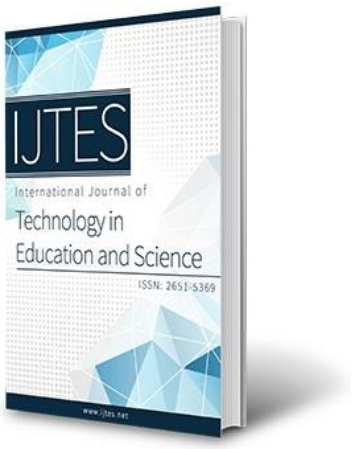

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To cite this article:

Massner, C. K. (2022). Who's Zooming who: A case study of videoconferencing's effects on faculty and students. *International Journal of Technology in Education and Science (IJTES)*, *6*(4), 602-619. https://doi.org/10.46328/ijtes.412

International Journal of Technology in Education and Science
2022, Vol. 6, No. 4, 602-619 https://doi.org/10.46328/ijtes.412

Who's Zooming Who: A Case Study of Videoconferencing's Effects on Faculty and Students

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Article Info

Article History

Received:
15 March 2022
Accepted:
01 September 2022

Keywords

Videoconferencing
Higher education
Zoom fatigue

Abstract

When COVID-19 forced colleges and universities to abruptly transition their in-person courses online in spring 2020, many professors instinctively turned to videoconferencing tools as a substitute for face-to-face interactions. The extensive implementation of synchronous online instruction through videoconferencing presented various opportunities and challenges for faculty and students. Notably, users quickly identified a new phenomenon that the popular press labeled Zoom fatigue. This study presents findings from a qualitative case study on videoconferencing use, its effects, and the problem of Zoom fatigue in higher education. The faculty and student experience with the synchronous, virtual classroom and Zoom fatigue is explored. A theoretical model of Zoom fatigue is presented. Finally, recommendations for the effective use of synchronous online instruction are shared. This study advances a working model of Zoom fatigue to explain the multi-dimensional factors that cause it. The mediated, virtual communication environment offers opportunities and challenges for participants to navigate as they attempt to answer, "Who's Zooming' who?"

Introduction

The events of 2020-2021 normalized videoconferencing in a variety of settings, including higher education. How colleges and universities respond long term to the lessons they take from the pandemic will likely shape higher education and learning for the foreseeable future. The effective use of videoconferencing and the role it should play in digitized instruction is essential for college and university stakeholders to understand if they are to encourage student success in virtual education environments.

Even prior to the COVID-19 pandemic, online education was growing at a steady rate. In 2018, one in three college students enrolled in at least one online course (Seaman et al., 2018). However, during the height of 2020's economic and government shutdowns, the numbers skyrocketed with nearly 90% of students of all ages learning online (Ralph, 2020). The majority of college faculty members, nearly 80%, reported using videoconferencing as part of their instruction (Ralph, 2020). Researchers predict remote, online learning will continue to play a predominant role in higher education since students have adjusted to the virtual classroom (Chirikov & Kizilcec, 2020). Therefore, it is critical higher education instructors and administrators determine the most effective tools

to engage students in online courses. The purpose of this study is to explore how videoconferencing affects faculty and students in online courses to better understand effective use of synchronous virtual instruction.

Background

Although videoconferencing technology had existed for years, the global health pandemic encouraged the exponential increase in its use. Bell Lab's first attempt at a picture or videophone was the ikonophone in 1927 (de Vasconcelos Filho et al., 2009; Dewal, 2016). After decades of further research, the picturephone was unveiled at the World's Fair in 1964 (de Vasconcelos Filho et al., 2009; Lawson, et al., 2010). By 1970, Bell established the first commercial picturephone service in Pittsburgh, but the costs were prohibitive (AT&T, 2012). The business sector drove further development of the technology as companies understood the time and cost-saving benefits of communicating over long distances with video and audio capabilities (Lawson, et al., 2010). By the 1990s, some higher education institutions could afford to incorporate the expensive systems to reach students in remote, rural locations. An instructor would be at one site while a class of students gathered remotely at a separate site for instruction (Lawson, et al., 2010). After the advent of the internet, these large site-to-site videoconferencing systems were primarily phased out as computer instruction became more convenient and less expensive for students and institutions. Asynchronous computer-mediated instruction grew more widespread (Bell & Federman, 2013). In the 2000s, further technological advancements, such as 3G technology, inexpensive webcams, and broadband internet service provided the means for affordable, convenient synchronous person-to-person videoconferencing. By 2004, Skype was introduced, which provided quick and easy web videoconferencing, and in 2010, Apple released FaceTime (Lawson et al., 2010; Richards, 2016). These developments set the stage for the quick implementation of synchronous virtual instruction in 2020 when professors searched for a way to keep their classes interactive and engaged in the online environment.

Videoconferencing promises real-time video and audio communication, yet there are important differences between videoconference and face-to-face interactions. These differences affect interactions through the communication technology tool and include interruptions to natural conversation patterns, including how eye contact, gestures, facial expressions, pausing, and interruptions are experienced (Bailenson, 2021; Miller, 2020; Storck & Sproull, 1995). The mediated alternative to face-to-face interactions drained users because increased effort was needed to communicate compared to face-to-face communication, and many users described intense feelings of exhaustion (Bailenson, 2021; Lee, 2020; Storck & Sproull, 1995). The popular press quickly labeled this new phenomenon Zoom fatigue (Fosslien & Duffy, 2020; Kobie, 2020; Lee, 2020; Sander & Bauman, 2020). Since Zoom fatigue was recently identified as a problem, it has attracted little scholarly attention about its effect on higher education (Bailenson, 2021; Lee, 2020).

