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Virtual classes in the U.S. University: Exploring Zoom fatigue experience based on English competency and course engagement among international students

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Abstract

Online video conferencing platforms, such as Zoom, are widely used for virtual classes. Zoom platforms bring flexibility and convenience, but also contribute to fatigue which is called “Zoom fatigue”. The purpose of the study is to investigate Zoom fatigue among international students at the U.S. university, and its links to Zoom-mediated communication in the field of education. The study investigates 152 international students to examine how English competency affects Zoom fatigue, and how course engagement affects Zoom fatigue in virtual classes at the U.S. university. The results show that English competency and course engagement have a negative relationship with Zoom fatigue. The study implies that when international students have high English competency, they have less Zoom fatigue experience. In addition, international students have less Zoom fatigue experience when they engage in virtual classes. The study suggests future directions on how to decrease Zoom fatigue and increase course engagement among international students in virtual classes.

Keywords: English competency, course engagement, virtual classes, Zoom

fatigue

1. Introduction

In the digital age, technology is a pivotal resource for communicating with others. Instead of meeting in person, people communicate with each other through phone or online video conferencing platforms. Online platforms bring convenience and flexibility so people can communicate from any place at any coordinated time. These conveniences and flexibilities impact our interpersonal communication in the workplace and education. To put it another way, people start to replace in-person meetings or classes with Zoom meetings or classes. While offering convenience and flexibility, one drawback is whenever the usage time gets longer, people start to express negative feelings regarding how Zoom leaves them feeling exhausted and burned out. This phenomenon has been referred to as "Zoom fatigue" (McCabe et al., 2023; Nesher Shoshan & Wehrt, 2022; Riedl, 2022).

"Zoom fatigue" emerged as a newly coined word from the workplace when people started relying on online video conferencing platforms. Many studies explained that Zoom fatigue occurred because of cognitive loads (Lee, 2020; McCabe et al., 2023). The concept of cognitive load is that an individual has a limited capacity working memory to interact with unlimited long-term memory for thinking and learning. People feel Zoom fatigue in virtual meetings because they invest extra cognitive efforts in computer-mediated communication (CMC) to acquire, store, produce, and interpret knowledge. Thus, CMC focuses on cognitive processes because meanings can be differently interpreted, formed or comprehended depending on communication mediums (Yao & Ling, 2020).

As Zoom platforms have become embedded in our workplace and school, Zoom-mediated communication has taken part in our lives. Current studies found how people are using Zoom platforms in workplaces and education, and why people feel fatigued from Zoom platforms (Epstein-Shuman & Kushlev, 2022; McCabe et al., 2023; Nesher Shoshan & Wehrt, 2022; Riedl, 2022). People tend to feel more fatigued in Zoom platforms because more nonverbal cues are provided (e.g., viewing others/own screen, icons, chatting) compared to face-to-face communication mediums. Likewise, the Zoom medium requires more cognitive effort to interpret and produce information because of extra nonverbal cues (Bailenson, 2021; McCabe et al..2023).

As the number of virtual classes is increasing, especially since the pandemic, there should be more studies about Zoom fatigue in virtual classes. Specifically, the study should consider individual characteristics in Zoom-mediated communication distinguishing international students from domestic students because international students speak English as a second language. International students may be especially prone to experience fatigue if English competency exacerbates Zoom fatigue because of increased cognitive load. In addition, the study should consider how course engagement is related to Zoom fatigue in virtual classes among international students. Some of the studies show that Zoom tools increase course engagement in learning, but students also face the challenge such as Zoom fatigue (Peper & Yang, 2021; Kohnke & Moorhouse, 2022). Thus, the study focuses on international students who are studying at U.S. universities to explore how international students' English competency affects Zoom fatigue, and how international students' course engagement

affects Zoom fatigue. The ultimate goal of this research is to explore causes of Zoom fatigue to suggest future direction on how to decrease Zoom fatigue and increase course engagement among international students who are studying at U.S. universities.

2. Literature review

2.1. International students abroad

International students do not have U.S. citizenship or legal permanent resident status. So, they are allowed to stay in the U.S. temporarily for their studies with visas (e.g., F-1 student visa, H4, L2) (Clark, 2009). Many American colleges or universities accept a certain number of international students because it brings mutual benefits to students and institutions. First, international students can extend their perspective and enrich the learning environment by sharing their different views and cultures. International and domestic students can develop a deeper understanding by exchanging information, ideas, and support (Andrade, 2006; Grayson, 2008) which brings educational benefits to each other. Second, international students contribute to revenue because they pay full tuition fees. When domestic students take federal student loans to cover their tuition fees, the universities do not fully gain the money because the federal student loan funds are disbursed to the U.S. Department of Education. Namely, the U.S. Department of Education has the authority to regulate the federal student loan funds to the university and the funds can be used for only intended purposes (e.g., faculty salaries, campus maintenance, academic programs, etc.). Thus, international students' tuition fees directly help the university to support the operation without any restriction from the federal state or U.S. Department of

Education. Third, international students earn personal development such as improving foreign language skills, career development, and building networks (Costello, 2015). As the number of international students has increased in U.S. colleges and universities, especially since the pandemic (Hughes, 2023; Nietzel, 2023), it is important to study and learn from international students, to know how English competency and course engagement relates to Zoom fatigue.

