Journal Pre-proof

What predicts the use of interaction-oriented pedagogies? The role of self-efficacy, motivation, and employment stability

Gabe Avakian Orona, Qiujie Li, Peter McPartlan, Carrie Bartek, Di Xu

PII: S0360-1315(22)00069-0

DOI: https://doi.org/10.1016/j.compedu.2022.104498

Reference: CAE 104498

To appear in: *Computers & Education*

Received Date: 26 March 2021

Revised Date: 3 February 2022

Accepted Date: 12 March 2022

Please cite this article as: Orona G.A., Li Q., McPartlan P., Bartek C. & Xu D., What predicts the use of interaction-oriented pedagogies? The role of self-efficacy, motivation, and employment stability, *Computers & Education* (2022), doi: https://doi.org/10.1016/j.compedu.2022.104498.

Author Contributions:

- **Gabe Avakian Orona**: Conceptualization; Data curation; Formal analysis; Methodology; Project administration; Visualization; Roles/Writing - original draft; Writing - review & editing.
- **Quijie Li**: Conceptualization; Project administration; Roles/Writing - original draft; Writing - review & editing.
- **Peter McPartlan**: Conceptualization; Roles/Writing - original draft; Writing - review & editing.
- **Carrie Bartek**: Data curation; Project administration; Resources; Roles/Writing - original draft; Writing - review & editing.
- **Di Xu**: Conceptualization; Data curation; Project administration; Funding acquisition; Investigation; Roles/Writing - original draft; Writing - review & editing.

What predicts the use of interaction-oriented pedagogies? The role of self-efficacy, motivation, and employment stability

Gabe Avakian Orona[a], Qiujie Li[b], Peter McPartlan[c], Carrie Bartek[d], & Di Xu[a]

Gabe Avakian Orona (corresponding author)
[a]University of California, Irvine
School of Education
3200 Education Bldg.
Irvine, CA 92697-4150
United States of America
E: gorona@uci.edu

Qiujie Li
[b]New York University
New York, NY 10003
United States of America
E: ql16@nyu.edu

Peter McPartlan [c]
[c]San Diego State University
5500 Campanile Dr, San Diego,
CA 92182
United States of America
E: pmcpartlan@sdsu.edu

Carrie Bartek
[d]Wake Technical Community College
9101 Fayetteville Rd,
Raleigh,
NC 27603CA 92182
United States of America
E: cebartek@waketech.edu

Di Xu
[a]University of California, Irvine
E: dix3@uci.edu

Declarations

Funding This work was supported by the National Science Foundation 17-537 DRL – Core R&D proposal #1750386

Conflicts of interest/Competing interests Not applicable

Declarations of interest: NONE

Availability of data and material Upon request

Code availability Upon request

Authors' contributions:

Conflicts of interest/Competing interests (include appropriate disclosures): Not applicable

Ethics approval (include appropriate approvals or waivers): NA

Consent for publication I consent to have this article published and confirm it is neither published or considered for publication elsewhere.

Author Contributions:

- **Gabe Avakian Orona**: Conceptualization; Data curation; Formal analysis; Methodology; Project administration; Visualization; Roles/Writing - original draft; Writing - review & editing.
- **Quijie Li**: Conceptualization; Project administration; Roles/Writing - original draft; Writing - review & editing.
- **Peter McPartlan**: Conceptualization; Roles/Writing - original draft; Writing - review & editing.
- **Carrie Bartek**: Data curation; Project administration; Resources; Roles/Writing - original draft; Writing - review & editing.
- **Di Xu**: Conceptualization; Data curation; Project administration; Funding acquisition; Investigation; Roles/Writing - original draft; Writing - review & editing.

Abstract

In this study we investigate college instructors' use of practices that facilitate interactions in online college courses. We begin by drawing on several strands of literature to offer a person-purpose interaction framework with two dimensions – one regarding the entities involved in the interaction (instructor, student, content) and the other regarding the pedagogical goal of the interaction (academic, social, managerial) – that result in six sub-domains of practices. Subsequently, we examine the frequency of, and factors associated with instructors' use of these six domains, using survey data collected from online college instructors (N=126) from a large community college. The results show that instructors using more interaction-oriented practices consistently have greater employment stability and teaching load, greater self-efficacy for using learning management systems, and greater perceived benefits of online learning for students. The findings have several implications for future research examining pedagogical behavior, as well as the design of professional development activities aimed at enhancing the use of effective online instructional practices among college instructors.

Keywords: online interaction; instructional practices, higher education; online education

1. Introduction

The physical separation of online college courses, coupled with a heightened demand for self-direction, often leads to diminished instructor-student and student-student interactions. This presents obstacles for students to engage in the course content, which may lead to feelings of isolation and low levels of performance (e.g. Huguet, et al., 2001; Kennette & Redd, 2015; Moore, 1989; Nissenbaum & Walker, 1998). The importance of connecting students—to each other, to instructors, and the course content—has led researchers and practitioners to propose an array of instructional techniques which fall under the broad category of "interaction-oriented practices" (Anderson, 2004; Moore, 1989). While both instructors and students perceive interaction-oriented practices as important (e.g., Bolliger & Martin, 2018; Martin et al., 2018), there is limited empirical evidence regarding the actual use of these techniques in current college online classes, and even less is known about the factors related to using (or not using) them. The purpose of this study is to: (a) gain insight into the extent to which these practices are implemented in college online classes and (b) understand the instructor characteristics and perceptions related to their use.

In pursuit of this contribution, we collect survey data from 126 instructors who taught at least one online course in the last three years at one community college. Information collected includes: (i) instructor background characteristics, including their demographic characteristics, teaching experiences, and employment stability; (ii) instructor use of online interaction-oriented practices; and (iii) instructor perceptions of online education. Using these data, we focus on two research questions (RQ):

RQ1: Whether and to what extent are online interaction-oriented practices implemented in college online classes?

RQ2: To what extent are instructor characteristics and perceptions of online learning associated with their use of online interaction-oriented practices?

We conduct this study at the community college setting instead of a four-year institution based on three considerations. First, community colleges enroll a large proportion of students who need to balance learning with family and work responsibilities, leading to high demand in and particularly fast growth of online learning (McFarland et al., 2017; Monaghan & Attewell, 2015; Wyner, 2014). In addition, there is a more urgent need to improve online instruction and learning at community colleges since existing research consistently identifies high course withdrawal rates, low course performance, and increased equity gaps in online courses at community colleges (e.g., Alpert, et al., 2016; Xu & Jaggers, 2011; 2013; 2014; Hart, et al., 2018). Thirdly, research conducted at community colleges identifies pronounced variations in instructors' teaching practices in online courses (e.g., Author 5; Cox, 2006; Jaggars & Xu, 2016; Tirrell and Quick, 2012), suggesting a fruitful setting to understand determinants of instructional practices and approaches.

Given higher education's unanticipated and sweeping transition to online education in response to the COVID-19 pandemic, it is likely that four-year institutions and other community colleges may begin to exhibit online course design and teaching practices akin to this study's institution (Lederman, 2020). Thus, although this study collects data from one community college only, lessons learned from this study are likely to be useful to college administrators and professional development program directors at higher education institutions nationwide.

2. Literature Review

To our knowledge, no single theoretical framework completely encapsulates both instructional practices specific to online courses and the instructor perceptions that predict their use. In the ensuing literature review, we therefore draw on multiple frameworks to situate the current study, beginning with a discussion of the online instruction frameworks.

2.1 A conceptual framework for understanding interaction-oriented practices in online learning

We build on two existing frameworks in understanding instructional practices centered on interactions in online courses. The first one is Moore's (1989) prominent distance education framework, which has been used for decades in the online instruction literature (e.g., Anderson, 2004; Bolliger & Martin, 2018; Wagner, 1998). Moore (1989) proposes three types of interactions that are critical for learning in virtual environments, including student-content, instructor-student, and student-student interactions. Based on Moore's framework, it is essential for instructors to not only provide instructional materials that help students interact intellectually with the course content, but also to provide sufficient opportunities for both instructor-student and student-student interactions (Moore, 1989; Morris, et al., 2005; Yang & Cornelious, 2005).

The second group of frameworks pivots on the pedagogical goal of the interaction. For example, the widely known community of inquiry (CoI) model offers a framework for considering the core dimensions of effective online learning through three overlapping presences: teaching presence, social presence, and cognitive presence. Among the three, a well-implemented teaching presence (i.e., the design, organization, and delivery of the course) plays a central role to support and enhance student cognitive presence (i.e., students actively constructing meaning) and social presence (i.e., students and instructors presenting themselves to

each other as “real people”) in online courses (Garrison, et al., 1999; 2001; 2010). In addition, multiple studies suggest that instructors’ efforts to organize learning activities and create a routine (e.g., sending regular announcements to students, Martin, & Bolliger, 2018; communicating important deadlines, Arbaugh, et al., 2008; providing clear course policy, Authors, 2016) are essential in keeping students on track, particularly in virtual environments. While CoI instruments are primarily used to capture students’ perceptions of the learning environment and experiences instead of instructors’ actual teaching practices, it provides an important basis for identifying instructional practices that can improve important elements of online learning experiences.

Building on the CoI and related frameworks, we classify online interactions into three major pedagogical goals: academic, managerial, and social (Berge, 1995; Author5 (2016); Quality Matters, 2014; 2018; Zhang, 1998; Garrison, et al., 1999). Academic-oriented practices directly facilitate student learning of knowledge and skills (e.g., providing video lectures and responding to students’ questions about a difficult concept). Managerial practices refer to logistical and administrative coordination (e.g., setting up late work policies). Social practices refer to instructors actively promoting social exchanges between students and themselves (e.g., instructors introducing herself to allow students to become familiar with her personality), as well as between students (e.g., providing forums where students can get to know each other’s interests) to promote feelings of belonging and develop a learning community.

Taken together, the two types of frameworks suggest that instructional practices are not unidimensional: each specific interaction-oriented instructional practice can be characterized based on the parties it involves during the interaction process, as well as the pedagogical purpose that interaction serves. However, previous studies have primarily relied only on one type of

framework, resulting in limited understanding on how the two dimensions interact with each other in shaping online instruction.

