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Faculty computer-mediated communication apprehension during shift to emergency remote teaching: implications for teacher-student interactions and faculty organizational outcomes

Kristen LeBlanc Farris[1]*, Luke A. Dye[2], Marian L. Houser[1] and
C. Erik Timmerman[1]

[1]Department of Communication Studies, Texas State University, San Marcos, TX, United States,
[2]Department of Communication, Cornell University, Ithaca, NY, United States

Guided by the model of faculty readiness for online teaching (FROT), the goal of the current study was to investigate the influence of instructors' knowledge (e.g., online teaching preparation), confidence (e.g., computer-mediated communication apprehension; CMCA), and attitudes about online teaching (e.g., perceived usefulness) on their communicative and organizational outcomes (e.g., communication frequency and satisfaction, job satisfaction, motivation). We recruited 206 college instructors from a variety of institutions to report on their experiences during the transition to emergency remote teaching in the spring 2020 academic semester. Results from the study suggest that instructors' CMCA was a significant and negative predictor of instructors' communication satisfaction with online student interactions, job satisfaction, and motivation to teach after controlling for the other predictors in the model. Taken together, the findings suggest that CMCA may serve as a barrier to instructor communication competence in online teaching and may have deleterious impacts on instructor affect toward their positions. Ultimately, we recommend that faculty workshops aimed at developing online teaching competence should specifically address instructor dispositional and affective characteristics such as CMCA to prevent faculty vulnerability.

KEYWORDS

instructor computer-mediated communication apprehension, faculty readiness for online teaching, pandemic pedagogy, teacher-student interactions, teacher satisfaction

Introduction

As universities and colleges across the globe instituted swift social distancing measures in spring 2020 to mitigate the spread of COVID-19, instructors were left to figure out how to maintain academic continuity in their courses. For most instructors, this meant transitioning their courses to an online format, or what some scholars identified as "emergency remote teaching" (Quintana and DeVaney, 2020)—emphasizing the abrupt shift to virtual class formats during times of crisis (Hodges and Fowler, 2020). Unfortunately, not all faculty reported having access to the necessary personal or organizational resources to successfully transition their courses to virtual or remote

formats (Farris et al., 2022a), and as a result, many instructors reported a significant decrease in various motivating job characteristics during this time when compared to pre-pandemic scores (Kulikowski et al., 2022). Consequently, the purpose of the current study is to explore how faculty members' knowledge, attitudes, and confidence impacted their communicative and organizational outcomes during the initial wave of the COVID pandemic. More specifically, guided by the model of faculty readiness for online teaching (FROT; Martin et al., 2019), we investigate whether instructors' confidence (measured via computer-mediated communication apprehension), predicts their communication satisfaction and frequency with their students, as well as their job satisfaction and motivation above and beyond their knowledge (e.g., online teaching preparation), and attitudes (e.g., perceived usefulness) toward online teaching.

Model of faculty readiness for online teaching

The faculty readiness for online teaching model (FROT; Martin et al., 2019) is guided by assertions in health behavioral change models (Rollnick et al., 2010) and predicts that faculty who are more knowledgeable about online teaching best practices, have more prosocial attitudes regarding online teaching as a distinct form of instruction, and are more confident in their online teaching competence, are likely to have better success in online teaching (Martin et al., 2019). For the current study, *knowledge* is conceptualized by online teaching preparation or faculty members' experience, expertise, and training in online teaching. Given the context of emergency remote teaching in the initial wave of the novel coronavirus pandemic (and during the time of data collection for this study), we selected online teaching preparation as an important factor predicting both communication and organizational outcomes. According to some estimates, approximately half of university instructors were teaching online courses during the pandemic without any formal training (Saha et al., 2022). This is problematic given that instructors identified their lack of familiarity with online teaching as a primary challenge they experienced during the pandemic (Ma et al., 2021).

Moreover, existing scholarship suggests that improved online teaching preparation is positively associated with a host of prosocial outcomes including greater teaching effectiveness, accommodation of students' learning needs, student engagement, faculty satisfaction with their jobs and faculty motivation (Shea, 2007; Richter and Idleman, 2017; Liu et al., 2019; Joardar and Kara, 2023). Based on these previous findings, we predict that instructors who transitioned face-to-face courses to an online modality during the pandemic and with less online teaching preparation would also report lower communication frequency and quality with their students and lower job satisfaction and motivation. These assumptions are grounded in the context of emergency remote teaching during the spring 2020 academic semester when university instructors in our sample and across the globe shifted their courses to online formats with very little notice or choice (Drueke et al., 2021).