Theoretical Perspectives

The mediated effect of videoconferencing during online class sessions is best explained through a communication perspective informed by multiple theories. Therefore, this study is informed by media richness theory (Daft & Lengel, 1986), expectancy violations theory (Burgoon & Hale, 1988), and self-presentation theory (Goffman,

1954). These theories provide an explanation of why faculty members select videoconferences for online instruction delivery as well as how faculty and students experience videoconference class sessions.

Media Richness Theory

Media richness describes media along a richness continuum according to criteria, including timeliness of feedback, message personalization, language variety, and the number of communication cues and channels. Daft and Lengel (1986) argued that face-to-face communication is the richest medium because it includes immediate feedback and a variety of nonverbal communication cues, including facial expressions, body language, and tone of voice. When faced with a choice, individuals prefer to use richer media because they include more cues, according to the theory. Media richness theory supports instructors' media selection decisions for their courses.

Self-presentation Theory

Self-presentation theory describes how faculty and students present themselves on videoconferences. Sociologist Erving Goffman (1959) developed self-presentation theory as a dramaturgical approach to understanding human behavior in social situations. Goffman (1959) maintained that individuals rationally manage the impressions that others have of them by intentionally performing roles in what he called the front stage. According to the tenets of the theory, individuals present their idealized self to others on the front stage, while their true self remains private on the backstage. The sociological theory provides the foundation for impression management scholarship and is useful for understanding how individuals manage their impressions during videoconferences.

Expectancy Violations Theory

Finally, expectancy violations theory posits why faculty and students feel disconnected when communicating through videoconferences. Expectancy violations theory emerged out of nonverbal communication research in the 1970s and 1980s and describes how people respond to unexpected nonverbal communication behaviors that violate social norms (Burgoon & Hale, 1988). Expectancies are identified as nonverbal behavior preferences individuals develop about others based upon social norms, and when these expectancies are violated, individuals evaluate the behavior as either desirable or undesirable. Expectancy violations theory provides a way to understand how students experienced an unprecedented shift to online learning. College students have expectations about their college classes, online education, and appropriate communication with faculty members (Ledbetter & Finn, 2018). From this perspective, when courses transitioned from face-to-face to online, courses that shifted according to students' expectations were viewed as more successful. While the use of videoconferencing is synchronous, many students expect online learning to be asynchronous and self-paced. This study seeks to investigate students' perceptions of the use of videoconferencing in online courses.

Method

A qualitative case study was used to explore videoconferencing use in higher education. The study investigated a

problem in a bounded environment, so a single-site holistic case study provided an in-depth examination of a specific case (Creswell & Poth, 2018; Yin, 2018). This method was appropriate because the research was interested in exploring faculty members' and students' experiences with videoconferencing and the phenomenon of Zoom fatigue. Yin (2018) explained that a single-case study is appropriate for a common case when the goal is to understand the conditions of an everyday situation, which corresponds to the purpose of this research.

Research Questions

This study explored several research questions. RQ1: How does mediated communication through videoconferencing affect college faculty members when they teach online? RQ2: Why does videoconferencing fatigue occur when faculty members use videoconferencing tools to teach online? RQ3: How does mediated communication through videoconferencing affect college students as they learn online? RQ4: Why do students experience videoconferencing fatigue when they use videoconferencing tools to learn online?

Setting

A small, private liberal arts university in central Appalachia serve as the site of this single-site case study. With 1,100 undergraduates and 850 graduate and professional students, the university is accredited by the regional accrediting agency and is well-established, serving the surrounding region for more than a century. The institution offers 26 undergraduate programs, three graduate programs, and two professional schools and is representative of other small, private independent higher education institutions across the country, providing a common case for understanding (Sidle, 2020). Nationally, there are more than 1,700 independent colleges and universities that enroll more than 5 million students (NAICU, 2019), so the site is comparable to a large population of faculty and students at institutions across the country.

Participants

The single-site case study included faculty member and student participants. Most online education research considers only student perspectives, creating a gap in the research. Since communication is a two-way process, it was critical for the perspectives of both faculty and students to be explored. The university is home to students from 13 countries and 43 states. Faculty members are 54% female and 46% male with 66% holding a terminal degree (Sidle, 2020).

Data Collection

This study used multiple data collection sources, including document review, online surveys, and in-depth interviews. Multiple methods of data collection allowed for the triangulation of data, substantiated the findings, and ensured a more dependable analysis (Yin, 2018). Existing university documents were reviewed, including 4,348 qualitative, narrative comments from course evaluations. Narrative comments applicable to technology use in online courses for the spring and fall semesters were pulled, yielding 1,358 relevant comments that were used

in analysis. The analysis of documentation informed the development of online survey instruments. The survey asked for demographic and contextual background information related to the individuals' experience with online courses and gathered qualifying information that was used to screen faculty and student interview respondents. The surveys explored participants' level of experience with videoconferencing, allowing for a purposeful sample to be drawn for in-depth interviews so that faculty and student perceptions could be probed during the interview phase. In all, 35 faculty surveys and 67 student surveys were completed. Then, individual semi-structured interviews were conducted with 10 faculty members and 11 students on Zoom, totalling 572 minutes. With permission, the interviews were electronically recorded and transcribed through NVivo.