2.2. Language competency

Language competency is one of the biggest challenges for international students adjusting to school and social groups (Andrade, 2006; Johnson, 1988; Wan et al., 1992; Yeh & Inose, 2003) because it is intertwined with their daily lives (e.g., ordering food, doing groceries in the store), social support (e.g., building social networks, sharing ideas and thoughts), and their academic work (e.g., understanding the courses, doing assignments). Many studies have revealed that low English competency increases international students' mental illness as well as academic stress to cope with those demands (Mori, 2000; Sandhu & Asrabadi, 1994; Wei et al., 2012). From this perspective, it is undeniable that international students' academic achievement is associated with English competency, which warrants investigation into virtual learning platforms.

2.3. Zoom classes

Virtual learning platforms are also known as online education platforms which the person does not have to be physically present on campus to learn or to teach (Minhas et al., 2021). Many educators are using the Zoom platform for their virtual classes because of high-quality audio and video. Zoom platforms assist people in

maintaining their careers and relationships without physically being in the same space. Instead of going to classes, many students can take the course remotely (e.g., home, coffee shop), which provides them with a comfortable atmosphere and convenience by saving their commuting time.

Despite the convenience, students who are using Zoom platforms feel fatigued during virtual classes (Epstein-Shuman & Kushlev, 2022; McCabe et al., 2023). The fatigue that people felt with the Zoom platforms was first shown in the workplace. People feel anxious, mentally or emotionally drained, or socially isolated when the duration of the time of videoconference becomes longer and longer referred to as "Zoom fatigue" (Nesher Shoshan & Wehrt, 2022; Riedl, 2022). Zoom fatigue has been widely shown in videoconferences because most employees feel physically trapped by staring at the screen for long periods, and women feel more fatigue than men (Fauville et al., 2021). Likewise, Zoom fatigue was also experienced in education settings by students who attend virtual classes.

Students felt Zoom fatigue in virtual classes especially when their camera was on (Epstein-Shuman & Kushlev, 2022). Zoom fatigue occurs after staring at the screen for a long time, especially when there is less interaction (Nadler, 2020). In virtual classes, students prefer the "chat" tool to communicate because students have less pressure to talk or engage in classes due to being in a different physical space than the professors (Moorhouse, 2020; Nadler, 2020). This difference in locations in virtual classes emphasizes the modes through which Zoom-mediated communication is experienced for professors and students during classes.

2.3.1. Cognitive load

As Zoom-mediated communication has different communication cues than face-to-face communication, Zoom-mediated communication will require extra cognitive effort for students to follow the virtual classes. Additionally, individual characteristics such as cultural background and English competency will be an important factor in gathering information through the Zoom platforms. For instance, international students might have difficulties comprehending the course material because of different cultural context and their low English competency. Therefore, Zoom fatigue will hinge on international students' English competency whether the camera is on or off, because they need extra cognitive effort to understand English.

To decrease Zoom fatigue in virtual classes, Zoom-mediated communication should be considered based on international students' English competency for two reasons. First, Zoom classes require multitasking which causes Zoom fatigue. To be specific, Zoom fatigue has been explained by five theoretical nonverbal mechanisms: mirror anxiety, physically trapped, hyper gaze, producing nonverbal cues, and interpreting nonverbal cues (Fauville et al., 2021; Raake et al., 2022). While international students can grasp information from the speaker in face-to-face classes, it is more complex for international students to comprehend the information in Zoom settings. As Zoom displays multiple screens, people feel anxious due to constantly viewing themselves which can lead to depression (Fauville et al., 2021; Fejfar & Hoyle, 2000). Viewing themselves is referred to as mirror anxiety while viewing others refers to hyper gaze (Fauville et al., 2021). Moreover, people feel physically trapped because they have to stay centered with the camera. These nonverbal

mechanisms catalyze Zoom fatigue because of the increased cognitive load (Fauville et al., 2021; Lee, 2020). Cognitive load explains that every individual has a limited-capacity information processing system to encode, store, and retrieve messages in interactions with people and environments (Lang, 2006). Given that, international students with lower English competency will likely experience higher Zoom fatigue as they process course information throughout a class on Zoom.

Second, Zoom-mediated communication requires additional cognitive efforts because of different and in ways limited communication cues compared to being in the physical classroom. Media richness theory associates the number of communication cues with the communication medium because the number of communication cues is different based on the communication medium (Daft & Lengel, 1986; El-Shinnawy & Markus, 1992). For instance, face-to-face communication is considered the richest medium compared to telephone and addressed written documents because face-to-face communication allows rapid mutual feedback and permits multiple communication cues, such as nonverbal, verbal, and contextual cues (El-Shinnawy & Markus, 1992; Suh, 1999).