> *H1: Instructors' online teaching preparation is positively associated with their self-reports of a) communication frequency with their students, b) communication satisfaction with their students, c) satisfaction with their job, and d) job motivation.*

In addition to proposing an association between instructors' knowledge and online teaching readiness, the FROT model also asserts that instructors' attitudes toward technology will impact their online teaching success (Martin et al., 2019). In the current study, instructor *attitude* is conceptualized by the construct of instructors' perceived usefulness of technology or "the degree to which [an instructor] believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). We opted to expand this conceptualization to explore instructors' perceptions of the usefulness of online teaching modalities more broadly as opposed to a focus on specific platforms or technologies.

Many studies guided by the technology acceptance model provide evidence of a positive statistical association between perceived usefulness of technology and both behavioral intentions and actual technology use (Hoffman, 2013; Granić and Marangunić, 2019; Drueke et al., 2021) as well as job satisfaction among online university instructors (Fülöp et al., 2022). Similarly, existing literature demonstrates that faculty who perceived online modalities as useful to their achievement goals during the shift to emergency remote teaching also report less burnout in their jobs and earn more positive evaluations of their teaching effectiveness from their students (Daumiller et al., 2021). Consequently, we assert that instructors who perceive teaching online to be more useful during the initial wave of the COVID-19 pandemic also report communicating more frequently with their students, report greater satisfaction with their online student interactions, and will be more satisfied with and motivated in their jobs.

> *H2: Instructors' perceived usefulness of online teaching modalities is positively associated with their self-reports of a) communication frequency with their students, b) communication satisfaction with their students, c) satisfaction with their job, and d) job motivation.*

Lastly, the FROT model also predicts instructor confidence to be positively associated with effective online teaching (Martin et al., 2019). In the current study, instructor *confidence* is assessed through a deficit lens via computer-mediated communication apprehension (CMCA) or "an individual's tendency to feel apprehensive or anxious when using or anticipating using computers as a medium to interact with another person or persons" (Clarke, 1991, p. 7). The inclusion of CMCA is warranted given the empirical evidence indicating teacher-student interactions via online modalities was one of the primary anxieties and stressors experienced by faculty who felt forced to incorporate educational technology into instructional processes (Syvänen et al., 2016) and during the shift to emergency remote teaching during the early stages of the pandemic (Pu, 2020).

Although similar constructs—such as computer anxiety—have been explored in relation to faculty technology acceptance and effectiveness in online teaching, anxiety related to using computers is not synonymous with the fear of using computers *to*

communicate with others (Igbaria and Parasuraman, 1989; Scott and Timmerman, 2005). For example, faculty may feel comfortable with the use of computers as tools to accomplish their research tasks yet feel apprehension about communicating with students during a virtual synchronous class session. Similarly, instructors may feel confident to use technology in their traditional, campus classrooms, yet still feel apprehensive about using online teaching technology to interact with their students.

Similarly, an important conceptual distinction exists between CMCA and general communication apprehension—the fear related to oral communication and/or anticipated oral communication with others (CA; McCroskey, 1982; Scott and Timmerman, 2005). Although some data suggests that people with greater general CA strategically seek out computer-mediated communication as a means to connect with others as compensation for their anxiety during in-person interactions (Ho and McLeod, 2008; Shalom et al., 2015; Hutchins et al., 2021), other findings provide evidence that general experiences of CA also translate to computer-mediated interactions especially when the specific technologies facilitate oral communication (Reinsch, 1985; Scott and Rockwell, 1997; Scott and Timmerman, 2005; Hunt et al., 2012). These contradictory findings can likely be explained via trait and situational CA; whereas trait CA is considered an individual's stable personality trait, situational CA refers to anxiety triggered by a specific situation and context (McCroskey and Beatty, 1986). Thus, CMCA is a specific form of situational CA focused on anxiety resulting from interacting with others via online teaching modalities.