Data Analysis

There was a two-pronged approach for data analysis, including the use of the researcher as a coding instrument and the use of computer-assisted qualitative data analysis software. Analysis of the documentation review included a word frequency analysis of the qualitative comments through NVivo. A sentiment analysis was also conducted on the narrative comments. Further, the researcher coded the comments using thematic analysis, which revealed three relevant themes.

The online surveys included quantitative and qualitative data. While the quantitative data was analyzed through SurveyMonkey for descriptive statistics, the qualitative data was coded by the researcher and analyzed thematically. The quantitative and qualitative data from the surveys were grouped into several categories for analysis: faculty demographic analysis, student demographic analysis, faculty teaching modalities and methods, student learning modality and methods, faculty videoconferencing usage, student videoconferencing usage, faculty and Zoom fatigue, and students and Zoom fatigue.

Twenty-one in-depth, semi-structured interviews were conducted virtually using Zoom during a two-week period with a total of 572 minutes recorded. After each virtual meeting, the researcher wrote reflective field notes. Interviews were then transcribed, and the transcriptions were read and re-read to identify relevant themes. Interview participants were also sent their individual transcripts to review for accuracy.

Thematic analysis was used to code the interview transcripts and employed a pattern-matching analytic technique to strengthen the findings (Yin, 2018). The researcher identified patterns that emerged from the interviews as well as compared and contrasted responses between the faculty and student interviews. From 14 initial faculty codes, 10 emerged for final analysis, and an initial 10 codes for the student interviews were refined to six.

Results

The case study's principal findings provide a detailed description of how faculty and students experienced videoconferencing in their teaching and learning. While analysis found significant differences between faculty and student perceptions of videoconferencing use, both agreed that the built-in limitations of the mediated communication environment during videoconferences negatively affected the learning environment. Overall,

faculty and student felt frustrated with videoconference class sessions, and they desired more genuine, authentic face-to-face communication.

Document Review

Documentation from the institution revealed the extensive use of videoconferencing during the spring and fall 2020 terms. Through systematic review, three primary themes were identified from the 1,358 qualitative student comments from course evaluations: reactions to video content, reactions to videoconferencing, and reactions to instructor availability. Students primarily expressed positive reactions to the use of Zoom and recorded video lectures in their online courses. They also reported that faculty used communication technologies, such as email and Zoom to be available to them, even from a distance, to help them transition between in-person and online learning modalities. Sentiment analysis demonstrated their comments about the use of videoconferencing in online courses were overwhelmingly positive. For instance, one student wrote, "The offer for help was significant. Everyone offered help in any way possible for services like tutoring online and Zoom sessions. Professors supported students in staying motivated." Notably, neither Zoom fatigue nor a sense of tiredness was mentioned in the student course evaluation comments.

Surveys

Online survey instruments were distributed to 67 undergraduate faculty members and 654 undergraduate students during a two-week period. The faculty survey yielded a strong response rate of 50.2%, while the student survey response rate was 10.2%. With 35 faculty respondents and 67 student surveys, a total of 102 surveys were completed (14.13% overall survey response rate). Respondents represented an overall cross-section of the campus community.

According to the survey results, faculty overwhelmingly prefer to teach face-to-face (65.63%), while 18.75% reported they prefer teaching online, and 15.63% of faculty reported they prefer teaching hybrid courses. Of note, 21.88% of the faculty members had never taught an online course prior to spring 2020. Faculty reported they used a variety of instructional methods and delivery modes to reach students during the disruptive environment of 2020. When teaching online, almost a third of the faculty respondents preferred synchronous instruction with over half of them reporting they utilized live videoconference lectures during 2020. Faculty members revealed they spent a great deal of time videoconferencing with an average of 16.84 hours per week. All the faculty members disclosed they have felt tired after using videoconferencing tools with 31.25% reporting they always feel tired, 31.25% reporting they often feel tired, 34.38% reporting they sometimes feel tired, and 3.13% reporting they rarely feel tired. Most described their tiredness as both physical and mental fatigue. The faculty respondents emphasized physical reactions, effort, and anxiety issues when describing this fatigue. One instructor expressed, "In video class sessions, with the students hiding behind the dark screen, too often, I feel like I am doing all the talking, and I am worn out by the end of the session."

The majority of students also reported they preferred face-to-face courses (57.69%), while 25% preferred hybrid

courses with a blend of online and face-to-face instruction. Online instruction was preferred by a total of 17.31% of the students with most of them preferring asynchronous online instruction (13.46%) and only 3.85% preferring synchronous online instruction. Most students favored the use of recorded video lectures or PowerPoint slides with audio when they learn online. They reported using videoconferencing an average of 4 hours per week, and they had mixed feelings about the communication tool. Sentiment analysis revealed an even distribution of feelings with slightly more students discussing negative experiences, 30.43%, while 26.09% shared positive experiences. Another 26.09% described their videoconference experiences neutrally, and 17.03% described live videoconferencing during classes both positively and negatively. While most of the students, 90.38%, reported they had experienced Zoom fatigue, 9.61% of them reported they rarely or never had experienced the phenomenon. The students described their tiredness as both physical and mental fatifue, but they emphasized "too much screen time" as the cause. One student observed, "Looking at the screen is draining."

Interviews

The reflexive, interpretative analysis of the 21 in-depth, semi-structured interviews identified numerous themes central to understanding how faculty members and students experience mediated communication through videoconferencing during their teaching and learning in online courses. Further, they provide explanations of why they feel videoconferencing fatigue after these interactions. The stories from the interviews demonstrate some similarities and many differences in how faculty and students perceive the use of videoconferencing in their courses. Ten themes emerged from the faculty interviews, and six themes were identified from the student interviews.