Drawing on both frameworks, we propose a person-purpose framework (Table 1) which categorizes interaction-oriented practices in online courses into six sub-domains defined by the intersections between two dimensions: (i) the type of interaction that the instructional practice aims to promote (e.g., between peers or between instructors and students), as well as (ii) the pedagogical purpose of the interactions. Specifically, the six sub-domains include: instructor-student academic interaction (ISAI), instructor-student social interaction (ISSI), instructor-student course management interaction (ISCMI), student-student academic interaction (SSAI), student-student social interaction (SSSI), and student-content academic interaction (SCAI).[1] A major benefit of this more fine-grained categorization is that it enables researchers and practitioners to distinguish between different instructional practices with a higher degree of specificity. Below, we explain instructional practices for each row in Table 1 in more detail and provide a brief review of existing evidence on the benefits and importance of these practices.

[Insert Table 1]

Instructor-student interaction

Extensive evidence consistently indicates that instructional practices that promote instructor-student interaction and connection can increase student engagement and satisfaction, which may lead to better learning outcomes in online courses (Dixson, 2010; Gayton & McEwen, 2007; Luo et al., 2019; Martin & Bolliger, 2018; Sher, 2009). These practices can be further divided into three subcategories depending on the purpose the interaction intends to

[1] It is worth noting that a few combinations of these two dimensions are not apparently relevant in typical online courses, such as student-student managerial interaction, student-content social interaction, and student-content managerial interaction, and therefore do not appear in our framework.

serve. The first subcategory is instructor-student academic interaction, where instructors communicate with students regarding the knowledge or skills to be learned in a course. Examples include an instructor answering content-related questions in synchronous sessions, discussion boards, and/or providing timely and constructive feedback on assignments (Bolliger & Martin, 2018; Gayton and McEwen, 2007; Martin et al., 2019; Sher, 2009). For instance, multiple studies highlight the importance of instructors providing "meaningful feedback"—content-related feedback beyond a mere grade or simple mark, which often leads to greater student engagement (e.g., Gayton and McEwen, 2007; Luo et al., 2019; Sher, 2009).

The second subcategory is instructor-student social interaction, where instructors and students engage in positive interpersonal interactions not directly related to academic activities. Several strategies that enhance instructor-student social interaction are recognized as important by online students, such as instructors introducing their interests and personal experiences and referring to students by name when interacting with students in discussion forums (e.g., Bolliger & Martin, 2018; Ralston-Berg et al., 2015). Recent studies have emphasized the significance of social communication between instructors and students as a strategy leading to enhanced student learning and course satisfaction (Cho & Cho, 2016; Kang & Im, 2013).

The third subcategory is instructor-student managerial interaction, where instructors communicate with students about course policy, schedule, and other logistical issues clearly and frequently to keep students informed of course events and requirements. Bolliger and Martin (2018) identified a list of managerial interactions between instructors and students that were highly rated by both instructors and students in online learning, such as instructors sending regular announcements and reminders and posting a "due date checklist" at the end of each instructional unit.

Student-student interaction

Prior research has supported the important role of student-student interaction in the context of online learning in terms of enhancing student performance, completion rate, course satisfaction, and sense of belonging (Bettinger et al., 2016; Jung, et al., 2002; Ke & Kwak, 2013; Sher, 2009). Researchers point out that frequent and effective peer interaction not only allows students to learn from each other, but also promotes positive peer relationships and a sense of community in otherwise isolated virtual environments (Anderson, 2004; Bettinger et al., 2016; Liu, et al., 2007; Luo et al, 2017).

Instructional practices that facilitate student-student interaction can serve two main pedagogical purposes. The first group of practices focus on improving student-student academic interaction, which is characterized as activities and learning opportunities where academic exchanges occur between students and their peers. The constructivism theory points out that peer-to-peer collaborative learning could expose students to new and diverse perspectives, promote them to think critically, and help them gain a deeper and more comprehensive understanding of the content (Bangert, 2006; Huang, 2002; Van Merriënboer & Paas, 2003; Walker, 2005). In addition to working together collaboratively, students may also help each other through direct teaching (e.g., explaining a solution to an assignment question in discussion forums), which has been found to be valuable for both students and their peers (Asikainen et al., 2021; Goldschmid & Goldschmid, 1976).

The second group of practices attempt to achieve higher levels of student-student social interaction, such as students uploading a personal profile to the learning management system and participating in icebreaker activities to introduce themselves and connect with one another (Bolliger & Martin, 2018; Stepich & Ertmer 2003). The social interaction among students is of

particular importance for enhancing students' sense of belonging and sense of community, which is essential to online engagement and persistence (Muilenburg & Berge, 2005; Hung, et al., 2015). For example, Stepich and Ertmer (2003) found that social interaction activities where students introduce themselves at the beginning of a course could enhance their sense of belonging. Interestingly, along these lines, Bettinger et al. (2016) found that online students merely addressing their classmates by name in discussion forums reaps positive effects on student outcomes for the recipient.

Student-content interaction

Finally, unlike instructor-student and student-student interactions, student-content interaction typically pivots on improving academic understanding, rarely serving managerial or social purposes. The first line of research on strategies for improving student-content interaction focuses on the delivery media students use to access course content, such as digital textbooks, video/audio lectures, and PowerPoints (Gilbrami, et al., 2011). Early research in multimedia learning suggests that multimedia materials (e.g., video) provide reinforcing information channels (e.g., auditory and visual), which can improve retention of information and enhance student learning (Lang 1995, p. 86; Mayer & Anderson, 1991; Mayer & Moreno, 1998; Moreno & Mayer, 1999). In a similar vein, there is evidence that students prefer instructors to provide instructional materials in more than one format, such as text, video, and audio, giving them the flexibility to choose the media most useful for a specific circumstance (Martin & Bolliger, 2018). For instance, students may prefer audio lectures so that they could listen to the lectures on their way to work, whereas they may prefer printing out and reviewing PowerPoint slides before exams.

Moreover, instructors can promote deeper learning by offering activities that require higher levels of cognitive engagement with course materials (Craik & Lockhart, 1972; Czerkawski, 2014). Strategies that are more cognitively engaging (e.g., elaboration and self-testing) play an important role in improving students' online outcomes (Carson, 2011; Huamao, et al., 2006; Luo et al, 2017; Puzziferro, 2008). For example, Dixson (2010) found that students consider activities engaging when they allow for the application of course concepts to case studies and involve problem-solving skills. Author1 (20xx) found that explicitly highlighting exam content and connecting current lecture material to prior information—such as indicating concepts that will be tested and intentionally drawing students' attention to past material—enhance student learning. Unlike learning in face-to-face settings, online learning often requires students to work with instructional materials independently due to instructor absence. Therefore, it is important for instructors to provide additional guidance and encouragement in applying cognitive learning strategies and effective studying techniques, such as self-testing and spacing (Rodriguez, et al., 2018), highlighting, again, the significant role that student-content interaction plays in online learning.

2.2 What predicts interaction-oriented practices?

We draw on the broad literature in psychology in understanding how instructors' perceptions might be related to their instructional practices. In particular, frameworks of motivation have been instrumental for helping education researchers' study how perceptions influence motivation and behavior, such as Eccles and colleagues' expectancy-value theory (EVT; Eccles et al., 1983). This motivation framework is built on the idea that a variety of perceptions inform the two questions most critical to predicting motivation: "Can I do it?" (i.e., expectancies), and "Do I want to do it?" (i.e., values). It has been used to study a variety of

choices for teachers (i.e., pedagogical decisions; Foley, 2011) and students (e.g., major selection; Keyserlingk, et al., 2019), including student motivation to participate in online and blended learning environments (Vanslambrouck et al., 2018). Similar models have emerged that are more narrowly tailored to studying how instructors' perceptions affect their pedagogical practices in online courses. The technology acceptance model (TAM), for instance, specifically highlights perceptions that predict instructors' intentions to adopt technology (Davis, 1989; Venkatesh & Davis, 2000; Wingo, et al., 2017). The two main predictors, perceived ease of use (how much effort the person will have to use to master the technology) and perceived usefulness (how helpful the technology will be for one's job performance), bear substantial similarity to expectancies and values central to Eccles and colleagues' EVT (1983), and suggest the relevance of an expectancy-value framework for identifying perceptions that may predict online instructors' practices.

Although the TAM model is well suited to understanding why instructors adopt specific technologies within an expectancy value framework, online instruction encompasses a range of decisions beyond just adopting technological tools and may rely on a broader set of perceptions of the online environment as a whole (Mercado, 2008; Wasilik & Bollinger, 2009). To organize this literature, we categorize instructor perceptions into four broad categories specific to online learning environments that have theoretical implications for instructors' expectancies and values.

Self-efficacy in using online platforms. Perhaps one of the most critical perceptions of instructors is their confidence, or self-efficacy, in their ability to use online tools to teach effectively (Wright, 2014; Zhen, et al., 2008). Self-efficacy is critical for, when not synonymous with, instructors' expectancies of success. Self-efficacy in online courses involves instructors' confidence in their ability to manage the course and convey content through digital media. This

may subsequently feed into students' own abilities and expectations about communicating with the instructor and engaging in the online course (Almeda & Rose, 2000; Baglione & Nastanski, 2007; Young, 2002). Teachers' self-efficacy is widely shown to support both student achievement and teachers' own job satisfaction (Caprara, et al., 2006; Mojavezi & Tamiz, 2012), an association likely to be mediated by the practices they adopt.

Feelings of Support. Many barriers exist to adopting online instructional practices, making institutional efforts to alleviate initial concerns crucial for supporting instructors' decisions to attempt and persist in online teaching (Orr, et al., 2009). Institutions can increase instructors' expectancies for success and perceived ease of use in online teaching by alleviating concerns about compensation and time, organizational change, and technical expertise, support, and infrastructure (Berge & Muilenburg, 2001; Muilenburg & Berge, 2001; Porter, 2003). The amount of time required to design an online course is seen as a major barrier when it is seen as taking away from other activities such as research (Bolliger & Wasilik, 2009; Rockwell, et al., 1999), and is considered a reason institutions should allot greater compensation for teaching one (Porter, 2003). Additionally, the technical complexity of online courses can discourage faculty from adopting online instruction (Zhen et al., 2008). Therefore, perceptions of support provided by an institution to address issues of time, inexperience, and technical problems can improve faculty's approach to online teaching (Frederickson et al., 2000).

Benefits. The support that institutions offer to deal with the inherent difficulties of online instruction can be complemented by instructors' perceptions of the inherent value of online instruction. Foremost among these benefits is flexible scheduling (Wingo, et al., 2017). Having a flexible work schedule is recognized by most instructors as a benefit of teaching online (Green & Brown, 2009), and is often considered the greatest overall benefit to teaching online (Chapman,

2011; Shea, 2007). However, other benefits may include the professional growth that comes with adopting online instruction or the ability to reach a wider student population (Chapman, 2011; Green & Brown, 2009; Wright, 2014).