Online applications for video conferencing, such as Zoom, provide high-quality visual and audio, replacing in-person classes with virtual classes facilitated on Zoom. However, there are some concerns about whether virtual classes can replace face-to-face classes (de Oliveira Dias et al., 2020; Gordon, 2020; Serhan, 2020; Toney et al., 2021). Since Zoom platforms can only provide communication cues via the screen, international students have to put more effort into producing and interpreting

the available communication cues because Zoom classes do not show the full body of others and professors and contextual cues such as atmosphere or situations.

As media richness theory states, an effective communication channel hinges on communication cues (Daft & Lengel, 1986). Specifically, richer communication media holds more communication cues to yield clear communication while low richness (e.g., full body posture) holds fewer communication cues allowing the message to be ambiguous and distorted (Daft & Lengel, 1986). Therefore, international students who have low English competency will be more likely to perceive messages as ambiguous and distorted because of limited and different communication cues in Zoom sessions. Thus, international students who have low English competency will have more cognitive loads to grasp the full meaning or nuance of the information which causes Zoom fatigue. So, the first hypothesis follows as below.

H1: International students' English competency will negatively relate to Zoom fatigue in virtual classes for those who study at U.S. university.

2.4. Course engagement and Zoom fatigue

Course engagement can be a pivotal factor for international students to continue their studies in colleges and universities in the U.S. because students' course engagement galvanizes students to learn and achieve their academic achievements (Appleton et al., 2008; Handelsman et al., 2005). Students' course engagement can be measured into two components: behavioral engagement (e.g., participation, doing

homework, taking notes, attendance, etc.) and affective or emotional engagement (e.g., desiring to learn, putting effort, being confident, etc.) (Handelsman et al., 2005; Newmann et al., 1992; Willms, 2003). To extend this conceptual work, course engagement merits further investigation in Zoom classes because the classroom environment is different from the physical one. Zoom classes provide various tools (e.g. breakout rooms, captions, and annotation tools) to facilitate class (Kohnke & Moorhouse, 2022; Lee, 2021). Therefore, more studies are needed to investigate how international students' course engagement relates to Zoom fatigue experiences in virtual classes.

International and domestic students show different course engagement because of cultural differences that are compounded by their English competency. For instance, American students are likely used to asking questions and participating actively in small-group discussions because of their K-12 education experiences. Comparatively, international students might be hesitant to ask questions and participate actively due to differing cultural norms. For example, Asian students (e.g., Taiwanese, and Chinese) prefer to be listeners rather than speakers. Furthermore, Asian students feel it is impolite to interrupt professors in the middle of a lecture (Balas, 2000).

In another perspective, international students might feel shy to participate in class because of their low English competency (Johnson, 1988; Wilson & Komba, 2012). International graduate students feel less confident speaking in English because it seems to be associated with their intelligence (Kuo, 2011). To be specific, if international graduate students do not speak fluent English in class, they think that

American students will see them as not intelligent. Thus, international students report that speaking is more difficult than writing when interacting with others because it cannot be edited or deleted once it is said. Also, international students' English proficiency can be evaluated instantly from pronunciation and grammar. Therefore, English competency is one of the barriers for international students to engage in courses.

Interestingly, the Zoom platform helps international students overcome the English competency barrier and enables students to engage in course material despite being anonymous or being in different spaces with professors. Moreover, students show positive reactions about Zoom tools for their learning in Zoom classes (Kohnke & Moorhouse, 2022; Lee 2021; Minhas et al., 2021). Some studies found that virtual classes help students learn foreign languages for being in small groups (Lee, 2021; Vurdien, 2019) because virtual classes in small groups increase students' motivation and confidence to learn the language (Vurdien, 2019). In addition, icons can be one of the tools to engage in class, and students can use the chat tool which is useful for students who are not good at speaking in English (Kohnke & Moorhouse, 2022). Therefore, international students with low English competency will have less stress and embarrassment to performing their English in virtual classes compared to face-to-face classes because there is indirect way to interact with classmates and an professor through various tools (e.g., icons, 1:1 chatting).

Also, co-annotating and screen sharing facilitate student learning in virtual classes (Kohnke & Moorhouse, 2022; Minhas et al., 2021). Zoom tools can assist international students to engage in classes as they can overcome their low English

competency by using Zoom tools (e.g., using a 1:1 chatting room, whiteboard, viewing captions), searching the words, or using a translation program. Searching words might help international students to follow along during Zoom classes. The translation program is beneficial for international students in their speaking and their writing. This autonomy ability (e.g., using the internet and Zoom tools) can give international students comfort and confidence to engage in classes. Therefore, the second hypothesis is:

Hypothesis 2: International students' course engagement will negatively relate to Zoom fatigue in virtual classes for those who study at U.S. university.

3. Method

3.1. Participants

The study employed a convenience sampling method to recruit participants from the international student population at Minnesota State University, Mankato. A total of 329 participants responded to the survey, but 177 participants were excluded due to incomplete surveys and for third-party gender options because of the small proportion of number. The study included a final data set of 152 international students. The demographics were measured: (1) biological sex (83 female, 55%), (2) age, measured in years (M = 23.30, SD = 4.6), and (3) years in college (M = 3.27 meaning junior, SD = 1.83). The survey included students' well-being, but it was removed for the purpose of the study. The survey approximately took about 5 minutes.