Faculty Interviews

Instructors disclosed they used videoconferencing as part of their online instructional delivery methods because they evaluated videoconference interactions to be as close to face-to-face interactions as possible. In their responses, they discussed the communication technology's media richness in terms of verbal and nonverbal communication. Their insights about media selection and media richness are outlined in the theme, "The next best thing." Faculty revealed they were looking for "engagement," "interaction," "connection," and "human contact" by using videoconferences in their courses. One professor acknowledged, "I was trying to recreate that in-person experience."

Although instructors had the best intentions when they used videoconferences during class sessions, the reality of the videoconference classroom posed numerous challenges. Their frustrations are demonstrated in the theme, "Talking heads and black boxes," which includes a discussion of the awkward communication that confronted faculty and students during the sessions. Deficiencies in both nonverbal and verbal communication cues led to learning environments that faculty members described as "disjointed," "dysfunctional," and "awkward." One instructor admitted, "To be honest, you feel a little like the talking head unfortunately." Another added, "What we're doing right now feels like a 1955 newscast." Overwhelmingly, faculty members criticized videoconferencing's inability to communicate nonverbally. "Lack of feedback, lack of nonverbal cues, gestures,

facial expressions, all that is lost," one instructor acknowledged. Additionally, faculty members immense difficulty in teaching on videoconferences when students primarily have their cameras turned off. "On Zoom … individuals will disappear, and I don't know if they're behind the camera or not because they turn it off, and they'll mute, and I wonder if they're there," one professor explained. Faculty missed the lack of direct feedback. One shared, "You feed off your audience, and that doesn't happen with Zoom." Further, pausing and silences are also experienced differently on Zoom, according to the faculty respondents. "On Zoom, it's like talking to a brick wall. I tried so hard to get the conversation flowing and just struggled so much with it," an instructor revealed.

Teaching on videoconferencing also negatively impacted professors' instructional strategies, and those problems are identified in the theme, "Juggling act." Faculty members revealed significant pedagogical challenges faced them in the videoconferences. Many faculty members discussed problems with balancing the features of Zoom while maintaining focus on the content they were sharing. As one admitted, "It's just been hard in general, and the effort that goes into this is phenomenal."

An unexpected benefit of teaching virtually through videoconferencing, according to the faculty respondents, was the addition of a text-based feedback channel, and this theme is identified as "Let's chat." Many instructors discussed shy students, who rarely talk in face-to-face classroom, increased their level of engagement by using the chat feature. One explained, "Being behind a computer screen, for some reason, seems to help some students. The chat feature makes it better." Another observed, "You flip the script for the introvert."

Faculty members revealed the use of videoconference class sessions created an intersection of their identities that left them uncomfortable, and these feelings are addressed in the theme, "When worlds collide." Faculty members recognized that teaching from their homes to students who are also in their private spaces causes dissonance, stress, confusion, and fatigue for both students and faculty. This collapsing of professional and personal spaces presents several challenges, and faculty expressed how this issue complicates videoconferencing communication situations. One professor explained, "You're bring people into the spaces where you're not used to having what could be strangers or acquaintances…" Another admitted, "I still think I grapple with all the different intersections of my identity, and I know our students do that, too…. You don't want to make your sacred space a workspace."

The size of a Zoom session directly influences its effectiveness, and this theme is discussed under "Size matters." Faculty members identified small size as a crucial factor in effective videoconferencing sessions. Larger videoconference sessions resulted in more one-way communication and less two-way communication between participants, so the size of the class directly affected the ability of instructors to engage with students on the platform. One professor observed, "I think they feel more comfortable talking in small groups where everybody has their camera on…Students are less apt to talk if they can't read the room, if they can't see their classmates." Another explained, "A group of four or five or six people can have a real conversation. It's very different that 20, 30 students. It just becomes a one-sided conversation."

The theme, "Disconnected," describes faculty concerns about the effect of sporadic internet connectivity and technology accessibility on videoconference class sessions. Many faculty members reported they had experienced

difficulties that affected their abilities to manage their online courses. They were also concerned about students access to technology and WiFi, since many of them live in low-income homes. One shared, "One in three times, you get in there, and the technology doesn't work; you can't get your screen to share, or the internet's not doing well, and people are being dropped off all the time. And you have to go back and redo things over and over again. Sometimes, the whole thing shuts down."

Anxiety was often mentioned by faculty respondents who reported an interesting interplay between participants' anxiety levels and their videoconferencing experiences, which are highlighted in the theme, "State of anxiety." Zoom interacted with their anxiety levels in individual ways, calming anxieties for some while raising anxiety for others. For those who admitted they normally feel anxiety, Zoom was viewed as comforting. Faculty members shared that being able to socially interact with others during a time of social distancing relieved their overall anxiety. One disclosed, "Part of what is anxiety and depression is I don't like to feel isolated. Having this [Zoom] allows me to have something to get in touch with people, and that helps out tremendously," On the other hand, others confided how videoconferencing adds to their levels of anxiety, especially in large sessions with people they do not know. "Any time I have the camera on, that anxiety level goes up…I feel like people are staring at me because I'm bad about looking at everybody in the Brady Bunch boxes," one professor admitted. Instructors also expressed concern for their students and how their anxiety may be impacted by the communication technological tool.