Finally, to further distinguish between these constructs, Scott and Timmerman (2005) report that CMCA accounts for additional explained variance in technology use after controlling for general CA and computer anxiety. Thus, theoretical and empirical evidence supports that CMCA is a distinct construct and that other "forms of apprehension may not fully capture users' anxieties related to communication with a given technology" (Scott and Timmerman, 2005, p. 692). Consequently, we included CMCA as a predictor in the current study based on the evidence that faculty experience apprehension related to online teaching interactions (Pu, 2020) and on the premise that faculty did not voluntarily opt in to transition their courses to virtual formats during the spring 2020 academic semester (Drueke et al., 2021).

Although to our knowledge, no existing scholarship explores the associations between university instructors' reports of CMCA and their communicative and organizational outcomes, previous research in other contexts suggests that CMCA impacts attitudes toward technology (Hunt et al., 2012), actual technology use (Clarke, 1991; Brown et al., 2004; Scott and Timmerman, 2005), and technological competence (Wrench and Punyanunt-Carter, 2007). Additionally, CMCA is theorized to influence interactants' behaviors via increased avoidance, withdrawal, disruption or inappropriate communication, and overcompensation or over-communication (McCroskey and Beatty, 1986). Moreover, Spitzberg's (2006) model of computer-mediated communication competence proposes that CMCA would impact competence in online interactions.

There is empirical evidence to support this line of theorizing in the context of social media wherein participants who self-report higher CMCA scores are also less likely to use specific platforms to interact with others (Hunt et al., 2012). These

associations are similarly evinced in virtual teams wherein high CMCA team members engaged in lower participation quality (based on task-oriented messages and new topics introduced) and quantity and received lower performance evaluations in comparison to low CMCA team members (Fuller et al., 2016). Furthermore, previous research has demonstrated that employees with higher CMCA levels who were required to work remotely during COVID-19 reported lower levels of rapport with their supervisors. This suggests CMCA has important organizational implications, particularly in the context of mandatory mediated communication during COVID-19 (McGloin et al., 2022). Thus, while specific organizational outcomes may vary by occupation and associated tasks, we expect that CMCA influences instructor job-related outcomes for online instructors during the initial wave of the pandemic. Given the existing literature, it is likely instructors with greater CMCA also report communicating less frequently with their students, feel less satisfied with online interactions with their students, and report decreased job satisfaction and motivation.

> *H3: Instructors' computer-mediated communication apprehension is negatively associated with their self-reports of a) communication frequency with their students, b) communication satisfaction with their students, c) satisfaction with their job, and d) job motivation.*

Outcomes of interest

First, in the current study we include instructor communication frequency and communication satisfaction with students as representations of faculty online teaching readiness—the primary outcome of interest in the FROT model (Martin et al., 2019). This decision is based on conceptualizations of course communication as a subdimension of faculty readiness for online teaching in previous studies (e.g., Martin et al., 2019). While communication frequency is characterized by how often instructors communicated with their students each week after the shift to emergency remote teaching in spring 2020, *communication satisfaction* refers to positive impressions of interactions that align with the communicators' expectations and accomplish their goals (Hecht, 1978). These communication behaviors are also indicators of instructor communication competence (Spitzberg, 2006), and recent empirical evidence suggests that students' perceptions of instructors' communication with them is positively associated with their course and communication satisfaction as well as improved learning, motivation, and self-reported retention during the initial wave of the COVID-19 pandemic (Farris et al., 2022b).

Finally, we included job satisfaction and motivation as outcomes of interest based on a recent re-conceptualization of the FROT model. Cutri and Mena (2020) argue the importance of considering factors that "could impact faculty teaching online and represent a form of professional vulnerability" (p. 369). Consequently, job satisfaction and motivation are included as a means of assessing instructors' professional vulnerability and affective responses to the unique experience of "forced distance teaching and learning" (Drueke et al., 2021, p. 2) during the spring 2020 academic semester. *Instructor job satisfaction* is

conceptualized as positive "affect toward their profession and their students" (Plax et al., 1986, p. 379), while *motivation* is defined as "a teacher's passion for instructing students…even in unfavorable working conditions" (Adarkwah, 2023, p. 304). As evidence of this professional vulnerability, job satisfaction is reported to have significant, negative associations with teacher turnover intentions and burnout in a recent meta-analysis (Madigan and Kim, 2021). These authors also argue that job satisfaction and motivation are likely to have similar associations and suggest that increasing both faculty job satisfaction and motivation may have buffering or protective effects for retaining teachers in the profession (Madigan and Kim, 2021). Thus, exploring the specific instructor variables that predict faculty job satisfaction and motivation may ultimately help protect faculty from professional vulnerability.

