, I am electronically signing this form.

Signed Wednesday, March 3, 2021 12:53:59 AM ET by Nayak, Ronit

**Be sure to click "Submit" on the next screen in order for your form to move forward in the submission process.**

**Supervising Investigator Review and Signature**  
 - Submitted 02/10/2021 1:43 PM ET by Call, Anson

**Supervising Investigator Review, Assurances and Signature**

**As supervising investigator, it is your responsibility to verify the application is complete, accurately reflects the study plans, and that human subjects protections are adequately addressed prior to submission.**

**Based on your review, is the application complete and ready to send to the IRB for review?**

Yes

**Supervising Investigator Assurances**

**By electronically signing this application, I certify that I have reviewed the contents of this application in its entirety, and I attest to the following:**

The information provided is complete, accurately reflects the study plans, and human subjects protections are addressed. It is also consistent with any proposal(s) submitted to external funding agencies. Misrepresentation of the research described in this or any other IRB application may constitute noncompliance with federal regulations and/or academic misconduct.  
 I agree.

The proposed research is scientifically sound, likely to achieve its aim, and the knowledge that is expected to result has importance in the field of study  
 I agree.

I have the necessary qualifications to oversee this study. I agree to provide proper oversight of this project, the principal investigator, and of project staff to ensure that the rights and welfare of the human subjects are protected. I will ensure that the PI and project staff adhere to the IRB-approved protocol. If the project is subject to FDA regulations, I will ensure adherence to all FDA requirements as required of the investigator or sponsor-investigator, as applicable.  
 I agree.

No human subjects research activity will begin until it has been approved by the IRB and written notification has been received by the principal investigator.  
 I agree.

If I plan to leave ISU (either permanently or for an extended period of time) or determine I can no longer supervise this project, I will inform the principal investigator and the IRB with sufficient time for an alternate supervising investigator to be identified and assume responsibility for project oversight.  
 I agree.

If the Principal Investigator's formal affiliation with ISU ends, I will either ensure that the project is formally closed to IRB oversight, or I will notify the IRB of my intent to assume the role of principal investigator.  
 I agree.

Any changes to non-exempt research will receive IRB approval prior to implementation, unless the change is necessary to prevent an immediate hazard to subjects. If this research is granted exempt status, I agree that no changes will be made without prior IRB review that may increase risk to subjects or that could alter the exempt status of the study. I have, or will, review the document Modifications to Exempt Research, and will follow the specified guidelines.  
 I agree.

The IRB will be promptly informed of any addition of or change in federal funding for this study. I understand that approval of this application extends only to funding sources that are specifically referenced within and will not be used as documentation of approval for other funding sources.  
 I agree.

Any problems or noncompliance will be promptly reported to the IRB. For reporting requirements, see Reporting Adverse Events and Unanticipated Problems and Policy on IRB Review of Protocol Deviations and Noncompliance for Non-exempt Research.  
 I agree.

The research will not take place without the receipt of permission from cooperating institutions, when applicable. I understand that IRB approval of this project does not grant access to any facilities, materials, or data on which this research may depend. Such access must be granted by the unit with the relevant custodial authority.  
 I agree.

When appropriate for the study, approval will be obtained from other appropriate committees, such as the IACUC (if the research includes animals), the IBC (if the research involves biohazards), the Radiation Safety Committee (if the research involves DXA, x-rays or other radiation producing devices or procedures), etc.; background checks for staff will be obtained when the research involves working with children.  
 I agree.

I will retain research records for at least three years after the study is complete as required by federal regulations.  
 I agree.

All activities will be performed in accordance with all applicable regulations and policies at the federal, state, local, and Iowa State University levels.  
 I agree.

**By entering my username and password, I am electronically signing this form.**

Signed Wednesday, February 10, 2021 1:43:37 PM ET by Call, Anson

**Be sure to click "Submit" on the next screen in order for your form to move forward in the submission process.**

**COI Check - Initial Submission**  
**- Submitted 03/03/2021 12:54 AM ET by System, The**  
**Required Signatures**

Do you (as a person responsible for the design, conduct, or reporting of the findings of this protocol) have a Significant Financial Interest\* that is or could reasonably be perceived by non-experts as related to the research to be conducted under this protocol?

\*A Significant Financial Interest includes any of the following for the investigator, his/her spouse or domestic partner, and his/her dependent children:

1. For PHS-sponsored or PHS-flow-through research (e.g. NIH, CDC, FDA), a significant financial interest is payment exceeding \$5,000 in the past 12 months.
2. Payment exceeding \$10,000 in the past 12 months or anticipated in the next 12 months (excluding payments from ISU), including salary, honoraria, fees, or other forms of compensation or anything of value from any entity having a financial interest in this research.
3. An equity interest in any publicly or privately owned entity whose financial interests could be affected by this research, including but not limited to shares of stock or stock options. Do not include equity held in a mutual, pension, or investment fund over which you have no control with regard to investment decisions.
4. An inventorship or ownership interest in any intellectual property not owned by Iowa State University Research Foundation being tested, evaluated, developed in, or its commercial value will be affected by this research.

Additional guidance on [Conflicts of Interest and Commitment](#).

Please do one of the following in order to proceed.

- If you have **any** of the Significant Financial Interests listed above, complete the [IRB COI Disclosure Form](#) to acknowledge your Significant Financial Interest for this study. Do NOT enter your password below.
- If there is **no** Significant Financial Interest that needs to be disclosed for this study, please continue by signing the form below.

By signing below, I am attesting to not having any of the conflicts listed above and understand that if I do have a Significant Financial Interest related to this study in the future, it is my responsibility to notify the IRB.

Nayak, Ronit (Principal Investigator) - signed at 03/03/2021 8:24 AM ET  
 Call, Anson (Supervising Investigator) - signed at 03/03/2021 9:01 AM ET