Perceived differences between online and face-to-face learning. Beyond an instructor's capacity to use different types of instructional practices, her perceptions of potential differences between online and face-to-face education may also influence how she is going to teach the class. Face-to-face courses are intuitive benchmarks against which to judge the affordances of online courses and students. Thus, instructors' perceptions of these differences, regardless of their accuracy, may have important implications for their approach to the course, and ultimately, student outcomes (Jussim & Harber, 2005). First, students themselves may be different in terms of their motivation (Jaggars, 2014) and competing obligations (Bailey et al, 2015; Author3, 20xx). Additionally, perceptions of how online and face-to-face students differ may interact with perceptions of online course affordances to impact instructors' perceptions that online courses are more or less advantageous for achieving common pedagogical goals, such as engaging students, organizing group projects, and monitoring students' progress. Similarly, this interaction may also impact instructors' perceptions of whether it is more or less difficult to help develop students' writing, critical thinking, or content knowledge in online courses.

Instructor Characteristics and fields of study. Previous research has nominated a variety of instructor characteristics that may influence the teaching and learning dynamic in college classrooms (e.g. Groccia, 2012; Phillips et al., 2017). For example, a recent paper by Vu (2017) establishes a framework for understanding systematically the barriers and drivers to adopting evidence-based instructional practices in higher education. Using a combination of quantitative transcript data and qualitative interview data, Vu (2017) found that instructor

background characteristics (such as job stability as measured by part-time versus full-time employment), past teaching experiences, and prior teaching experiences all serve as important predictors of instructors' pedagogical approach.

In a similar vein, a small but growing literature has used college administrative data to examine whether instructors hired through different employment contracts may influence student outcomes differently (e.g. Bettinger & Long, 2010; Carrell & West, 2010; Figlio et al., 2015; Hoffmann & Oreopoulos, 2009; Author5, 2019). In community college settings in particular, Author5 (20xx) found that students who take their introductory coursework with instructors hired through part-time adjunct positions are associated with negative downstream outcomes (such as subsequent course enrollment and performance) in comparison to full-time faculty. Furthermore, the negative impact of part-time adjuncts on subsequent enrollment within the same field of study is particularly pronounced in STEM fields that are more closely tied to a profession instead of non-STEM and academic-oriented fields.

Taken together, results from the existing literature highlight the importance of considering instructor characteristics—including both personal and professional attributes (e.g., employment arrangements)—in relation to their teaching practices. In the current study, we heed previous recommendations and collect information on instructor employment characteristics and teaching experiences with the notion that such factors will be salient in explaining usage of interaction-oriented practices.

2.3 Summary

While existing research has identified various key online teaching strategies, a more nuanced framework integrating the type of interaction and the pedagogical purpose it serves has yet to be established. Using the person-purpose framework, we collected survey data from online

instructors to document the frequency of using interaction-oriented practices and investigate what instructor-level attributes are associated with their implementation. With the long-standing relationship between instructor teaching beliefs and behaviors (Basckin et al., 2021; Ertmer, 2005; Zhihui, 1996), and the perceptions and characteristics that lead to pedagogical decisions (Vu, 2017), such information could provide important insights into possible mechanisms through which instructors choose to approach online interaction-oriented practices, potentially fueling targeted interventions to enhance adoption of practices beneficial to student learning.

Methods

3.1 Setting and Participants

This study was conducted at a large suburban community college located in the southeastern United States. The institution serves over 30,000 students in associate degree and certificate programs. Additionally, over one-third of the institution's enrollment is in fully online courses. To better support online teaching and learning, the institution introduced a mandatory online learning assessment and orientation for all students registering for online courses starting in spring 2015, and a comprehensive, mandatory online teaching certification for faculty teaching online courses starting in Fall 2017. The level of the use of interaction-oriented instructional practices at this college may be reflective of the institutional effort on online teaching and learning preparation. Perhaps as a result of these efforts, the success rate (i.e., receiving an A, B, C, or Pass) of online courses has been increasing slowly in the past few years, although there is still a persistent performance gap between online and face-to-face courses: In the academic year of 2015-2016, the average course success rate in online classes is 69%,

compared to 76% in face-to face classes; in 2018-2019, the corresponding rates are 72% and 78% for online and face-to-face classes respectively.

It is important to note that with the advent of the COVID-19 virus pandemic and the swift shift to online instruction in higher education, many institutions have implemented student preparation and faculty professional development programs similar to the online education initiatives at the institution of the current study (Lederman, 2020). Therefore, this study is relevant for understanding the instructional practices and perceptions of online instructors not only at this institution, but at other institutions attempting to improve online teaching and learning during and after the COVID-19 pandemic.

The data used in this study come from a survey that was administered in spring 2019 among all 399 instructors at the institution who taught at least one online course in the last three years. Online instructors within the college were contacted via their school email address and invited to participate in the study. Each instructor was provided with a study information sheet that explained the purpose, rationale, and nature of their participation in the study, which also stated their right to not participate.

A total of 209 instructors agreed to participate in the study and started the survey, yielding an over-50% participation rate; of the 209 instructors, 60% (N=126) completed 90% of the survey and were included in our analytical sample. Most of the instructors who did not complete the survey did not respond to any (0%) of the perception, practice, or characteristic questions. The online courses indicated by the instructors revealed a wide range of fields of study and course topics, and we classify them into broader discipline areas according to the Classification of Instructional Programs (CIP) codes (National Center for Education Statistics,

2010). A listing of individual courses can be found in the additional text found in Appendix A. Table 2 shows the characteristics of the analytic sample.[2]

3.2 Data Collection/Measures

Figure 1 presents the general flow of the current study. This figure provides a guide of the steps we proceeded through, from literature review to data collection.

[Insert Figure 1]

Item Development

The development and selection of interaction-oriented practice items followed an iterative process. First, the research team conducted an intensive literature review to identify online course design features and instructional practices that are shown to be related to student learning, engagement, and satisfaction. Sources spanned three types, ranging from specific instruments, scholarly and practitioner reflections and recommendations, and empirical research typologies and findings from surveying faculty and students.

For instance, in developing items to capture interaction-oriented instructional practices, we leveraged information from the Quality Matters (2018) rubric—which is widely used to study online instruction and design features, the Community College Faculty Survey of Student Engagement (CCFSSE, 2018; Marti, 2008), and the Value Rating Checklist for Web-Assisted Technology (Frey et al., 2003). Reflections and recommendations consulted included Martin et al.'s (2019) summary of award-winning faculty online teaching practices, Freeman and Jarie-Eggart's (2019) practitioner-focused recommendations for interacting with students in online

[2] Ideally, we would like to compare the characteristics of our survey sample with those of all the online instructors at this institution to provide an insight into the extent to which the survey respondents are representative of the targeted population. Yet, the administrative data we have access to include limited information about instructors and the only variable available is instructors' highest degree attained by the time of the survey. Summary statistics suggest that the percent of instructors with bachelors (11%), masters (65%), and doctorate degrees (17%) in the population is comparable to the sample statistics of the survey sample (our analytical sample) presented in table 2, with only slight overrepresentation from those with masters and doctorates in our analytical sample.

classes, and Kim et al.'s (2006) projection piece on future online pedagogical techniques. While many research studies were referenced, Martin et al.'s (2018) findings on student's perceptions of helpful online interactions, Blaine's (2019) qualitative content analysis of online interaction, Bolliger and Martin's (2018) survey of faculty perceptions of important practices, and Martin and Bolliger's (2018) survey of students identifying important engagement strategies in online courses are among the most influential.

After the initial phase of survey development, the instrument was disseminated to three experts of online education at the study site as well as two education psychologists to vet the items. Feedback was incorporated and used to refine, edit, drop, or rephrase existing items and their response categories. A focus group interview was then conducted with five educational researchers of online education to determine if items appeared relevant to the domains they were intended to ask. This information spurred further refinement.

Individual cognitive interviews were also conducted with community college online instructors from the target population to review the survey item-by-item. Twelve instructors spanning math, physics, business, computer technology, and humanities departments at the study site were recruited. Participants were asked to go through the full survey and provide feedback on the general clarity, time limit, and any missing aspects. Data and feedback from the cognitive interviews were incorporated to further improve the clarity and relevance of the survey.

Instructional Practices The abovementioned procedures resulted in a total of 34 instructional practice items (ISAI = 5 items; ISSI = 3 items; ISCMI = 6 items; SSAI = 3 items; SSSI = 2 items; SCAI = 15 items). To elicit the actual use and implementation of practices, items from previous studies were written or modified to measure frequency of use, as opposed to their perceived importance or helpfulness. Additionally, practice items were not all positioned on

the same scale to accommodate the unique nature of each interaction-oriented practice. For instance, some items were positioned on a 5-point Likert-type scale (e.g., "When a student asked a question about logistics and course requirements, I quickly responded (within 24 hours) "), while others were positioned on a dichotomous scale (e.g., "I introduced myself to my students via emails, audio, video, or images"). The sub-domains with 5-point response options include ISAI, ISCMI, SSAI, and SCAI; the sub-domains with 0/1 (dichotomous) response options include ISSI and SSSI. Table 3 showcases all the items and their respective response formats.

Instructor Characteristics and fields of study. With the significance stated in the literature review, we also collect information on three categories of instructor characteristics and perceptions that may be related to the use of these practices. These categories include: (1) online teaching experiences; (2) general work experiences; and (3) employment stability at an institution and typical teaching load . Table 1 shows all the variables under these three categories, which were standardized and summed respectively, to form three composites with means of 0 and standard deviations of 1. In addition to these three categories of information, the survey also collects information about the discipline area of the course indicated by the instructor. Finally, we obtain the information on instructor's highest degree earned from the college administrative data.