In the theme, "Zoomed in on faculty fatigue," faculty members attribute the feeling of exhaustion to several factors. In addition to effects from anxiety, they admitted that teaching on videoconferences requires increased effort, and this extra work is a major driver of their feelings of tiredness. Faculty members also described the effects of multiple Zoom sessions, multi-tasking during synchronous classes, and the type of video call as contributing to their fatigue. The breakdown of classroom norms, the prevalence of one-way communication, and intense feelings of disappointed were also revealed as adding to their level of Zoom fatigue. According to one instructor, "I find it more tiring to teach on videoconference than in person." Others agreed. "I just feel tired," another admitted. Serial Zoom sessions was identified as a dominant cause of Zoom fatigue. One instructor described, "Back-to-backs are the worst, going from one video thing to another video thing." Another shared, "Maybe it's a subconscious anxiety from being on camera. It's like you're putting on a television show…I know that people are there virtually, but it's the feeling of being front stage in your backstage."

Finally, faculty members discussed videoconferencing's potential impact on the future of higher education in the theme, "Back to the future." Faculty members expressed conflicting feelings. While some found the communication technology offers many benefits in terms of convenience and flexibility for students, others observed that the college classroom may never be the same. One argued, "In the future, I think they'll be a lot more use of videoconferencing in online classes, more so than before." Others are concerned about the lasting effect on higher education. "Unfortunately, this pandemic has changed education forever," one claimed. Another shared, "Students have had a taste of what it can be. I think we're going to see more students expecting more flexibility in courses…If you give students the option of whether to Zoom or to come in person, they choose Zoom…It's kind of like Pandora's box has been opened."

Student Interviews

Student respondents revealed some similarities, yet striking differences with the faculty members' experiences, demonstrating the videoconference experience is markedly distinctive for faculty and students. Students claimed they and their peers were "overwhelmed" and "stressed" as they felt somewhat lost, negotiating a completely virtual college experience. Students recognized that professors were often trying to do the best they could; however, they expressed their frustrations with remote learning, citing difficulties with connecting to internet, communicating with instructors, and finding the energy to fully engage in their courses. Their frustrations led them to question the value and quality of the education they were receiving, as they noted critical differences between the instruction and communication that they had previously experienced in their courses.

While students appreciated the convenience of videoconferences, they perceived the virtual, synchronous environment as restricting their ability to interact with their instructors and classmates. These thoughts are evident in the identified theme, "Muted." A key feature of videoconferencing applications is the ability to turn the audio and video feeds on and off. Most students prefer to participate with their video and audio off. Students also reported that many professors required students to have their audio feed turned off during class sessions to limit interruptions and distractions. Therefore, students revealed they are essentially silenced. Feeling muted, literally and figuratively, during their videoconference class sessions was commonly expressed among the student respondents. They said they were frustrated because they were unable to communicate freely with their professors or peers. One student confided, "I'm usually muted with my camera off…Doing a lot of Zoom, you don't have that much interaction between students and even some professors who set out to where you can only see the professor, and so, you don't have any interaction between students." Another admitted, "So, the cameras being off. Everybody's muted. And when the teacher would ask, 'Do you guys have any questions?'… in the Zoom lecture, nobody is going to have a question because they're afraid to unmute their mic and turn on their camera." The problematic nature of asking questions on Zoom was repeatedly mentioned by students. One observed, "It's really hard to participate. The professor always mutes all of the students, and you have to get the professor's attention to speak. I do the hand waving emoji thing. And sometimes they don't see it. I'll start waving to the camera and sometimes, there are so many people in the class that they don't see me." The microphone on-off button confuses normal conversational patterns during videoconferences, according to the student participants.

The theme, "Zoomed out," accounts for students' description of Zoom class sessions as an "obligation" and "pointless." They primarily criticized the videoconference sessions' quality of instruction. Students claimed they were unable to stay focused during synchronous online videoconferencing sessions. While they attempted to meet the platform's unique demands and expectations, they found the experience often left them dissatisfied with the process and results. One student argued, "I'm just not getting what I should be getting out of classes." Another shared, "Most of the time, I feel like I haven't learned anything from that videoconference." Another student claimed, "The task of the day is to sit through them, and my body gets tense." One student described the Zoom sessions as "forced communication. It feels disingenuous, and you question whether or not it's worth being there. So, you have to try twice as hard or three times as hard just to get something out of the class."

The ever-present camera represents a particular dilemma for students, and their opinions are presented in the theme, "Camera shy." In a videoconference, the camera creates both opportunities and perceived threats for students. Students often reflected on the camera's intrusive presence in their homes, dorm rooms, and lives. One acknowledged, "If the professor says you don't have to have your camera on, 90 percent of the students will not have their camera on. So, that way it looks like they're in class, and that it makes me feel really awkward trying to have mine on when nobody else is on." There was also a marked preoccupation with the self-feedback video. One student observed, "I'm always constantly looking and making sure I don't have something wrong, like if my shirt's not fixed or hair or whatever…You can see yourself in your little camera, so you're constantly looking at not only the other people…but I always look at myself and just make sure that nothing's out of place or looks weird." Some students expressed how difficult it can be to share your private space to others on camera. One disclosed, "Most people have it [camera] off. I feel like this is because when you're in your house or in your dorm, that's your private space, and I feel like people just aren't comfortable with showing that part of their lives to everyone in the class."