3.2. Variables

3.2.1. Control variables

According to previous studies, covariates were measured and included in the analyses to control the relationships between measures of interest (Fauville et al., 2021; Epstein-Shuman & Kushlev, 2022; Nesher Shoshan & Wehrt, 2022). Participants were asked, “How do you define your gender?” (83 female, 55%), “How many Zoom classes are you taking this semester?” (*M* = 1.30 meaning one class, *SD* = .60), “How much do you turn on-or-off video during the Zoom classes?” used a Likert response set, ranging from 1 (*Never*) to 5 (*Always*) (*M* = 2.75, *SD* = 1.48) and “How many minutes are you on Zoom in a typical class session?” (*M* = 86.66 meaning almost one hour and a half, *SD* = 39.60).

3.2.2. Independent variable

3.2.2.1. English competency

English competency was measured using the Perceived English Proficiency Scale (PEP; Wei et al., 2012). The PEP included five items to assess participants’ perception of their own English proficiency in listening, speaking, reading, writing, and overall English ability. The variable consisted of five items and used a Likert response set, ranging from 1 (*Very poor*) to 5 (*Excellent*) (*M* = 4.05, *SD* = .78). The reliability was satisfied because all of the items were higher than conventional criteria (Cronbach’s α = .95). Additionally, the average factor loading of convergent validity was higher than conventional criteria, indicating convergent validity was achieved (λ =0.83).

3.2.2.2. Course engagement

The Student Course Engagement Questionnaire (SCEQ) Handlesman et al. (2005): was used to measure college students' course engagement. Some of the questions were modified to make items more relevant for students who are using Zoom (e.g., "Listening carefully in class or carefully reading online course discussion posts" was changed to "Listening carefully in class or carefully reading Zoom classes material"). The variable consisted of 23 items representing four subscales (i.e., participation, performance, skills, emotional) and used a Likert response set ranging from 1 (*not at all characteristics of me*) to 5 (*very characteristic of me*) (see Table 1 for a summary of the items).

3.2.2.3. Factor analysis of course engagement

To test the scale's dimensionality, exploratory factor analysis using promax rotation was conducted using SPSS (version 27) to examine construct validity. Initially, some items were loading on other factors and those items were removed. In the end, nine items were clustered into three factors: participation, performance, and skills. The model revealed a good fit and retained three factors in the sample: Kaiser-Meyer-Olkin (KMO) = .83, $\chi^2(34) = 774.39$, $p < .001$ (see Table 2 for factor loadings of each construct and variances). Additionally, the reliability was satisfied because all nine items were higher than the conventional criteria (Cronbach's $\alpha = .89$). To develop a comprehensive measure of "course engagement", the individual scores of the retained variables associated with the three factors were summed and averaged ($M = 3.44$, $SD = .80$).

3.2.3. Dependent variable

3.2.3.1. Zoom fatigue

A 15-item scale to measure Zoom fatigue was developed by Fauville et al. (2021). To increase coherence in college course settings, scale items were modified to represent Zoom course facilitation (e.g., “How mentally drained do you feel after video conferencing?” was changed to “I feel mentally drained after Zoom classes”). The variable used a Likert response set ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) (see Table 3 for a summary of the items).

3.2.3.2. Factor analysis of Zoom fatigue

To test the scale's dimensionality, exploratory factor analysis using promax rotation was conducted using SPSS (version 27) to examine construct validity. In the initial factor analysis, one item produced split factor loading, that is, “I feel moody after the Zoom class”. In response, the emotional item with the other two items, which are, “I feel emotionally drained after the Zoom class” and “I feel irritable after the Zoom class”, were removed. In the end, twelve items were clustered into four factors: general, visual, motivational, and social. The model revealed a good fit and retained four factors in the sample: KMO = .87, $\chi^2(64) = 934.13$, $p < .001$ (see Table 4 for factor loadings of each construct and variances). Additionally, the reliability was satisfied because all the 12 items were higher than the conventional criteria (Cronbach’s $\alpha = .91$). To develop a comprehensive measure of “Zoom fatigue”, the individual scores of the retained variables associated with four factors were summed and averaged ($M = 2.67$, $SD = .75$).

4. Results

4.1. Correlations between independent variables and dependent variable

Initial analyses involved testing for the significance of correlations between the model variables using SPSS (version 27). This research tested for a relationship between Zoom fatigue and English competence $r(116) = -.20^*$, $p = .036$, and Zoom fatigue and course engagement $r(114) = -.24^*$, $p = .01$. Due to data that were missing randomly, the total number of participants was shown differently in the correlations and stepwise regression.