Instructor Perceptions about Online Education. The broad literature on instructor motivation, self-efficacy, online support and satisfaction as it relates to teaching practices informed the development and refinement of online education perception items (e.g., Bolliger & Wasilik, 2009; Eccles et al., 1983; Davis, 1989; Jussim & Hasrber, 2005; Orr, et al., 2009; Venkatesh & Davis, 2000; Wingo, et al., 2017; Wright, 2014). Culling information from instructor survey instruments (e.g., Bolliger & Wasilik, 2009; Mercado, 2008) and the

technology acceptance model (TAM; Davis, 1989; Jussim & Harber, 2005), instructor self-efficacy in using online platforms, feelings of support for online teaching, instructor-centered motivation and benefits for online teaching, student-centered motivation and benefits for online teaching, and perceptions that face-to-face course formats are easier to reach and teach students than online formats, entail the five areas surveyed in the present study. Table 2 displays the descriptive statistics for the five perception composites; additional information on the response scales, individual item means and standard deviations, and psychometric information (model fit, factor loadings and reliability estimates), are found in the appendix.

[Enter Table 2]

3.3 Analytic plan

RQ1: Frequency of Use

To address RQ1, we begin by displaying the means, standard deviations, and minimum and maximum values for each interaction-oriented practice item. We then compute a composite score for each of the six sub-domains of instructional practices by taking the average of all items under each domain (see table 3 for descriptive statistics). Our decision to generate composite scores instead of examining individual practice items is based on two main considerations. First, one of our primary interests is to construct measures in response to our conceptual framework. Thus, we are interested in providing information that directly speaks to instructor engagement with each of the six sub-domains of interaction-oriented practices as well as their overall use of interaction-oriented practices.

Another reason why we aggregate across individual practices to generate composite score is to address the potential concern about multiple hypothesis testing. That is, as we test more and more outcomes (such as to conduct the analysis for each of the 34 practice items), the problem of

false positives could arise from multiple hypothesis testing, where some p-values may appear to be statistically significant purely by chance if a sufficient number of hypotheses are tested. One approach commonly used in the literature to address multiple hypothesis testing is to create summary indices instead of using individual items (e.g., Anderson 2008; Deming 2009; Kling, Liebman, and Katz 2007; Bolliger & Martin, 2018). This approach has also been used in previous research about instructional practice (Bolliger & Martin, 2018), which average across practice items to represent meaningful clusters. It is worth noting here that we are not using these scores to make measurement claims (e.g., presenting a validity argument that a latent construct has been appropriately quantified); nor do we presume that the practices combined in a composite share covariance and/or represent a metaphysical entity (Markus & Borsboom, 2013, p. 112). Rather, since the literature indicates that these practices are advantageous, our aggregation is an expedient way of examining sub-domains of interaction-oriented practices.

Finally, we standardize the six composites and generate an overall interaction-oriented practice (IOP) index and examine the distribution of overall use.

RQ2: Predictors of IOP and IOP Composites

To address RQ2, we utilize multiple linear regression to examine which instructor characteristics and perceptions are correlated with the usage of interaction-oriented practices. Specifically, we specify two sets of models: one with the overall IOP index as the outcome variable, and another set with the six sub-domains as outcome variables. For the IOP index analysis, we examine models with instructor characteristics only, with perceptions only, and with instructor characteristics and perceptions together. The purpose in specifying these three models is to examine the explanatory contribution for both sets of predictors, as well as examine the stability of estimates across models. For the sub-domain analysis, we focus on the preferred

model (with all variables). All dependent and (continuous) independent variables were standardized to have a mean of 0 and standard deviation of 1, rendering interpretations comparable across predictors and outcomes.

4. Results

4.1 RQ1: Descriptive statistics on the use of interaction-oriented practices

Table 3 displays the summary statistics for each individual interaction-oriented practice, as well as for the composite scores of each of the six sub-domains. The most widely implemented practice in the ISAI sub-domain is Providing face-to-face office hours for students to ask academic related questions (M = 4.82), while the least is Interacting with students using synchronous media (e.g., Skype or other video conference tools) (M = 3.42). The most widely implemented practice in the ISSI sub-domain is I introduced myself to my students via emails, audio, video, or images (M = 0.97), while the least is Sharing aspects of my hobbies, interests, pets, and other aspects of my life with my students(M = 0.85). The most widely implemented practice in the ISCMI sub-domain is Sending announcements or reminders to students about course content and assignments (e.g., weekly check-ins, announcements, etc.) (M = 4.97), while the least is Providing opportunities for students to give feedback about the course (M = 2.97). The most widely implemented practice in the SSAI sub-domain is Providing collaborative work (e.g., group assignments, peer review)? (M = 2.74), while the least is Assigning student-to-student discussions of the concepts outlined in the course using synchronous media (e.g., Skype or video conferencing tools)? (M = 1.67). The SSSI sub-domain only has two items, for which Asking my students to introduce themselves to each other via emails, audio, video, or images (M = 0.81) is used more widely than Encouraging my online students to get to know each other more than what is required for assignments or tasks (M = 0.71). Finally, the most widely

implemented practice in the SCAI sub-domain is Providing online classroom practice (e.g., quizzes, problem-sets, other assignments) (M = 4.63), while the least is Encouraging students to make diagrams (M = 2.22).

[Enter Table 3]

Table 3 also displays the descriptive statistics for the six composite scores (sub-domains) of instructional practices and provides information on the extent to which each domain of practice is used by instructors in our sample. For example, instructor-student academic interaction (ISAI) has a mean of 4.39. Since the responses for items under ISAI were positioned on a 5-point Likert scale ranging from 1 = "Never", 2= "Once", 3 = "Three times in total during the semester", 4 = "Every two weeks", and 5 = "Every Week", a mean score of 4.39 indicates that, on average, instructors in our sample use instructional practices that center on instructor-student academic interactions between every two weeks to every week. In contrast, student-student academic interaction (SSAI) has a substantially lower mean of 2.8. Also following a 5-point Likert scale, a mean score of 2.8 indicates that instructors in our sample, on average, use instructional practices that center on student-student academic interactions between only once and three times in total during a semester.

4.2 RQ2: Relations between instructor perceptions/characteristics and instructional practices

IOP Index Analysis

To examine how instructor perceptions/characteristics related to the overall use of interaction-oriented practices, we created the overall IOP index variable (depicted in figure 2). The six composites were standardized prior to being combined (summed) so that no one practice area would have a larger influence when generating the IOP index. The index was then

subsequently standardized to have a mean of 0 and standard deviation of 1. As depicted, the IOP Index exhibits a fairly normal distribution. Table 4 displays the results of the linear regression analysis predicting scores on the IOP index across three different model specifications. Model 1 (column 1), with the instructor characteristics alone, explains 5% of the variance in IOP scores; model 2 (column 2), with the perceptions alone, explains 25%; and together, in model 3 (column 3), the explained variance in IOP scores is 29%. Additionally, except that employment stability and teaching load statistically significantly predict IOP scores only in model 1 ($b = .19$, $p < .05$), self-efficacy in using online platforms, instructor-centered motivation for teaching online and student-centered motivation for teaching online remain statistically significant in the third model with all predictors included. In model 3, self-efficacy in using online platforms ($b = .42$, $p < .001$) and student-centered motivation for teaching online ($b = .28$, $p < .05$) are associated with higher IOP scores. On the contrary, instructor-centered motivation for teaching online is predictive of lower IOP scores ($b = -.30$, $p < .01$).

[Insert Figure 2]

[Insert Table 4]

Sub-domain Analysis

We then turn to examining how these predictors relate to each individual sub-domain. Akin to model 3 in table 4, table 5 displays the full set of variables predicting each of the six sub-domains of interaction-oriented practices. The models explain at least 11% of the variance for each domain of practices, and 28% for the SCAI domain. All models exhibit statistically significant predictors ($p < .05$) except the model predicting ISCMI.

[Insert Table 5]

Echoing the results from the analysis of IOP, self-efficacy, student-centered motivation for online teaching, and employment stability and teaching load are predictive of higher use of practices that serve at least one of the sub-domains of interaction-oriented practices. First, self-efficacy is predictive of higher use of practices from all the six sub-domains, except ISCMI ($p < .01$). For instance, one standard deviation increase in instructor self-efficacy is associated with 0.388 of a standard deviation increase in the use of practices that serve ISAI. In addition, student-centered motivation for online teaching is predictive of higher use of practices that serve SSAI ($b = 0.34$ and $p < .01$) and SCAI ($b = 0.31$ and $p < .01$). Finally, employment stability and teaching load are associated with significantly higher use of practices that serve ISSI ($b = .19$, $p < .05$).

Conversely, unlike student-centered motivation, instructor-centered motivation for online teaching is associated with significantly lower use of practices that serve ISAI ($b = -.30$ and $p < .05$) and SCAI ($b = -.44$, $p < .001$). Feeling supported for online teaching is significantly and negatively associated with higher ISSI use ($b = -.24$, $p < .05$). Also, the perception that F2F is easier to teach and reach students than online platforms is associated with significantly lower use of SCAI ($b = -.22$, $p < .05$).

Figure 3 graphically displays the linear relationship (with shaded confidence intervals) for the largest predictor of each of the six sub-domains, with only the predictor for ISCMI not being significant. Self-efficacy is most related to ISAI ($b = .39$, $p < .001$), ISSI ($b = .28$, $p < .01$), and SSSI ($b = .31$, $p < .01$). Student-centered motivation is the largest significant predictor for SSAI ($b = .34$, $p < .01$), and instructor-centered motivation is the largest significant predictor for SCAI ($b = -.44$, $p < .001$).

[Insert Figure 3]

5. Discussion

5.1 Overarching contribution of the current study

With these results, we answered our first research question by examining the prevalence of individual practices and groupings of practices. This constitutes a novel benchmark for research on interaction-oriented practices. We find that not all practices are used to the same extent, and that many of the most common practices are also those deemed most helpful based on previous work (e.g., Bolliger & Martin, 2018). For our second research question, we find that different interaction-oriented practices can be meaningfully predicted from different instructor-level perceptions and characteristics. This information is valuable for both researchers and professional development efforts aimed at enhancing adoption of promising online pedagogies. Together, these results constitute the novel contribution of this study. We discuss the theoretical ties of our findings and implications for practice below.

5.2 Theoretical connections with previous work

Our results indicate that perceptions and characteristics associated with teachers' expectancies for success relate to decisions to use instructional practices in a manner consistent with Eccles and colleagues' expectancy-value theory (EVT; Eccles et al., 1983). First, self-efficacy in navigating online learning systems positively predicts higher use of instructional practices. The significance of instructor self-efficacy in higher education has been well argued (Fong et al., 2019; Roche & Marsh, 2000), and research has found that it positively relates to promoting engaging learning techniques (Gibbs & Coffey, 2004). Daumiller et al. (2016) found that higher self-efficacy is related to both instructional quality and college students' self-reported learning gains. And more recently, Vu (2017) found that instructor perceptions of their abilities about teaching influenced their adoption of active learning techniques. Thus, the self-efficacy

associations found in this study are consistent with the EVT model and the empirical research informed by its stipulations.