Taken together, the goal of this scholarship is to explore whether instructors' CMCA accounts for additional variance in the outcomes of interest above and beyond perceived usefulness of online teaching modalities and online teaching preparation. It is logical to assume that if (a) instructors perceive technology to be more useful for online teaching, (b) if they are more prepared to use those online teaching technologies, and (c) are less apprehensive about communicating in mediated contexts, they would also report greater communication frequency and satisfaction with their online student interactions. As many others have discussed, the additional cognitive and emotional demands expected of instructors during the abrupt shift to emergency remote teaching had negative implications for instructors' personal and professional outcomes (Hilger et al., 2021; Moorhouse and Kohnke, 2021; Kulikowski et al., 2022). We assert that instructors with more online teaching preparation, greater perceived usefulness of online teaching modalities, and lower CMCA will report less job dissatisfaction and de-motivation.

> H4: Instructors' reports of CMCA will account for additional variance in a) communication frequency with their students, b) communication satisfaction with their students, c) job satisfaction, and d) motivation after controlling for online teaching preparation and perceived usefulness of online teaching modalities.

Method

Participants

We contracted Qualtrics panel services to recruit instructors of higher education (N = 206) in June of 2020. To participate in the current study, faculty must have been teaching at the college-level during the spring 2020 academic semester and must have experienced the transition from teaching (at least partially) face-to-face courses to online class formats. After acknowledging informed consent and completing the cross-sectional, online survey, participants were compensated $15.

The sample in the current study was evenly distributed in sex/gender identity (Male = 54%, Female = 45%). Instructors were primarily White/Caucasian (78.2%), full-time employees at their respective institutions (74%), and taught courses at the undergraduate level (80%) at the time data was collected.

Instructors were evenly split in terms of tenure status (50% non-tenured, 49% tenure-track or tenured), while rank was more varied: Lecturer/Instructor (28.2%), Full Professor (27.7%), Adjunct Instructor (17.5%), Associate Professor (13.1%), Assistant Professor (11.7%). Instructors taught in the following disciplines: STEM (36.9%), humanities (23.3%), social sciences (13.6%), business (7.3%), health and health sciences (6.3%), fine arts (3.9%), professions (3.4%), library and information sciences (2.4%), and education and child development (1.9%).

Instruments

CMCA was measured by Scott and Timmerman's (2005) 5-point, Likert-type scale with larger values representing greater CMCA. Sample items included: "I would enjoy giving a presentation to others online" and "I look forward to the opportunity to interact with others on the computer." *Online teaching preparation* was operationalized with Robina and Anderson's (2010) instrument with response options (1 = Strongly Disagree, 5 = Agree) of larger value suggesting greater online teaching preparation. Sample items included: "I have met with an instructional support expert during an online teaching experience" and "I have been given release time to develop an online course." *Perceived usefulness of online teaching modalities* was measured by a revised version of Davis's (1989) 5-point, Likert-type scale. Sample items included: "Using online content improves my teaching performance" and "Using online content enhances my effectiveness in class." Larger means on this scale represent a greater perceived usefulness of online teaching modalities.

Instructors' *communication frequency* with their students was measured with one item that asked how often they communicated with their students each week after the shift to emergency remote teaching in spring 2020. Instructors' *communication satisfaction* with their students was measured by a shortened version of Goodboy et al.'s (2009). Likert-type scale including items such as "I dislike talking with my students" and "When I talk to my students, the conversations are rewarding." Response options included 1 = Strongly Disagree to 5 = Strongly Agree; thus, larger values indicate greater satisfaction with online student interactions. Instructors' *job satisfaction* was measured by the Generalized Belief Model (GBM; McCroskey and Richmond, 1989). Instructors responded to 5-point, semantic-differential items with sample response options including "disagree-agree," "no-yes" related to the prompt, "I am very satisfied with my job." Instructors completed Baringer and McCroskey's (2000) 5-item, semantic-differential scale as an operationalization of *instructor motivation*. Instructors responded to response options including "motivated-unmotivated" and "dreading it-looking forward to it" when asked about how they felt about their job-related motivation since the shift to online teaching. Larger values for both job satisfaction and motivation indicate greater magnitude of these variables for participants.