4.2. How does international students' English competency affect Zoom fatigue?

To test the first hypothesis between international student English competency and Zoom fatigue, the study used a stepwise regression model with SPSS (version 27) to test the model. The first block included control variables (biological sex, number of Zoom classes, Zoom class time, camera-on) and the second block includes the independent variable of English competency. The second block of adjusted R^2 is .101 which indicates that approximately 10% of the variance in Zoom fatigue in the sample can be accounted for international students' English competency. Also, the linear combination of Zoom fatigue with international students' English competency is significant ($F(5, 105) = 3.46$, $p = .006$). The result indicates that when international students' English competency is higher, international students report lower Zoom fatigue ($b = -.20$, $p = .028$). (see Table 5 for the result of regression).

4.3. How does international students' course engagement affect Zoom fatigue?

To examine the second hypothesis of international student course engagement and Zoom fatigue, the study used a stepwise regression model with SPSS (version 27) to test the model. The first block included control variables (biological sex, number of Zoom classes, Zoom class time, camera-on) and the second block includes the independent variable of course engagement. The second block of adjusted R^2 is .166 which indicates that approximately 17% of the variance in Zoom fatigue in the sample can be accounted for international students' course engagement. Also, the linear combination of Zoom fatigue with international students' course engagement is significant ($F(5, 103) = 5.30$, $p < .001$). The result indicates that when international students report higher course engagement, international students report lower Zoom fatigue ($b = -.35$, $p = <.001$) (see Table 6 for the results of regression).

5. Discussion

The current study investigates how Zoom fatigue is predicted by international students' English competency and course engagement. The study involved an online survey and used SPSS (version 27) to run stepwise regression, which confirmed support for the first and second hypotheses.

The first hypothesis predicted English competency to be negatively related to Zoom fatigue among international students attending the U.S. university. This implies that students report lower Zoom fatigue when international students' English competency is high. This finding aligns with arguments regarding computer-mediated communication and cognitive load. Computer-mediated communication explains that

students require extra cognitive effort to interpret, form, or comprehend the information because computer-mediated communication has different communication cues compared to face-to-face communication according to media richness theory. As the information is delivered via Zoom medium, international students will put extra cognitive effort into capturing the nuance and meanings because of their low English competency. In addition, international students will need extra cognitive efforts because of nonverbal mechanisms associated with the Zoom virtual environment, including mirror anxiety, feeling physically trapped, a hyper gaze, and producing and interpreting nonverbal cues. Previous studies showed that employees feel fatigued during the videoconference because of the five these nonverbal mechanisms (Fauville et al., 2021; Raake et al., 2022). The intense nonverbal cues might be the reason for Zoom fatigue among international students with low English competency because of increased cognitive loads. Therefore, the study shows that international students who have low English competency will likely have more Zoom fatigue in virtual classes.

The second hypothesis predicted course engagement to be negatively related to Zoom fatigue among international students attending a U.S. university. This implies that international students report lower Zoom fatigue when the students report higher course engagement. This finding aligns with behavioral engagement as the course engagement factors are participation (i.e., breakout rooms, discussion board, asking questions, and answering questions), skills (i.e., making sure to study regularly, finding ways to make the course material relevant to their life, applying course to their life), and performance (i.e., getting a good grade, doing well on the tests, solving all the homework problems). Previous studies found that breakout rooms and

nonverbal tools (e.g., written chat, icons) were useful tools for students to engage in classes especially for those who are not fluent in English (Lee 2021; Kohnke & Moorhouse, 2022; Vurdien, 2019), Zoom tools can decrease Zoom fatigue. Additionally, international students who have low English competency may increase confidence to participate in virtual classes because their faces are not always shown in virtual classes. Moreover, the Zoom platform may lessen Zoom fatigue because Zoom allows international students to engage more in virtual classes by using the Internet or translation programs to overcome their English barrier. Thus, Zoom platform may encourage international students to engage in virtual classes and decrease Zoom fatigue. In other words, international students will likely have less Zoom fatigue from engaging in virtual classes. Therefore, the study shows that course engagement is a pivotal element in decreasing Zoom fatigue for international students.

Like any other study, this study has potential limitations. Since the data was gathered at one institution, it restricts the breadth of applicability and generalizability of the findings. Therefore, the study should be examined in different institutions as well with a larger sample size. Additionally, the study did not measure the usage of Zoom tools to figure out how course engagement negatively relates to Zoom fatigue. Further studies are encouraged to measure usage of Zoom tools (e.g., chatting room, sharing screen, and breakout room section) to investigate how Zoom tools affect international students' course engagement.

Despite limitations, the study is meaningful in figuring out how English competency and course engagement are related to Zoom fatigue separately in virtual classes among international students. The study shows the ambivalence of virtual

classes that can be harmful and beneficial for international students who have low English competency. To sum up, international students with low English competency can decrease their Zoom fatigue through course engagement, but also Zoom fatigue can occur because of their low English competency.