Second, the different benefits for teaching online (e.g., benefits for students versus benefits for instructors) predict instructional practices in appropriately different ways. Both the EVT and the technology acceptance model (TAM) posit that the perceived benefits, or "utility", of an action should increase motivation to take it. In line with these models, our results indicate that when instructors recognize the benefits that online learning holds for students, instructional use of desirable practices increases. Conversely, when the instructors primarily perceive online teaching as something beneficial for themselves, use of desirable practices decreases. That is, instructors may realize benefits of online teaching for their own lifestyle, though this does not motivate them to employ student-centered pedagogies.

Some current empirical evidence points to this as a plausible explanation. For instance, König and Rothland (2012), while applying EVT to understand why instructors choose teaching as a profession, found that intrinsic motivation (being driven by the satisfaction of doing an activity) was positively related to pedagogical knowledge, whereas extrinsic motivation (behaviors that are driven by external rewards) was negatively associated with pedagogical knowledge. Overall, these results support the intuitive notion that instructors are more likely to engage in desirable pedagogical practices when they are driven more by the perceived benefits online teaching can provide for their students than simply the benefits it can provide for themselves.

The study findings also relate to broader research on factors inhibiting or driving adoption of instructional techniques. For instance, akin to our findings and utilizing a mixed-method study, Vu (2017) found that instructors with stable teaching positions were more likely

to enact student-centered teaching strategies. Conversely, he (Vu, 2017) found that the lack of a supportive environment is negatively associated with implementing promising instructional techniques, while our findings showed that increased feelings of support decrease the use of online interaction-oriented practices. This discrepancy could be a meaningful difference with how feelings of support lead to different associations due to the course format, as Vu's (2017) study explored face-to-face lectures. Still, future research is needed to substantiate this possibility. To gain a better understanding of motivated choice in using interaction-oriented practices, future research should more formally operationalize and test the relations stipulated in EVT as it pertains to explaining online instructional behavior in higher education settings.

5.3 Implications for practice

The findings of this study also have several important implications for practice. First, a nontrivial proportion of the instructors in our sample are only engaged in limited amounts of interaction-oriented practices in teaching online classes. This deserves policy attention at the institution given the consistent evidence in the literature that converges on the importance of facilitating interactions in a virtual learning setting. Our subsequent analysis indicates that the usage of practices highly hinges on how confident instructors are in using these practices. Colleges may consider offering professional development (PD) opportunities focusing on beneficial practices that require systematic training and may therefore impose challenges on faculty without sufficient scaffolding and guidance. For example, Martin et al. (2019) suggests that to support online instructors, colleges should consider instructional resources (videos, check lists, etc.), one-on-one consultations, and opportunities for practice. However, training alone may not be sufficient, as the PD literature suggests that faculty encounter various obstacles in applying what they have learnt in PD training (Kennedy, 2020; Borup & Evmenova, 2019). This

then calls for follow-up research to identify these obstacles and ensure that institutions provide a sufficient level of ongoing support and resources to faculty to facilitate their engagement in these practices.

In addition, our analyses indicate that instructor perceptions of the benefits of online learning are also strong predictors of their use of interaction-oriented practices. This implies that PD training that focuses on developing skills alone may not be sufficient in enabling instructors to change their practices. Instead, PD training needs to actively incorporate content that relays the characteristics of students typically enrolled in online classes, the role of online learning in expanding educational opportunities to this population, and the challenges online students may encounter (Rienties et al, 2013; 2016). Accordingly, interventions that aim at increasing instructors' use of effective practices may combine skill scaffolding with a motivational lens to probe instructor self-efficacy and value of online education for student-centered benefits as conduits to higher usage.

Finally, our results indicate that instructors who are employed full time at the institution are more likely to be high users of interaction-oriented practices. This is consistent with the existing literature that indicates that part-time faculty, especially those hired through temporary adjunct positions tend to be provided with fewer PD opportunities than full-time instructors hired through longer-term employment. (Ran & Sanders, 2020). In addition, part-time faculty often encounter various challenges that negatively influence their engagement with the institution and with students (e.g., no office space, insufficient involvement in departmental decisions, etc.; Buch, et al., 2017; Rhoades, 2020; Wyles, 1998). Thus, providing a sufficient level of support where adjunct and part-term faculty are more commonly employed may provide a critical foundation toward improving the engagement and effectiveness of our college teaching force.

5.4 Limitations and future research

There are a few limitations to this study. First, our sample is drawn from one college in one state, and only approximately one third of the targeted online instructor population completed the survey. As a result, the extent to which the responses of instructors can be generalized to the broader college instructor population may be limited. However, previous work taking place elsewhere report similar levels of endorsement for practices reported in our study. For instance, Bolliger and Martin (2018) found that online instructors rate sending announcements and email reminders as the most valuable instructor-student engagement strategy; in our study we found this to be the highest rated instructional practice in the instructor-student domain as well.

In addition, although instructors were asked to reflect on their actual use of practices, the cross-sectional data collected in this study limits the temporal understanding between practices and instructor characteristics and perceptions. While we rely on theory to inform and dictate the direction of the specified relationships in this study, it is also possible that instructors' practices in past courses may influence their current perceptions of online teaching and learning. Therefore, future research that intends to better address this concern and achieve a more accurate understanding of how perceptions predict instructors' behaviors may wish to collect perception data prior to the start of a course and then collect instructional practices at the end of the course.

There are also several avenues for future research to explore based on the results of this study. First, the pedagogical behavior documented here relies on instructor introspection and self-report. Although some studies have shown strong positive correlations between self-reported measures and objective observations (Junco, 2013; Hill, et al., 2011), understanding the extent to which instructors are accurately reporting their behavior precludes this study. Observations of

course design features and teaching strategies would be a more direct measure of teaching practices, and future research should consider examining the extent to which self-reported measures and observations of course design features are compatible. Second, although it is important to document the relationship between college online teaching practices and perceptions, relating these to student outcomes would shed light on their respective contribution to student learning. Third, a more detailed exploration into the drivers and barriers of using instructor-student course management interaction is warranted, as this sub-domain of interaction-oriented practices was the only area that did not exhibit significant associations with any predictors used in this study. It may be worthwhile measuring instructors' conscientiousness, as this teaching strategy relies on organization and consistency.

5.5 Conclusion

In this study, we present the person-purpose interaction framework for conceptualizing combinations of meaningful elements among myriad online interaction-oriented practices. The holistic yet nuanced features of the framework are used to obtain the frequency of using these techniques among college online instructors at three different levels (individual practices, sub-domains, and an overall index). Additionally, we examine the extent to which instructor characteristics and perceptions about online education are related to their use of various online interaction-oriented practices. We observe robust associations between instructor self-efficacy and student-centered benefits and higher use of interaction-oriented practices. The findings of this study hold potential for future work aiming to benchmark online instructional quality. It also encourages PD training to aim at specific instructor perceptions and beliefs to enhance engagement in evidence-based teaching practices. Finally, it provides further impetus for future research to examine the relation interaction-oriented practices have with student outcomes.

References

Abrami, P. C., Bernard, R. M., Bures, E. M., Borokhovski, E., & Tamim, R. M. (2011). Interaction in distance education and online learning: Using evidence and theory to improve practice. Journal of Computing in Higher Education, 23(2-3), 82-103.

Almeda, M. B., & Rose, K. (2000). Instructor satisfaction in University of California Extension's on-line writing curriculum. Journal of Asynchronous Learning Networks, 4(3), 180−195.

Anderson, T. (2004). Towards a theory of online learning. Theory and practice of online learning, 2, 109-119.

Antonenko, P. D., Toy, S., & Niederhauser, D. S. (2012). Using cluster analysis for data mining in educational technology research. Educational Technology Research and Development, 60(3), 383-398.

Asikainen, H., Blomster, J., Cornér, T., & Pietikäinen, J. (2021). Supporting student integration by implementing peer teaching into environmental studies. Journal of Further and Higher Education, 45(2), 162-182.

Author1 (2021). To be added following double-blind review

Author3 (2021a). To be added following double-blind review

Author5 (2016a). To be added following double-blind review

Author5 (2019). To be added following double-blind review

Author5 (2020). To be added following double-blind review

Author 5 (2021). To be added following double-blind review

Azevedo, R., Cromley, J. G., & Seibert, D. (2004). Does adaptive scaffolding facilitate students'

ability to regulate their learning with hypermedia? Contemporary Educational Psychology, 29 (3), 344–370.

Baglione, S. L., & Nastanski, M. (2007). The superiority of online discussion: Faculty perceptions. The Quarterly Review of Distance Education, 8(2), 139−150.

Bailey, M., Ifenthaler, D., Gosper, M., Kretzschmar, M., & Ware, C. (2015). The changing importance of factors influencing students' choice of study mode. Technology, Knowledge and Learning, 20(2), 169–184. https://doi.org/10.1007/s10758-015-9253-9

Bangert, A. W. (2006). The development of an instrument for assessing online teaching effectiveness. Journal of Educational Computing Research , 35(3), 227-244.

Basckin, C., Strnadová, I., & Cumming, T. M. (2021). Teacher beliefs about evidence-based practice: A systematic review. International Journal of Educational Research , 106, 101727.

Berge, Z. L. (1995). The role of the online instructor/facilitator. Educational technology, 35(1), 22-30.

Berge, Z. L., & Muilenburg, L. (2001). Obstacles faced at various stages of capability regarding distance education in institutions of higher education. TechTrends, 45(4), 40.

Bettinger, E. P., Fox, L., Loeb, S., & Taylor, E. S. (2017). Virtual classrooms: How online college courses affect student success. American Economic Review, 107(9), 2855-75.

Bettinger, E., Liu, J., & Loeb, S. (2016). Connections Matter: How Interactive Peers Affect Students in Online College Courses. Journal of Policy Analysis and Management, 35(4), 932-954.

Bettinger, E. P., & Long, B. T. (2010). Does cheaper mean better? The impact of using adjunct instructors on student outcomes. The Review of Economics and Statistics, 92(3), 598-613.

Blaine, A. M. (2019). Interaction and presence in the virtual classroom: An analysis of the perceptions of students and teachers in online and blended Advanced Placement courses. Computers & Education, 132, 31-43.