Results

Prior to the primary analyses, we conducted a normality check and explored the collinearity diagnostics of the predictors.

Please see Table 1 for the descriptive statistics and Table 2 for the bivariate correlations of the study variables as evidence of the data's alignment with these statistical assumptions.

To test H1$_{a-d}$-H4$_{a-d}$, we conducted four hierarchical regressions with instructors' online teaching preparation and perceived usefulness of virtual teaching modalities entered in step one and instructors' CMCA entered in step two of the model. Instructors' communication frequency, communication satisfaction, job satisfaction, and motivation were entered as dependent variables, respectively in the separate models. Results suggest the covariates in the model significantly predicted instructors' communication frequency with their students [$F_{(3,202)}$ = 6.71, p <0.001], communication satisfaction with their students [$F_{(3,202)}$ = 17.05, p < 0.001], job satisfaction [$F_{(3,202)}$ = 28.04, p < 0.001] and instructors' motivation [$F_{(3,202)}$ = 34.38, p < 0.001]. The predictors in the models accounted for ~8% of the variance in communication frequency (R^2_{adj} = 0.08), 19% of the variance in communication satisfaction (R^2_{adj} = 0.19), 28% of the variance in job satisfaction (R^2_{adj} = 0.28) and 33% of the variance in instructors' motivation (R^2_{adj} = 0.33).

Results of H1$_{a-d}$ primarily support our predictions: *online teaching preparation* positively predicted instructors' communication satisfaction their students (β = 0.37, p < 0.001), motivation in their positions (β = 0.22, p < 0.01) and job satisfaction (β = 0.20, p < 0.01). Contrary to predictions, online teaching preparation did not significantly predict communication frequency (β = 0.16, p = 0.07, *95% CI:* −0.01, 0.34). Thus, H1 was partially supported.

Results of H2$_{a-d}$ indicate *perceived usefulness of online teaching modalities* was a significant and positive predictor of instructors' communication frequency with their students (β = 0.19, p = 0.04), their job satisfaction (β = 0.22, p < 0.01) and their motivation in their teaching positions (β = 0.21, p < 0.01). Contrary to predictions, perceived usefulness of online teaching modalities was a significant, but negative predictor of instructors' communication satisfaction with their students (β = −0.17, p = 0.05). Thus, H2 was partially supported.

Results of H3$_{a-d}$ and H4$_{a-d}$ provide evidence that *instructors' CMCA* accounted for significantly more variance in three outcomes (e.g., communication satisfaction, job satisfaction, motivation) after being added to the model. Additionally, instructors' CMCA was negatively associated with communication satisfaction (ΔR^2 = 0.04, β = −0.25, p = 0.002), job satisfaction (ΔR^2 = 0.06, β = −0.32, p < 0.001), and motivation (ΔR^2 = 0.05, β = −0.27, p < 0.001). Contrary to our predictions, CMCA did not account for any additional variance in communication frequency and was not a significant predictor of this outcome (ΔR^2 = 0.00, β = 0.01, p = 0.87). Thus, H3 and H4 were partially supported.

Discussion

The goal of the current study was to explore the impacts of instructors' computer-mediated communication apprehension (CMCA), online teaching preparation, and perceived usefulness of online teaching modalities on their communication and organizational outcomes. Through this study, we responded to

calls from scholars (e.g., Baran et al., 2011; Cutri and Mena, 2020) to expand the faculty readiness for online teaching model (FROT; Martin et al., 2019) to center instructor disposition and affective responses to online teaching demands through the inclusion of instructor CMCA as the primary predictor of interest. We recruited faculty in June 2020 to reflect on their experiences of transitioning face-to-face courses to the online environment during the initial wave of the coronavirus pandemic in the spring 2020 academic semester. Scholars have labeled this unique experience as "emergency remote teaching" (Hodges and Fowler, 2020; Quintana and DeVaney, 2020) and "forced distance teaching and learning" (Drueke et al., 2021) to emphasize the required obligation of faculty to abruptly shift their courses to virtual class formats. Given this context and theoretical framing, we predicted that instructor confidence (e.g., CMCA) would account for additional variance in the outcomes (e.g., communication frequency and satisfaction, job satisfaction and motivation) after controlling for instructor knowledge (e.g., online teaching preparation) and instructor attitudes (e.g., perceived usefulness) of online teaching modalities.