There should be further studies to decrease international students' Zoom fatigue and increase course engagement. First, the study can advance the model putting the two variables (i.e., English competency and course engagement) together to see how they affect Zoom fatigue. Second, there should be more studies how to engage international students in virtual classes. Although some studies show that students engage in virtual classes more when they turn their camera on and when they show their facial and body expressions (e.g., nodding heads, giving thumbs up or down) (Epstein-Shuman & Kushlev, 2022; Peper & Yang, 2021), the future studies should investigate more thoroughly how it can be applied to international students and examine the proper time of Zoom classes as Zoom fatigue is associated with the amount of time staring at the screen (Epstein-Shuman & Kushlev, 2022; Nesher Shoshan & Wehrt, 2022). Lastly, there should be more studies about interpersonal communication in Zoom-mediated communication with emotional course engagement and emotional Zoom fatigue. Based on the factor analysis, emotional factors of course engagement (e.g., having fun in class, desiring to learn the material, and thinking about the course between class meetings) and emotional factors of Zoom fatigue (e.g., feeling emotionally drained, feeling irritable, and need time by themselves after the Zoom classes) were removed. This can show the limitation of virtual classes because of remoteness. Proximity is an important element to build relationships with a

professor and classmates (Bejerano, 2008). Therefore, there could be further study on emotional course engagement and emotional Zoom fatigue in virtual classes. A potential benefit of this future study would be to provide international students with social and academic support from interaction with other students and professors in virtual classes at U.S. universities.

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Table 1.

Survey questions for course engagement

Factors	**Items**
Participation	Raising my hand or answering questions in the Zoom class. Participating actively in breakout rooms or discussion board. Asking questions when I don't understand the instructor. Putting forth effort. Helping fellow students. Listening carefully in class or carefully reading Zoom classes materials.
Performance	Doing all the homework problems. Getting a good grade. Doing well on the tests.
Skills	Coming to class every day or logging on to the Zoom class regularly. Going to the professor's office hours or contacting him/her to review assignments or tests, or to ask questions. Taking good notes in class. Looking over class notes between classes to make sure I understand the material. Being organized. Staying up on the readings. Making sure to study on a regular basis. Finding ways to make the course material relevant to my life. Applying course material to my life.
Emotional	Thinking about the course between class meetings. Finding ways to make the course interesting to me. Really desiring to learn the material. Being confident that I can learn and do well in the class. Having fun in class.

Table 2.

Factors loading and variances of 9 items of course engagement

Course Engagement Items	Factor loading			Percentage of Variance	Cumulative
	1	2	3		
Factor 1: Participation					
1. Raising my hand or answering questions in the Zoom class.	**.95**	-.00	-.09	53%	53%
3. Asking questions when I don't understand the instructor.	**.83**	.09	-.03		
2. Participating actively in breakout rooms or discussion board.	**.76**	.02	.13		
Factor 2: Skills					
22. Applying course material to my life.	-.01	**.96**	-.01		
23. Listening carefully in class or carefully reading Zoom.	.00	**.94**	-.05	14.72%	67.72
20. Making sure to study on a regular basis.	.20	**.64**	.14		
Factor 3: Performance					
15. Getting a good grade.	-.12	.05	**.92**		
16. Doing well on tests.	-.12	.17	**.81**	9.72%	77.45%
4. Doing all the homework problems	.26	-.22	**.78**		

Table 3.

Survey questions for Zoom Fatigue

Factors	**Items**
General	I feel tired after the Zoom class.
	I feel exhausted after the Zoom class.
	I feel mentally drained after the Zoom class.
Visual	I feel my vision gets blurred after the Zoom class.
	I feel my eyes get irritated after the Zoom class.
	I feel my eyes hurt after the Zoom class.
Motivational	I feel dread doing somethings after the Zoom class.
	I feel like doing nothing after the Zoom class.
	I feel too tired to do other things after the Zoom class.
Emotional	I feel emotionally drained after the Zoom class.
	I feel irritable after the Zoom class.
	I feel moody after the Zoom class.
Social	I avoid social situations after the Zoom class.
	I just want to be alone after the Zoom class.
	I need time by myself after the Zoom class.

Table 4.

Factors loading and variances of 12 items of Zoom fatigue

Zoom Fatigue Items	Factor loading				Percentage of Variance	Cumulative
	1	2	3	4		
Factor 1: General						
2. I feel exhausted after the Zoom class.	**.95**	-.04	.02	-.01		
3. I feel mentally drained after the Zoom class.	**.94**	.05	-.04	-.03	50.78%	50.78%
1. I feel tired after the Zoom class.	**.89**	-.01	.03	.01		
Factor 2: Visual						
4. I feel my vision gets blurred after the Zoom class.	.03	**.94**	.02	-.13		
5. I feel my eyes get irritated after the Zoom class.	-.07	**.90**	-.03	.11	12.42%	63.21%
6. I feel my eyes hurt after the Zoom class.	.05	**.87**	.01	.03		
Factor 3: Social						
14. I just want to be alone after the Zoom class.	-.05	.06	**.96**	-.02		
13. I avoid social situations after the Zoom class.	-.03	.05	**.89**	.00	11.40%	74.60%
15. I need time by myself after the Zoom class.	.10	-.11	**.84**	.04		
Factor 4: Motivational						
8. I feel like doing nothing after the Zoom class.	-.03	-.06	-.02	**.94**		
9. I feel too tired to do other things after the Zoom class.	-.06	.01	.05	**.92**	6.64%	81.24%
7. I feel dread doing somethings after the Zoom class.	.24	.12	.00	**.57**		

Table 5.