Bolliger, D. U., & Martin, F. (2018). Instructor and student perceptions of online student engagement strategies. Distance Education, 39(4), 568-583.

Borup, J., & Evmenova, A. S. (2019). The effectiveness of professional development in overcoming obstacles to effective online instruction in a College of Education. Online Learning, 23(2), 1-20.

Buch, K., McCullough, H., & Tamberelli, L. (2017). Understanding and responding to the unique needs and challenges facing adjunct faculty: a longitudinal study. Int J Educ Res, 16(10), 27-40.

Community College Faculty Survey of Student Engagement (2018). https://www.ccsse.org/aboutsurvey/docs/CCSSE_2017_sample.pdf

Caprara, G. V., Barbaranelli, C., Steca, P., & Malone, P. S. (2006). Teachers' self-efficacy beliefs as determinants of job satisfaction and students' academic achievement: A study at the school level. Journal of School Psychology, 44(6), 473-490.

Carrell, S. E., & West, J. E. (2010). Does professor quality matter? Evidence from random assignment of students to professors. Journal of Political Economy, 118(3), 409-432.

Carson, A. D. (2011). Predicting student success from the LASSI for learning online (LLO). Journal of Educational Computing Research, 45(4) , 399-414.

Chapman, D. D. (2011). Contingent and tenured/tenure-track faculty: Motivations and incentives to teach distance education. Online Journal of Distance Learning Administration, 14(3). Retrieved from http://www.westga.edu/ ~distance/ojdla/fall143/chapman143.html

Ching, Y. H., Hsu, Y. C., & Baldwin, S. (2018). Becoming an online teacher: An analysis of prospective online instructors' reflections. Journal of Interactive Learning Research, 29(2), 145-168.

Cho, M. H., & Cho, Y. (2016). Online instructors' use of scaffolding strategies to promote interactions: A scale development study. International Review of Research in Open and Distributed Learning: IRRODL, 17(6), 108-120.

Corbeil, J. R. (2003). Online technologies self-efficacy, self-directed learning readiness, and locus of control of learners in a graduate -level web-based distance education program (Doctoral dissertation). Retrieved from ProQuest Dissertations and Theses database. University of Houston.

Cox, R. D. (2006). Virtual access. In T. Bailey & V. S. Morest (Eds.), Defending the community college equity agenda (pp. 110–131). Baltimore: Johns Hopkins.

Craik, F.I.M., & Lockhart, R.S. (1972). Levels of processing: A framework for memory research, Journal of Verbal Learning and Verbal Behavior, 11 , 671-684.

Cronin, L., Allen, J., Ellison, P., Marchant, D., Levy, A., & Harwood, C. (2019). Development and initial validation of the life skills ability scale for higher education students. Studies in Higher Education, 1-14.

Czerkawski, B. C. (2014). Designing deeper learning experiences for online instruction. Journal of Interactive Online Learning, 13(2).

Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration?. Educational technology research and development , 53(4), 25-39.

Daumiller, M., Grassinger, R., Dickhäuser, O., & Dresel, M. (2016). Structure and relationships of university instructors' achievement goals. Frontiers in Psychology , 7, 375.

Dixson, M. D. (2010). Creating effective student engagement in online courses: What do students find engaging?. Journal of the Scholarship of Teaching and Learning, 1-13.

Drost, E. A. (2011). Validity and reliability in social science research. Education Research and perspectives, 38(1), 105.

Fang, Z. (1996). A review of research on teacher beliefs and practices. Educational research, 38(1), 47-65.

Figlio, D. N., Schapiro, M. O., & Soter, K. B. (2015). Are tenure track professors better teachers?. Review of Economics and Statistics, 97(4), 715-724.

Freeman, M. T. M., & Jarvie-Eggart, M. E. (2019). Best Practices in Promoting Faculty-Student Interaction in Online STEM Courses.

Frey, A., Faul, A., & Yankelov, P. (2003). Student perceptions of web-assisted teaching strategies. Journal of social work education, 39(3), 443-457.

Foley, L. S. (2011). Exploring K–3 teachers' implementation of comprehension strategy instruction (CSI) using expectancy-value theory. Literacy Research and Instruction, 50(3), 195-215.

Fong, C. J., Dillard, J. B., & Hatcher, M. (2019). Teaching self-efficacy of graduate student instructors: Exploring faculty motivation, perceptions of autonomy support, and undergraduate student engagement. International Journal of Educational Research, 98, 91-105.

Garrison, D. R., Anderson, T., & Archer, W. (1999). Critical inquiry in a text-based environment: Computer conferencing in higher education. The internet and higher education, 2(2-3), 87-105.

Garrison, D. R., Anderson, T., & Archer, W. (2001). Critical thinking, cognitive presence, and

computer conferencing in distance education. American Journal of distance education, 15(1), 7-23.

Garrison, D. R., Anderson, T., & Archer, W. (2010). The first decade of the community of inquiry framework: A retrospective. The Internet and Higher Education , 13(1-2), 5-9.

Gayton, J. and McEwen, B.C. (2007). Effective online instructional and assessment strategies. The American Journal of Distance Education , 21(3), 117-132.

Gibbs, G., & Coffey, M. (2004). The impact of training of university teachers on their teaching skills, their approach to teaching and the approach to learning of their students. Active learning in higher education , 5(1), 87-100.

Goldschmid, B., & Goldschmid, M. L. (1976). Peer teaching in higher education: A review. Higher Education, 5(1), 9-33.

Green, T., Alejandro, J., & Brown, A. (2009). The retention of experienced faculty in online distance education programs: Understanding factors that impact their involvement. The International Review of Research in Open and Distance Learning, 10(3), 1-15. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/683/1279

Groccia, J. E. (2012). A model for understanding university teaching and learning. Handbook of college and university teaching: A global perspective, 2-13.

Harrak, F., Bouchet, F., & Luengo, V. (2019). From students' questions to students' profiles in a blended learning environment. Journal of Learning Analytics, 6(1), 54-84.

Hart, C. M., Friedmann, E., & Hill, M. (2018). Online course-taking and student outcomes in California community colleges. Education Finance and Policy , 13(1), 42-71.

Helleve, A., Flisher, A. J., Onya, H., Kaaya, S., Mukoma, W., Swai, C., & Klepp, K. I. (2009). Teachers' confidence in teaching HIV/AIDS and sexuality in South African and

Tanzanian schools. Scandinavian Journal of Public Health, 37 (2_suppl), 55-64.

Hill, H. C., Kapitula, L., & Umland, K. (2011). A validity argument approach to evaluating teacher value-added scores. American Educational Research Journal, 48(3), 794-831.

Hoffmann, F., & Oreopoulos, P. (2009). A professor like me the influence of instructor gender on college achievement. Journal of Human Resources, 44(2), 479-494.

Huamao, P., Ying, W., & Ronghuai, H. (2006). Moderating role of online self-efficacy in relation between learning strategy and online performance. In International Conference on Computers in Education: Learning by Effective Utilization of Technologies: Facilitating Intercultural Understanding, Beijing .

Huang, H. M. (2002). Toward constructivism for adult learners in online learning environments. British Journal of Educational Technology, 33(1), 27-37.

Hung, W., Flom, E., Manu, J., & Mahmoud, E. (2015). A review of the instructional practices for promoting online learning communities. Journal of Interactive Learning Research, 26 (3), 229-252.

Jaggars, S. S. (2014). Choosing between online and face-to-face courses: Community college student voices. American Journal of Distance Education, 28(1), 27–38. https://doi.org/10.1080/08923647.2014.867697

Junco, R. (2013). Comparing actual and self-reported measures of Facebook use. Computers in Human Behavior, 29(3), 626-631.

Jung, I., Choi, S., Lim, C., & Leem, J. (2002). Effects of different types of interaction on learning achievement, satisfaction and participation in web-based instruction. Innovations in Education and Teaching International, 39 (2), 153-162.

Jussim, L., & Harber, K. D. (2005). Teacher expectations and self-fulfilling prophecies: Knowns

and unknowns, resolved and unresolved controversies. Personality and Social Psychology Review, 9(2), 131-155.

Josse, J., & Husson, F. (2016). missMDA: a package for handling missing values in multivariate data analysis. Journal of Statistical Software, 70(1), 1-31.

Kang, M., & Im, T. (2013). Factors of learner-instructor interaction which predict perceived learning outcomes in online learning environment. Journal of Computer Assisted Learning, 29(3), 292-301.

Kennedy, M. M. (2016). How does professional development improve teaching?. Review of educational research , 86(4), 945-980.

Kennette, L. N., & Redd, B. R. (2015). Instructor presence helps bridge the gap between online and on-campus learning. College Quarterly, 18(4), n4.

Kim, K. J., & Bonk, C. J. (2006). The future of online teaching and learning in higher education. Educause quarterly, 29(4), 22-30.

König, J., & Rothland, M. (2012). Motivations for choosing teaching as a career: Effects on general pedagogical knowledge during initial teacher education. Asia-Pacific Journal of Teacher Education, 40(3), 289-315.

Krumrei-Mancuso, E. J., & Rouse, S. V. (2016). The development and validation of the comprehensive intellectual humility scale. Journal of Personality Assessment, 98(2), 209-221.

Lederman, D. (2020, October 6). Faculty confidence in online learning grows. Inside Higher Ed. Retrieved from https://www.insidehighered.com/digital-learning/article/2020/10/06/covid-era-experience-strengthens-faculty-belief-value-online

Lee, S. J., & Huang, K. (2018). Online interactions and social presence in online learning. Journal of Interactive Learning Research, 29 (1), 113-128.

Liu, X., Magjuka, R. J., Bonk, C. J., & Lee, S. H. (2007). Does sense of community matter? An examination of participants' perceptions of building learning communities in online courses. Quarterly Review of Distance Education, 8(1), 9.

Luo, N., Zhang, M., & Qi, D. (2017). Effects of different interactions on students' sense of community in e-learning environment. Computers & Education, 115, 153-160.

Luo, N., Zhang, Y., & Zhang, M. (2019). Retaining learners by establishing harmonious relationships in e-learning environment. Interactive Learning Environments, 27(1), 118-131.

Markus, K. A., & Borsboom, D. (2013). Frontiers of test validity theory: Measurement, causation, and meaning . Routledge.

Marti, C. N. (2008). Dimensions of student engagement in American community colleges: Using the Community College Student Report in research and practice. Community College Journal of Research and Practice , 33(1), 1-24.