Collectively, the findings suggest the importance of CMCA to the experience of faculty transitioning their courses to online formats during the pandemic. Although the hypothesis predicting the association between CMCA and instructor communication frequency was not supported in the current study, CMCA remained a strong, negative predictor of instructor communication satisfaction with their students as well as instructor professional outcomes (e.g., job satisfaction, motivation) after controlling for the other predictors in the model. This suggests that instructors who experience greater levels of CMCA are also more likely to report decreased communication quality of their online student interactions, decreased satisfaction with and motivation to continue their jobs. This is after having considered instructors' feelings about the usefulness of online teaching to their jobs and their previous experience, training, and expertise with online teaching. These findings are aligned with critical re-conceptualizations of the FROT model that assert faculty affective responses should be considered as evidence of faculty (un)readiness and that this may impact instructors' professional vulnerability (Baran et al., 2011; Cutri and Mena, 2020).

Additionally, our findings support previous theorizing (McCroskey and Beatty, 1986; Spitzberg, 2006) and scholarship suggesting CMCA is associated with competence in virtual contexts (Wrench and Punyanunt-Carter, 2007; Fuller et al., 2016; McGloin et al., 2022). CMCA may serve as a barrier to instructor communication competence in online teaching environments given its negative association with communication quality and quantity in the current study. This may be particularly problematic, because instructor communication quality and quantity during the transition to emergency remote teaching and learning predicted various student outcomes including cognitive learning and motivation, stress and depression, and retention (Farris et al., 2022b). Moreover, given that faculty CMCA was predictive of decreased job satisfaction and motivation in the current study, this may indicate that CMCA is not only impedes teacher-student online interactions but may also have implications for faculty turnover via instructors' decreased job satisfaction and motivation (Madigan and Kim, 2021).

TABLE 1 Descriptive statistics for study variables.

	Mean (SD)	α	Skewness	Kurtosis	VIF	Tolerance
Perceived usefulness of online modalities	3.17 (1.18)	0.93	−0.22	−0.93	1.78	0.56
Online teaching preparation	3.53 (1.08)	0.87	−0.52	−0.56	1.71	0.58
Computer-mediated communication apprehension	2.42 (0.89)	0.84	0.38	−0.33	1.58	0.63
Communication frequency	2.48 (1.11)	–	0.71	−0.08	–	–
Communication satisfaction	4.33 (0.52)	0.75	−0.68	0.47	–	–
Job satisfaction	3.98 (1.01)	0.96	−0.98	0.43	–	–
Motivation	3.82 (0.88)	0.85	−0.43	−0.35	–	–

TABLE 2 Bivariate correlations between study variables.

	Variable	1	2	3	4	5	6	7
1	Perceived usefulness of online modalities	1	0.60**	−0.55**	0.28**	0.19**	0.45**	0.47**
2	Online teaching preparation		1	−0.53**	0.27**	0.40**	0.39**	0.46**
3	Computer-mediated communication apprehension			1	−0.17*	−0.35**	−0.49**	−0.51**
4	Communication frequency				1	0.13	0.13	0.18**
5	Communication satisfaction					1	0.36**	0.32**
6	Job satisfaction						1	0.76**
7	Motivation							1

**p < 0.01, *p < 0.05.

Counter to our predictions, perceived usefulness of online teaching modalities was the only significant predictor of instructors' communication frequency with their students after controlling for the other predictors in the model; this suggests that when university instructors perceived online teaching to be more useful, they also reported more frequent weekly online communication with their students during the transition to emergency remote teaching. Our findings also suggest a negative association between perceived usefulness of online teaching and communication satisfaction. Perhaps the scale's focus on the efficiency of teaching online explains both findings. For instance, the items emphasize how the use of online teaching technology "increases productivity" and enables instructors "to accomplish [their] work more quickly." As a result, it is possible that faculty who perceive online teaching technology to be adept at facilitating quick communication would also put that teaching technology to more frequent use in communicating messages to their students. These faculty may also recognize that even though these technologies may be efficient and productive, they may not be satisfied with the quality of the online interactions these technologies afford to them.