Students also experienced numerous technical issues as shared in the theme, "Glitches." Students complained about access to adequate internet connections and technology. Of note, these problems occurred whether students lived on or off campus. One confided, "I have internet issues, and I'm always running to my grandparents' house, going down the road to a place I can get service. I've sat in my car and done some classes before."

The theme, "Zooming in on student fatigue," presents student reason for feeling tired after videoconferences. Students claimed they felt exhaustion, arguing videoconferences contribute to their overall sense of burnout. As one student described, "You're exhausted for about an hour," due to the digital interactions and what he described as "digital anxiety." Another revealed, "Honestly, sometimes, I feel like it drains more from me than doing something in person." He blamed the feeling on "looking at the screen a lot." Other students described an overall feeling of being overwhelmed. "I feel like I'm trying to take notes and trying to engage, so I try to answer questions, but then I forget. My train of thought is just everywhere. So, it's overwhelming," one student confided. The students identified the one-way communication in many videoconferences as a significant part of the problem. "I'll be in a Zoom, and you're just sitting there listening to someone lecture, and there's no class participation, so there's no other voices to listen to, and there's no change in the conversation that this professor is having; it's boring," a student shared. Students acknowledged videoconferences will affect their futures in the theme, "Back to the future 2." While students recognize videoconferencing will figure prominently in the future, they also recognized their experiences in the past year have prepared them for that future. One explained, "A lot of working remotely and learning remotely are going to become popular in the near future because we've seen that we can do it." Another observed, "I think that it's going to have a larger role in society."

Model of Zoom Fatigue

The survey results and interview findings revealed a clear sense of exhaustion associated with videoconferencing use. Faculty and students reported feeling Zoom fatigue, and they identified multiple factors cause it. Further analysis and interpretation of the data led to a proposed theoretical model of Zoom fatigue that includes four key

dimensions: situational factors, individual trait factors, environmental factors, and communication factors (see Figure 1). These factors are outlined in Table 1.

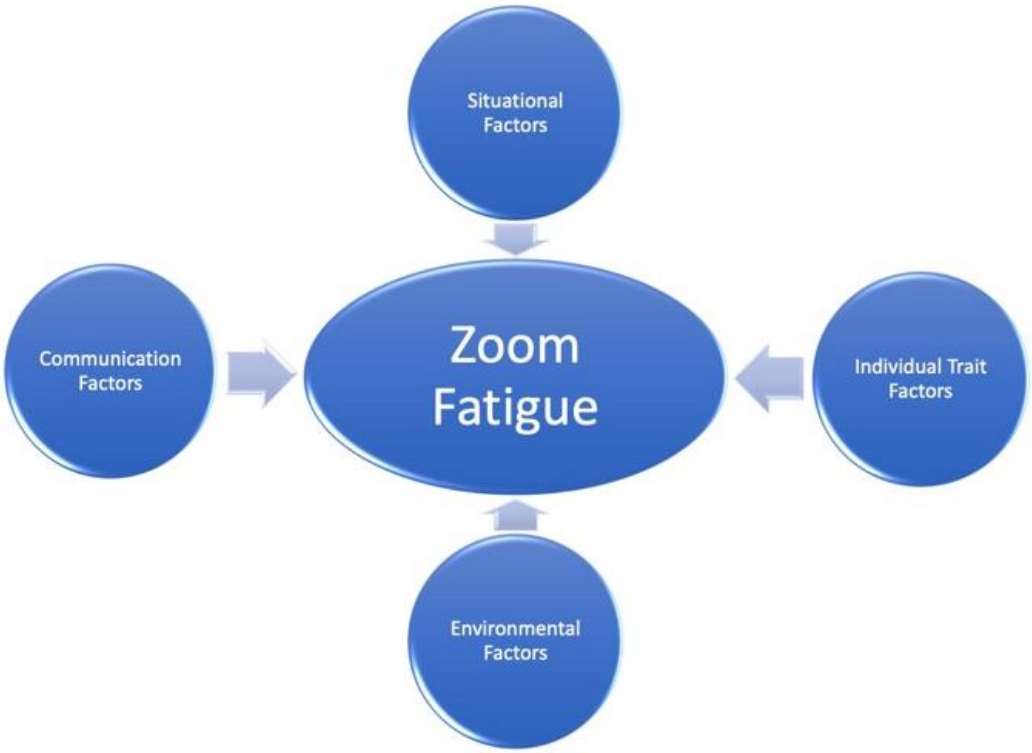

Figure 1. Model of Zoom Fatigue

Situational factors are defined as dimensions related to the specific conditions of a videoconference, such as the number of videoconferences scheduled a day, the size of the videoconference, the relationship among participants, the type of content shared in the videoconference, the level of participation (host or participant), and the amount of interaction during the videoconference. Individual trait factors pertain to a participant's characteristics, which include personality type, anxiety level, motivation, self-awareness, and self-esteem. Environmental factors consist of external elements, including background distractions, physical location, furniture, type of device, camera and microphone settings, and internet connectivity. Finally, communication factors emphasize the interaction aspects of verbal and nonverbal communication, which include conversation flow, lack of nonverbal cues, awkward silences, interruptions, overlapping, and feedback.

Table 1. Factors of Zoom Fatigue

Situational	Individual Trait	Environmental	Communication
number	personality	background	gestures
size	anxiety level	physical location	facial expressions
relationships	self-awareness	furniture	eye contact
type of content	self-esteem	device accessibility	pauses
host or participant		camera setting	interruptions
amount of interaction		microphone setting	overlapping
internet connectivity	feedback		

The combination and interaction of these four factors impact the level of Zoom fatigue that videoconferencing participants feel, according to survey and interview data.