Martin, F., & Bolliger, D. U. (2018). Engagement matters: Student perceptions on the importance of engagement strategies in the online learning environment. Online Learning, 22(1), 205-222.

Martin, F., Ritzhaupt, A., Kumar, S., & Budhrani, K. (2019). Award-winning faculty online teaching practices: Course design, assessment and evaluation, and facilitation. The Internet and Higher Education, 42 , 34-43.

Martin, F., Wang, C., Budhrani, K., Moore, R. L., & Jokiaho, A. (2019). Professional development support for the online instructor: perspectives of US and German

instructors. Online Journal of Distance Learning Administration , 22(3).

Martin, F., Wang, C., & Sadaf, A. (2018). Student perception of helpfulness of facilitation strategies that enhance instructor presence, connectedness, engagement and learning in online courses. The Internet and Higher Education , 37, 52-65.

Mayer, R. E., & Anderson, R. B. (1991). Animations need narrations: An experimental test of a dual-coding hypothesis. Journal of educational psychology, 83(4), 484.

Mayer, R. E., & Moreno, R. (1998). A cognitive theory of multimedia learning: Implications for design principles. Journal of Educational Psychology, 91(2), 358-368.

Means, B., Toyama, Y., Murphy, R., Bakia, M. & Jones, K. (2010). Evaluation of evidence-based practices in online learning: A Meta-analysis and review of onlinelearning Studies. Technical Report. U.S. Department of Education, Washington, D.C. Retrieved from http://www2.ed.gov/rschstat/eval/tech/evidence-based-practices/finalreport.pdf

Mercado, C. (2008). Readiness assessment tool for an e-learning environment implementation. Special Issue of the International Journal of the Computer, the Internet and Management , 16, 18-11.

Mojavezi, A., & Tamiz, M. P. (2012). The impact of teacher self-efficacy on the students' motivation and achievement. Theory & Practice in Language Studies, 2 (3).

Moore, M. G. (1989). Three types of interaction. The American Journal of Distance Education, 3(2), pp. 1-6.

Moreno, R., & Mayer, R. E. (1999). Cognitive principles of multimedia learning: The role of modality and contiguity. Journal of educational psychology, 91 (2), 358.

Morris, L. V., Xu, H., & Finnegan, C. L. (2005). Roles of faculty in teaching asynchronous

undergraduate courses. Journal of Asynchronous Learning Networks, 9(1), 65-82.

Muilenburg, L., & Berge, Z. L. (2001). Barriers to distance education: A factor-analytic study. American Journal of Distance Education , 15(2), 7-22.

Muilenburg, L. Y., & Berge, Z. L. (2005). Student barriers to online learning: A factor analytic study. Distance education , 26(1), 29-48.

National Center for Education Statistics. (2010). IPEDS Classification of Instructional Programs (CIP). Retrieved from https://nces.ed.gov/ipeds/cipcode/browse.aspx?y=55

Orr, R., Williams, M. R., & Pennington, K. (2009). Institutional efforts to support faculty in online teaching. Innovative Higher Education , 34(4), 257.

Pancsofar, N., & Petroff, J. G. (2013). Professional development experiences in co-teaching: Associations with teacher confidence, interests, and attitudes. Teacher education and Special Education, 36(2), 83-96.

Phillips, L. A., Baltzer, C., Filoon, L., & Whitley, C. (2017). Adult student preferences: Instructor characteristics conducive to successful teaching. Journal of Adult and Continuing Education, 23(1), 49-60.

Porter, R. D. (2003). Internet-based distance educators address major distance education barriers in large postsecondary institutions (pp. 1-179). Saint Louis University.

Puzziferro, M. (2008). Online technologies self-efficacy and self-regulated learning as predictors of final grade and satisfaction in college-level online courses. The American Journal of Distance Education, 22 (2), 72-89.

Quality Matters. (2014). Quality matters higher education rubric. Annapolis, MD: Author.

Quality Matters (2018). Quality matters higher education rubric. Retrieved from

https://www.qualitymatters.org/sites/default/files/PDFs/StandardsfromtheQMHigherEducation Rubric.pdf

Ran, F. X., & Sanders, J. (2020). Instruction quality or working condition? The effects of part-time faculty on student academic outcomes in community college introductory courses. AERA Open, 6(1), 2332858420901495.

Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2020). Online university teaching during and after the Covid-19 crisis: Refocusing teacher presence and learning activity. Postdigital Science and Education , 2(3), 923-945.

Rhoades, G. (2020). Taking college teachers' working conditions seriously: Adjunct faculty and negotiating a labor-based conception of quality. The Journal of Higher Education , 91(3), 327-352.

Rienties, B., Giesbers, B., Lygo-Baker, S., Ma, H. W. S., & Rees, R. (2016). Why some teachers easily learn to use a new virtual learning environment: A technology acceptance perspective. Interactive Learning Environments, 24(3), 539-552.

Roche, L. A., & Marsh, H. W. (2000). Multiple dimensions of university teacher self-concept. Instructional Science, 28(5), 439-468.

Rodriguez, F., Rivas, M. J., Matsumura, L. H., Warschauer, M., & Sato, B. K. (2018). How do students study in STEM courses? Findings from a light-touch intervention and its relevance for underrepresented students. PloS one, 13(7), e0200767.

Sher, A. (2009). Assessing the relationship of instructor-student and student-student interaction to student learning and satisfaction in web-based online learning environment. Journal of Interactive Online Learning, 8(2).

Stepich, D. A., & Ertmer, P. A. (2003). Building community as a critical element of online

course design. Educational Technology, 33-43.

Sterkenburg, T. F. (2016). Solomonoff prediction and Occam's razor. Philosophy of Science, 83(4), 459-479.

Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. Research in Science Education, 48(6), 1273-1296.

U.S. Department of Education/National Center for Education Statistics. (2019). Digest of Education Statistics 2019, Table 311.15. Retrieved from: https://nces.ed.gov/fastfacts/display.asp?id=80

van Merriënboer, J. J. G., and Paas, F. (2003). Powerful learning and the many faces of instructional design: Toward a framework for the design of powerful learning environments. In de Corte, E., Verschaffel, L., Entwistle, N., and van Merrienboer, J. (eds.), Unravelling Basic Components and Dimensions of Powerful Learning Environments, Elsevier Science, Oxford, UK, pp. 1–20.

Vanslambrouck, S., Zhu, C., Lombaerts, K., Philipsen, B., & Tondeur, J. (2018). Students' motivation and subjective task value of participating in online and blended learning environments. The Internet and Higher Education, 36, 33-40.

Wagner, E.D. (1998). Interaction strategies for online training designs. Proceedings of Distance Learning 98: 14th Annual Conference on Distance Teaching & Learning, pp. 417-421. Madison, WI: University of Wisconsin System.

Walker, G. (2005). Critical thinking in asynchronous discussions. International Journal of Instructional Technology and Distance Learning, 2 (6), 15-22.

Wasilik, O., & Bolliger, D. U. (2009). Faculty satisfaction in the online environment: An institutional study. The Internet and Higher Education, 12 (3-4), 173-178.

Wingo, N. P., Ivankova, N. V., & Moss, J. A. (2017). Faculty perceptions about teaching online: Exploring the literature using the technology acceptance model as an organizing framework. Online Learning, 21(1), 15-35.

Wright, J. M. (2014). Planning to meet the expanding volume of online learners: An examination of faculty motivation to teach online. Educational Planning, 21 (4), 35-49.

Wyles, B. A. (1998). Adjunct Faculty in the Community College: Realities and Challenges. New directions for higher education , 104, 89-93.

Yang, Y., & Cornelious, L. F. (2005). Preparing instructors for quality online instruction. Online Journal of Distance Learning Administration , 8(1), 1-16.

Young, J. R. (May 31, 2002). The 24-hour professor: Online teaching redefines faculty members' schedules, duties, and relationships with students. : Chronicle of Higher Education

Zhang, P. (1998). A case study on technology use in distance learning. Journal of Research on Computing in Education, 30(4), 398-419.

Zhen, Y., Garthwait, A., & Pratt, T. (2008). Factors affecting faculty members' decision to teach or not to teach online in higher education. Online Journal of Distance Learning Administration, 11(3), 18.

Tables

Table 1. A Person-Purpose Framework of Online Interaction-Oriented Instructional Practices

Practice	Abbreviation	Example Item
Instructor-Student Academic Interaction	ISAI	Directly responding to student postings regarding academic content on discussion forums
Instructor-Student Social Interaction	ISSI	I tried to make my personality come through in my communication with students.
Instructor-Student Course Management Interaction	ISCMI	After grading an assignment, I proactively identified students that were struggling (e.g., missing assignments, low grades, low class participation) and reached out to them.
Student-Student Academic Interaction	SSAI	How often did you provide collaborative work (e.g., group assignments, peer review)?
Student-Student Social Interaction	SSSI	I encouraged my online students to get to know each other more than what is required for assignments or tasks.
Student-Content Academic Interaction	SCAI	Provided online classroom practice (e.g., quizzes, problem-sets, other assignments)

Note: For all items in each practice domain, please refer to table 3. The "person" in the person-purpose framework refers to what persons or entities students are interacting with, which includes: instructor-student (IS), student-student (SS), or student-content (SC) interactions. The "purpose" in the person-purpose framework refers to the aim or goal of an online interaction, such as: academic interaction (AI), social interaction (SI), or course managerial interaction (CMI). When these elements are combined, we get the listed set of sub-domains of interaction-oriented practices.