Based on these findings, faculty development and teaching and learning center specialists should focus their efforts on managing instructors' CMCA as a means of developing instructor communication competence in online teaching. Some CMCA experts assert the importance of prescreening remote workers, such that instructors should self-select to teach online as opposed to being required to do so (Fuller et al., 2016). However, given that the pandemic created "forced online teaching" (Drueke et al., 2021) and even greater demand for remote teaching beyond the initial waves

of the pandemic, this may not be feasible (Cutri and Mena, 2020). Following the advice of scholars researching faculty experiences during the pandemic, higher education administrators should also emphasize reduction of job demands and simultaneous increase of resources as a means of minimizing CMCA among instructors (Zhang et al., 2022). As we have argued elsewhere, tangible, institutional support in the form of financial incentives and/or purchasing of hardware/software necessities as well as emotional and instrumental support through collective sensemaking and brainstorming/training sessions for faculty teaching online may help reduce these demands (Farris et al., 2022a). Future research should specifically explore resources and interventions that help instructors manage and minimize their CMCA. One logical starting place would be to test the efficacy of systematic desensitization, cognitive modification, and computer-mediated communication skills training as these are all empirically validated processes for minimizing general forms of communication apprehension (Bodie, 2010).

The results of the current study should be interpreted with the following limitations in mind. The cross-sectional design limits causal assertions regarding the associations of interest, and the homogenous sample limits the generalizability of the findings. Additionally, given that communication frequency was measured using a single item, it was not possible to assess the reliability of the measure. It may be that participant responses varied regarding what "counts" as a single instance of communication with students (e.g., does an email interaction thread with one student count as a single interaction or several interactions? Does a class announcement count as one interaction or 30?). This

likely explains the small variance accounted for in communication frequency by the predictors in the current study. Future studies should employ multi-item measures for communication frequency when able, especially in computer-mediated contexts. Additionally, the non-significant associations between the predictors and the communication frequency measure might be indicative of method variance given that all measures were collected cross-sectionally and that most measures assessed instructor affect.

Future directions

Scholars should consider collecting longitudinal data to explicate the potential bi-directional effects between the study variables and should attempt to recruit more representative faculty samples. Moreover, additional data related to the frequency of specific types of messages (e.g., task-oriented, relational-oriented) as well as the communication platforms or technologies instructors used to communicate with their students would be helpful. Relatedly, obtaining actual messages from faculty-student online interactions would not only aid in the potential method variance bias but also provide more objectivity to the study of online teacher-student interactions. Finally, collecting data about how instructor online teaching preparation, perceived usefulness of teaching modalities, and CMCA predict faculty members' enactment of instructional communication behaviors (e.g., verbal and non-verbal immediacy, confirmation, clarity, social presence, etc.) from both instructor and student perspectives would provide a better understanding of instructors' communication competence in these online interactions with their students.

Conclusion

Although the initial waves of the COVID-19 pandemic and accompanying emergency remote teaching are behind us, scholars have already begun identifying the long-lasting implications to higher education. For instance, there are initial reports for greater demand among students and administrators for online learning at the college-level since the start of the pandemic (McKenzie, 2021), and some scholars argue that this increased demand will make opting out of online teaching nearly impossible (Cutri and Mena, 2020). Moreover, we assert that requiring online teaching as a means of maintaining academic continuity during other forms of class disruption (e.g., natural/weather disasters, faculty medical/family leave, grid failures, etc.) will likely be one of the major legacies of COVID-19′s impacts on higher education. As a result, these findings suggest the importance of helping faculty manage their computer-mediated communication apprehension, appreciate the usefulness of various online teaching technologies, and be prepared via hosting online teacher training sessions—preferably before a crisis occurs. Collectively, these strategies

may impact instructor communication competence through more frequent and satisfying online interactions between teachers and students and may help faculty be more motivated and satisfied in their roles.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Texas State University Institutional Review Board. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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