Discussion

Since much of the research about the use of videoconferencing in higher education focused on older, site-to-site videoconferencing technology and was conducted from a quantitative approach, this study addressed a gap in the historical literature and considered the effects of web-based videoconferencing in college classrooms from a qualitative perspective. Although Bailenson (2021) discussed observations about Zoom fatigue in general, no research studies have explored the recently identified phenomenon of Zoom fatigue or have considered it in a higher education context. This qualitative case study was exploratory, seeking to emphasize faculty and student experiences with web-based videoconferencing and investigating causes of videoconferencing fatigue.

The case study cultivated a complex understanding of faculty and student perspectives through the analysis of 1,358 narrative comments on course evaluations, 35 faculty surveys, 67 student surveys, 10 in-depth faculty interviews, and 11 in-depth student interviews. The triangulation of multiple data collection methods and sources from the case study site enhanced the study's validity and reliability and provided a rich description of how videoconferencing is experienced by faculty members and students as they participate in online teaching and learning, enhancing the study's transferability. An understanding of the newly identified phenomenon of Zoom fatigue and its causes were carefully noted, and the foundation for a theoretical model of Zoom fatigue was proposed.

Although videoconferencing technology had existed for years, a global pandemic in 2020 normalized videoconferencing in many settings, including higher education. This study describes how faculty members included videoconferences as part of their response to an abrupt transition to teaching online because videoconferencing was perceived as a rich medium to communicate with students, closely simulating face-to-face classroom interactions. In practice, faculty and students found the supposed media rich videoconferences lacking in a number of ways that prevented and stymied natural conversation and interaction. While faculty and student experiences with videoconferences in courses greatly diverged, they both expressed frustration, disappointment, and dissatisfaction. Faculty members felt claimed many students did not interact on the videoconferences, with most of them opting to keep their cameras off during the sessions. This produced an environment in which faculty were often teaching to a wall of black boxes, and they were frustrated with trying to coax students to engage with the material or them. On the other hand, students felt discouraged from participating in the videoconferences and reported feeling hidden and muted. The inherent organizational structure of the mediated environment deterred their active participation. They argued instructor policies that required microphones be muted to prevent distractions also discouraged their direct feedback. Students felt uncomfortable with the process of muting and un-muting the microphone feature to ask or answer questions because they feared interrupting or overlapping the instructor or peers. In short, videoconferencing complicates many of the dimensions of the communication process, including feedback and nonverbal communication. As one student explained, videoconference class sessions are "not genuine." Stifled communication and disjointed videoconferences left faculty and students

desiring more natural interaction. The result was faculty members realized they weren't reaching students, and students felt they weren't learning. While videoconferences can effectively be implemented within college courses, the effort requires significant training, time, and design by faculty to ensure students are engaged with the material and don't view the sessions as "pointless."

Conclusion

During the pandemic of 2020, America's colleges and universities transformed their traditional ivory towers into a digital landscape that included LMS, discussion boards, learning modules, and videoconferences. In this virtual world of higher education, faculty connected with their students through the use of various digital tools with most implementing the use of videoconferences because they provide simultaneous visual and verbal communication, which simulate an in-person experience. Unfortunately, the extensive use of videoconferencing quickly led to the identification of Zoom fatigue. Since there is limited research about the effect of videoconferencing in higher education and even less known about Zoom fatigue, this research sought to better understand how mediated communication through videoconferencing affects the teaching and learning processes in online courses. This qualitative single-site case study explored how the synchronous online instructional strategy affected teaching and learning for faculty and students by examining documents, administering online surveys, and conducting in-depth interviews. This research also examined the causes of Zoom fatigue, a multi-dimensional problem that affects videoconferencing participants in meaningful ways. Specifically, the study explored how faculty and students experience Zoom fatigue in a higher education context, advancing a model for understanding the multiple factors that contribute to this phenomenon.

A comprehensive picture of how videoconferences affected faculty and students emerged from the analysis of data. The study's findings suggest several methods instructors may use to improve videoconferences in online courses to achieve learning outcomes. Videoconferencing is a complex construct for the higher education online classroom, and its implementation should be carefully designed as part of an online course's overall pedagogy. The use of videoconferencing in college classrooms should be integrated intentionally after extensive training and familiarity with the application and with much planning and preparation by faculty members. Furthermore, videoconferencing is appropriate in some, but not all, online classroom contexts. The findings advise faculty members do not plan sessions for a set time just because that is the course time. Every live, synchronous session on videoconference should have a demonstrated purpose and function. If there is a large amount of content that instructors need to deliver to students remotely, they should chunk the information into short, recorded videos as they are both preferred by students and more effective for achieving learning outcomes.

Additionally, instructors should recognize that large classes do not transition well into videoconference sessions. Instructors in videoconference sessions should see all students' screens at one time. Failing to do so creates a virtual barrier between students and faculty that discourages student interaction and engagement. If videoconferences are used for large class sizes, the findings recommend the classes be broken into smaller groups. Small groups communicate more effectively on videoconferences, according to both faculty and students. Student respondents also reported they were disappointed that they could not easily communicate with peers through

videoconference sessions, so instructors should intentionally design opportunities for student-student interaction, which will also improve learning outcomes.