The effect of English competence on Zoom fatigue

Variables	*B*	β	SE
Block 1: Control variables			
Gender (female = 1, male = 0)	.18	.13	.13
Number of Zoom classes	.26	.18	.13
Zoom classes time	.00	.07	.00
Camera-on	.10*	.20*	.05
R^2		.10	
Adjusted R^2		.07	
F-value (4, 106)		2.97*	
Block 2: Independent variable			
English competency	-.20*	-.20*	.09
R^2		.14	
Adjusted R^2		.10	
F-value (5, 105)		3.46**	

Note. * $p < .05$, ** $p < .01$, *** $p < .001$, $N = 111$.

Table 6.

The effect of course engagement on Zoom fatigue

Variables	*B*	β	SE
Block 1: Control variables			
Gender (female = 1, male = 0)	.17	.12	.13
Number of Zoom classes	.25	.18	.13
Zoom classes time	.00	.06	.00
Camera-on	.10	.20	.05
R^2		.09	
Adjusted R^2		.06	
F-value (4, 104)		2.70*	
Block 2: Independent variable			
course engagement	-.35***	-.35***	.09
R^2		.21	
Adjusted R^2		.17	
F-value (5, 103)		5.30***	

Note. * $p < .05$, ** $p < .01$, *** $p < .001$, $N = 109$.

Appendix -Survey Questions

Introduction:

The purpose of this research is to understand how international students' English competency affects Zoom classes, course engagement, and well-being.
Thank you for participating in the survey. A survey will take approximately 5-6 minutes. **For participating in the survey, one of the lucky winners will earn a Starbucks e-card gift card worth $30 via email and ten people will earn a Starbucks e-card gift card worth $10 via email.**

Please know that this research is being conducted by Esther Son, a Graduate Assistant, under the guidance of Dr. Kristen Cvancara (kristen.cvancara@mnsu.edu), Professor, Dr. Deepa Oommen (deepa.oommen@mnsu.edu), Associate Professor, and Dr. Anne Kerber (anne.kerber@mnsu.edu), Associate Professor, in the Department of Communication and Media at Minnesota State University, Mankato. If you have any questions, please email Ms. Son (esther.son@mnsu.edu). If you want to stop participating in the survey for any reason, I will honor your request. Your choice to participate or not in this survey will not result in any negative consequences.

1. Are you an international student in the U.S.?
   a. Yes
   b. No (→ End the survey)

2. Have you already completed this survey on how international students' English competency affects Zoom classes, course engagement, and well-being: (Allow multiple answers)

   a-1. this Fall 2023 semester-No
   a-2. this Fall 2023 semester -Yes (→ End the survey)
   b-1. last Spring 2023 semester -No
   b-2. last Spring 2023 semester -Yes (→ End the survey)

3. How long have you been in the U.S.?
   - Less than 6 months
   - 6 to 12 months
   - 1 to 3 years

- 4 to 6 years
- 7 years or more

4. What is your mother tongue?
    - Arabic
    - Chinese
    - English
    - French
    - German
    - Hindi
    - Japanese
    - Korean
    - Portuguese
    - Russian
    - Somali
    - Spanish
    - Vietnamese
    - Other- please specify: _____
5. Where were you born?
    - Africa
    - Asia
    - Australia/New Zealand
    - Europe
    - Latin America
    - Canada
    - Other- please specify: _____
6. Are you taking Zoom classes this semester? Yes/No
7. How many Zoom classes are you taking this semester?

    _____ class/classes

8. How many minutes are you on Zoom in a typical class session? (Write it in minutes)

    _____ minutes

9. How many minutes do you turn the camera on in a typical Zoom class session? (Write it in minutes)

    _____ minutes

10. How much do you estimate you turn on camera during the Zoom class?

Never	Seldom	About Half the Time	Usually	Always

11. English Competency

Please read each statement and mark the degree which indicates your English Competency. There are no right or wrong answers. Do not spend too much time on any statement.

	Very poor	Poor	Average	Good	Excellent
How would you rate your English-speaking ability?					
How would you rate your English listening ability?					
How would you rate your English reading ability?					

How would you rate your English writing ability?					
How would you rate your English overall ability?					

12. Zoom fatigue

Please read each statement and mark the degree which indicates how much the statement applied to you when you are participating in Zoom class sessions. There are no right or wrong answers. Do not spend too much time on any statement.

Questions	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
I feel tired after the Zoom class.					
I feel exhausted after the Zoom class.					
I feel mentally drained after the Zoom class.					
I feel my vision gets blurred after the Zoom class.					
I feel my eyes get irritated after the Zoom class.					
I feel my eyes hurt after the Zoom class.					
I feel dread doing somethings after the Zoom class.					
I feel like doing nothing after the Zoom class.					
I feel too tired to do other things after the Zoom class.					