Past research and the current findings suggest that students prefer autonomy in the use of technology in their courses. Therefore, professors should not mandate synchronous videoconference class sessions. It is recommended instructors schedule optional sessions, record them, and encourage attendance through incentives as effective strategies to appeal to students.

Further, instructors should consider student concerns about questions. To encourage interaction, faculty members should provide guidelines that address how students should ask questions during videoconferences. These guidelines should reference how and when they can participate with their microphone unmuted as well as the use of the chat box and reactions. Faculty members need to ensure students understand and are comfortable with these policies prior to holding online videoconference discussions.

Another method of facilitating concentration on the part of both students and faculty members is to keep content simple. Instructors should not plan too many screen switches during a class session; remember, less is more. Faculty members who switch between PowerPoint slides, videos, demonstration screens, and other content continuously throughout a class session reported they get overwhelmed and lose focus. Meanwhile, students also struggled to keep up with too many messages in a single session. Findings indicated faculty members should narrow the content to manageable bits of information and ensure that any screen changes are smooth and necessary.

To prevent Zoom fatigue, the findings indicate that videoconference participants consider the controllable factors in the theoretical model and plan accordingly for the aspects they cannot control. Situational and environmental factors are elements participants can actively address. Scheduling can be controlled, so participants should not schedule serial Zoom sessions. Space videoconferences apart, avoid too many in one day, and be sure to practice self-care by taking breaks in between sessions. To the degree possible, videoconference participants should control their background environment; if participating at home, create a professional space within the private space. Even more important is the type of furniture participants use for videoconferences, as posture is important during the session and contributes to the physical fatigue after a session. Another factor that participants can control is their level of engagement. Interacting on the videoconference through direct feedback, chatting, or the use of reactions will keep participants focused and motivated to listen, whereas passive listening behaviors cause more fatigue.

Technology and online learning will likely influence the shape of higher education for years to come. It is, therefore, essential stakeholders realize how to best reach students through online education and what role videoconferencing should play in online course delivery. While videoconferences promise video and audio communication in real time, in practice, faculty and students reported the synchronous digital interactions to be deficient in numerous ways. Compared to face-to-face communication, videoconferences violated several natural conversational patterns, negatively affecting the learning process. Faculty members felt disappointed because many students did not interact on the videoconferences as they had imagined. In an apparent contradiction,

students also reported feeling disappointed with the videoconference sessions because they felt hidden and muted by the organizational structure of the mediated environment and were deterred from actively participating and interacting during class sessions.

If all of this sounds exhausting, that's because it is. This exhaustion, labeled Zoom fatigue, emerged from the prevalent use of videoconferencing. This study advances a working model of Zoom fatigue to explain the multi-dimensional factors that cause it. The mediated, virtual communication environment offers opportunities and challenges for participants to navigate as they attempt to answer, "Who's Zooming' who?"

Recommendations

Since this study is exploratory in nature, the findings imply several avenues for future research to gain additional insights about the nature of mediated communication through videoconferencing, the problems associated with videoconferencing fatigue, and the application of synchronous videoconferences in higher education. As is often the case with qualitative research, follow-up research from a quantitative perspective will be useful in further examining the study's findings and addressing questions that arose.

The purpose of the study was to explore why videoconferencing fatigue occurs in higher education settings, and the data revealed Zoom fatigue as a complex, multidimensional concept worthy of further study. The study demonstrated there were psychological and physiological effects from virtual communication through videoconferencing, and a model of Zoom fatigue was advanced. Examination of the study's findings provides direction for future scholarship to further understand the phenomenon of Zoom fatigue and test some of the preliminary factors identified in the proposed model of Zoom fatigue. Specifically, Zoom fatigue is attributed to situational factors, individual trait factors, environmental factors, and communication factors. Follow-up studies to test these factors with a wider audience is necessary to better understand how videoconferencing fatigue operates. Such research should examine situational factors, including the number of videoconferences scheduled a day, the size of the videoconference, the relationship among participants, the type of content shared in the videoconference, the level of participation, and the amount of interaction during the videoconference. Individual trait factors should also be considered, such as the role of personality type, an individual's anxiety level, and the interaction of self-esteem. Environmental factors, such as background distractions, location, furniture, and internet connectivity should also be assessed in terms of how they affect fatigue. Communication factors, including difficulties in verbal and nonverbal communication, should be analyzed in future Zoom fatigue research. Further research is required to test the multiple variables associated with videoconferencing fatigue and investigate how the dimensions potentially interact with one another.

Follow-up study on some of the study's themes are also suggested. For instance, videoconference's chat function presents an interesting unit for future analysis. While faculty members expressed strongly the chat feature gave shy, introverted students a larger voice in the college classroom, this anecdotal evidence warrants further investigation. By administering a personality inventory and examining chat box conversations, researchers can determine whether a relationship exists between personality type and utilization of the chat feature in

videoconferences.

Another theme from the faculty and student interviews worthy of future research is the use of the camera feature in videoconferences. Student use of the camera during videoconferences and their personality type, self-esteem, and self-presentation behaviors deserve further research attention. Student perceptions of others presented on the videoconference camera is another area of research that include examining their impressions of peers and instructors. For example, research could examine whether an instructor's appearance on videoconference influences students' perceptions about instructor credibility, instructor presence, and satisfaction with the course and instructor.

Note

This paper is based upon the author's previous unpublished dissertation: Massner, C. Zooming in on Zoom fatigue: A case study of videoconferencing and Zoom fatigue in higher education [dissertation]. Lynchburg, VA: Liberty University. 2021.

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