I feel emotionally drained after the Zoom class.					
I feel irritable after the Zoom class.					
I feel moody after the Zoom class.					
I avoid social situations after the Zoom class.					
I just want to be alone after the Zoom class.					
I need time by myself after the Zoom class.					

13. Student Course Engagement

To what extent do the following behaviors, thoughts, and feelings describe your experience with Zoom classes? Please mark each of them on the following scale: 1 = not at all characteristic of me, 2 = not really characteristic of me, 3 = moderately characteristic of me, 4 = characteristic of me, and 5 = very characteristic of me.

Questions	Not at all like me	Not really like	Moderately like me	Like me	Very much like me
Raising my hand or *answering questions* in the Zoom class					
Participating actively in *breakout rooms* or *discussion board* discussions					
Asking questions when I don't understand the instructor					
Doing all the homework problems					
Coming to class every day or *logging on to the Zoom class regularly*					
Going to the professor's office hours or *contacting him/her* to review assignments or tests, or to					

ask questions					
Thinking about the course between class meetings					
Finding ways to make the course interesting to me					
Taking good notes in class					
Looking over class notes between classes to make sure I understand the material					
Really desiring to learn the material					
Being confident that I can learn and do well in the class					
Putting forth effort					
Being organized					
Getting a good grade					
Doing well on the tests					
Staying up on the readings					
Having fun in class					
Helping fellow students					
Making sure to study on a regular basis					
Finding ways to make the course material relevant to my life					
Applying course material to my life					
Listening carefully in class or carefully reading Zoom classes materials					

14. **Depression and anxiety** - Depression, Anxiety and Stress Scales-Short Form (DASS; Lovibond & Lovibond, 1995).

Please read each statement and mark the number 0, 1, 2 or 3 to indicates how much each statement applies to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:
0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree, or a good part of time
3 Applied to me very much, or most of the time

1	**In the past week,** I found it hard to wind down.	0	1	2	3
2	I was aware of dryness of my mouth.	0	1	2	3
3	I couldn't seem to experience any positive feeling at all.	0	1	2	3
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion).	0	1	2	3
5	I found it difficult to work up the initiative to do things.	0	1	2	3
6	I tended to over-react to situations.	0	1	2	3
7	I experienced trembling (eg, in the hands).	0	1	2	3
8	I felt that I was using a lot of nervous energy.	0	1	2	3
9	I was worried about situations in which I might panic and make a fool of myself.	0	1	2	3
10	I felt that I had nothing to look forward to.	0	1	2	3
11	I found myself getting agitated.	0	1	2	3
12	I found it difficult to relax.	0	1	2	3
13	I felt down-hearted and blue.	0	1	2	3
14	I was intolerant of anything that kept me from getting on with what I was doing.	0	1	2	3

15	I felt I was close to panic.	0	1	2	3
16	I was unable to become enthusiastic about anything.	0	1	2	3
17	I felt I wasn't worth much as a person.	0	1	2	3
18	I felt that I was rather touchy.	0	1	2	3
19	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat).	0	1	2	3
20	I felt scared without any good reason.	0	1	2	3
21	I felt that life was meaningless.	0	1	2	3

15. Can you tell us more about how your grades are impacted in a class that uses Zoom compared to a class that doesn't?

[open-ended answer for participants to type …]

16. How do you define your gender?

- Male
- Female
- Non-binary/third gender
- Prefer not to answer

17. How old are you in year? _____

18. What is your ethnicity? (Mark all that apply)

- Asian
- Caribbean/West Indian
- Hispanic or Latino
- Latin American
- Middle Eastern
- European
- Other- please specify: _____

19. What is the highest level of school you have completed or the highest degree you have received?

- Less than high school degree
- High school degree or the equivalent (e.g., GED)
- Some college but no degree
- Bachelor's degree
- Master's degree
- Associate degree
- Doctorate degree

20. What year are you in university?

- Freshman
- Sophomore
- Junior
- Senior
- Master program
- Ph.D. program
- Professional program (e.g., TESOL/TESL/TEFL)
- Graduated student

21. What is your major?

- Art/Music
- Business
- Education
- Engineering
- Hard Sciences
- Health
- Liberal Arts
- Math/Stats/Computer Science
- Social Sciences
- Other- please specify: _____

22. What is your current marital status?

- Single
- Divorced
- Married
- Separated
- Widowed
- Rather not say

23. How comfortable are you in classes that require you to use Zoom software and its features?

Not at all	Little Comfortable	Somewhat Comfortable	Comfortable	Very Comfortable

24. Do you currently have a physical or mental disability that substantially limits one or more major life activities such as seeing, hearing, learning, interacting with others, walking, etc.?

- Yes
- Temporarily disability
- No
- Prefer not to respond

24. If you are interested in being the lucky winner of a prize package, please click the links to leave your contact information (contact information will be separated from the survey data you just completed). Click on this link.