Table 2. Sample Characteristics

	N	M (SD)
Online Teaching Experience		
Taught 1 online course at any post-secondary institution	126	0.19 (0.39)
Taught 2-5 online courses at any post-secondary institution	126	0.49 (0.50)
Taught 6 or more online courses any post-secondary institution	126	0.32 (0.47)
Instructor typically teaches fully online courses during a term	126	0.25 (0.43)
Employment Stability and Teaching Load		
Post-secondary teaching is primary career	126	0.86 (0.35)
Instructor full-time during current academic term	126	0.67 (0.47)
Instructor only employed at surveyed college	126	0.72 (0.45)
Typically teach 8 or less credits	126	0.31 (0.46)
Typically teach 12-16 credits	126	0.35 (0.48)
Typically teach 16+ credits	126	0.34 (0.48)
General Experience		
Total years of post-secondary teaching (any institution)[a]	126	12.98 (7.47)
Age: < 46	126	0.50 (0.50)
Age: > 46	126	0.44 (0.50)
Age: Did not respond	126	0.06 (0.24)
Education[b] and Discipline Area		
BS/BA or certificate earned	126	0.08 (0.27)
Masters earned	126	0.71 (0.45)
Doctorate earned: PhD/Professional Degree	126	0.21 (0.41)
Art & Humanities	126	0.36 (0.48)
Business	126	0.16 (0.37)
STEM & Health Sciences	126	0.33 (0.47)
Social & Behavioral Sciences	126	0.10 (0.31)
Other discipline (e.g., hardware/software support, crisis intervention, etc.)	126	0.05 (0.21)
Instructor Perceptions[a]		
Self-Efficacy in using Online Platforms	126	4.55 (0.68)
Benefits: Instructor-centered motivation for online teaching	126	3.53 (0.77)
Benefits: Student-centered motivation for online teaching	126	3.86 (0.99)
Feeling supported for online teaching	126	3.46 (0.73)
Perception that F2F easier	126	4.41 (0.84)

Note: [a]These variables are numeric; all other variables are binary (1/0). However, when generating the characteristic composites, credits and online courses taught were recoded to have ordinal values; values of 1 represent the lowest category. The means for binary variables represents the percent of individuals in that category. For example, 19% of instructors taught at least one online course prior any post-secondary institution, and 67% of the sample were full-time instructors. [b]Education variables are the highest degree earned reported by the instructor at the time of the survey. That is, 71% of instructors indicated a master's degree as the highest degree earned up to the time of the survey.

Table 3. Interaction-Oriented Practices: Composites (Sub-domains) and Full Items

	Full Item	M	SD	Min	Max
ISAI Composite		**4.39**	**0.5**	**2.8**	**5**
ISAI_1	Providing face-to-face office hours for students to ask academic related questions.	4.82	0.6	2	5
ISAI_2	Providing feedback (beyond a grade) on student work	4.79	0.53	3	5
ISAI_3	Directly responding to student postings regarding academic content on discussion forums	4.44	0.85	2	5
ISAI_4	Interacting with students using synchronous media (e.g., Skype or other video conference tools)	3.42	0.92	2	5
ISAI_5	Interacting with students using asynchronous media (discussion boards, etc.)	4.48	0.86	2	5
ISSI Composite		**0.93**	**0.16**	**0.33**	**1**
ISSI_1	I introduced myself to my students via emails, audio, video, or images.	0.97	0.18	0	1
ISSI_2	I tried to make my personality come through in my communication with students.	0.96	0.2	0	1
ISSI_3	I shared aspects of my hobbies, interests, pets, and other aspects of my life with my students.	0.85	0.36	0	1
ISCMI Composite		**4.25**	**0.46**	**2.83**	**5**
ISCMI_1	Sending announcements or reminders to students about course content and assignments (e.g., weekly check-ins, announcements, etc.)	4.97	0.18	4	5
ISCMI_2	When I gave a course assignment, I provided explicit grading criteria (e.g., rubric).	4.49	0.86	1	5
ISCMI_3	When I recognized struggling students, I offered additional supports (e.g., study tips, resources, and advice).	3.81	0.9	2	5
ISCMI_4	When a student asked a question about logistics and course requirements, I quickly responded (within 24 hours).	4.83	0.44	2	5
ISCMI_5	ow often did you provide opportunities for students to give feedback about the course?	2.92	1.1	2	5
ISCMI_6	I provided explicit grading criteria (e.g., rubric) for discussion forum assignments.	4.47	1.12	1	5
SSAI Composite		**2.8**	**0.9**	**1**	**5**
SSAI_1	How often did you provide collaborative work (e.g., group assignments, peer review)?	2.74	1.44	1	5
SSAI_2	How often did you assign student-to-student discussions of the concepts outlined in the course using asynchronous media (e.g., Blackboard/Canvas/Moodle discussions)?	3.99	1.14	1	5
SSAI_3	How often did you assign student-to-student discussions of the concepts outlined in the course using synchronous media (e.g., Skype or video conferencing tools)?	1.67	1.17	1	5
SSSI Composite		**0.76**	**0.33**	**0**	**1**
SSSI_1	I encouraged my online students to get to know each other more than what is required for assignments or tasks.	0.71	0.45	0	1
SSSI_2	I asked my students to introduce themselves to each other via emails, audio, video, or images.	0.81	0.39	0	1
SCAI Composite		**3.49**	**0.64**	**1.67**	**4.93**
SCAI_1	Explicitly connected new lessons with prior content	4.07	0.79	2	5
SCAI_2	Summarized the big ideas in the course	4.14	0.8	2	5
SCAI_3	Emphasized important information/exam content	4.38	0.67	3	5
SCAI_4	Emphasized application of facts, theories, or methods to practical problems or new situations	4.1	0.94	1	5
SCAI_5	Emphasized analysis of an idea, experience, or line of reasoning in depth by examining its parts	3.91	1.02	1	5

SCAI_6	Emphasized evaluation of a point of view, decision, or information source	3.63	1.16	1	5
SCAI_7	Emphasized formation of a new idea or understanding form various pieces of information	3.83	0.98	1	5
SCAI_8	Provided online classroom practice (e.g., quizzes, problem-sets, other assignments)	4.63	0.85	1	5
SCAI_9	Provided lectures through video (e.g., audible videos of yourself solving problems/lecturing)	2.96	1.64	1	5
SCAI_10	Provided lectures through audio (e.g., voice integrated within PowerPoint slides, etc.)	2.25	1.61	1	5
SCAI_11	I encouraged my students to do self-testing.	3.56	1.57	1	5
SCAI_12	I encouraged my students to make outlines.	2.67	1.61	1	5
SCAI_13	I encouraged my students to make diagrams.	2.22	1.49	1	5
SCAI_14	I encouraged my students to use flashcards.	2.52	1.6	1	5
SCAI_15	I encouraged my students to reflect on their learning.	3.52	1.35	1	5

Note: ISAI = instructor-student academic interaction; ISSI = instructor-student social interaction; ISCMI = instructor-student course managerial interaction; SSAI = student-student academic interaction; SSSI = student-student social interaction; SCAI = student-content academic interaction. ISAI items were positioned on a 5-point Likert scale ranging from 1 = "Never", 2= "Once", 3 = "Three times in total during the semester", 4 = "Every two weeks", and 5 = "Every Week". Instructor-student social (ISSI and ISAI) items ask whether or not an instructor employed a certain technique, and these items were placed on a binary response format, with 0 = *"No"* and 1 = *"Yes".* Instructor-student course management items did not lend themselves to weekly administration, response options included 1 = "Never", 2= "Rarely", 3 = "Occasionally", 4 = "Frequently", and 5 = "Very Frequently". SSAI = student-student academic interaction; SSSI = student-student social interaction. Student-student academic items were positioned on a 5-point Likert scale ranging from 1 = "Never", 2= "Once", 3 = "Three times in total during the semester", 4 = "Every two weeks", and 5 = "Every Week". Student-student social items ask whether or not an instructor encouraged students to introduce and get to know each other, and these items were placed on a binary response format, with 0 = *"No"* and 1 = *"Yes".* SCAI = student-content academic interaction. SCAI_1-7 response options included 1 = "Never", 2= "Rarely", 3 = "Occasionally", 4 = "Frequently", and 5 = "Very Frequently". SCAI_8-15 were on a 5-point Likert scale ranging from 1 = "Never", 2= "Once", 3 = "Three times in total during the semester", 4 = "Every two weeks", and 5 = "Every Week".

Table 4. Linear Regression: Characteristics and Perceptions Predicting IOP Index

	IOP Index		
	(1)	(2)	(3)
Online Teaching Experience	0.112 (0.095)		-0.028 (0.090)
Employment Stability and Teaching Load	0.192* (0.095)		0.167 (0.085)
General Experience (age and years teaching)	0.112 (0.089)		0.125 (0.080)
Doctorate earned: PhD/Professional Degree	0.063 (0.230)		0.071 (0.197)
Teaches in STEM Field	-0.032 (0.190)		0.124 (0.176)
Self-Efficacy in using Online Platforms		0.425*** (0.087)	0.423*** (0.088)
Benefits: Instructor-centered motivation for online teaching		-0.277* (0.106)	-0.300** (0.111)
Benefits: Student-centered motivation for online teaching		0.242* (0.111)	0.282* (0.115)
Feeling supported for online teaching		0.001 (0.086)	0.009 (0.087)
Perception that F2F easier		-0.078 (0.086)	-0.090 (0.086)
Constant	-0.002 (0.117)	0.000 (0.079)	-0.056 (0.104)
Observations	126	126	126
R^2	0.050	0.247	0.294
Adjusted R^2	0.010	0.215	0.233

Note: *p<0.05; **p<0.01; ***p<0.001
IOP = interaction-oriented practice index. Aside from Teaches in STEM Field and Doctorate earned: PhD/Professional Degree, which are dichotomous variables, all variables are standardized to have a mean of 0 and standard deviation of 1. Thus, we display standardized coefficient.

Table 5: Linear Regression: Characteristics and Perceptions Predicting IOP Sub-domains

	ISAI	ISSI	ISCMI	SSAI	SSSI	SCAI
Online Teaching Experience	-0.034	0.082	0.076	-0.087	-0.115	-0.030
	(0.095)	(0.099)	(0.101)	(0.096)	(0.097)	(0.091)
Employment Stability and Teaching Load	0.156	0.189*	0.050	0.004	0.110	0.134
	(0.090)	(0.094)	(0.096)	(0.091)	(0.092)	(0.086)
General Experience (age and years teaching)	0.105	-0.031	0.129	0.140	0.046	0.093
	(0.084)	(0.088)	(0.090)	(0.085)	(0.087)	(0.081)
Doctorate earned: PhD/Professional Degree	0.135	-0.108	0.040	0.123	0.157	-0.075
	(0.209)	(0.218)	(0.222)	(0.211)	(0.214)	(0.200)
Teaches in STEM Field	0.320	0.139	0.108	0.012	0.188	-0.072
	(0.186)	(0.195)	(0.198)	(0.189)	(0.191)	(0.179)
Self-Efficacy in using Online Platforms	0.388***	0.279**	0.136	0.254**	0.309**	0.265**
	(0.093)	(0.097)	(0.098)	(0.094)	(0.095)	(0.089)
Benefits: Instructor-centered motivation for online teaching	-0.300*	-0.138	-0.147	-0.168	0.033	-0.438***
	(0.117)	(0.123)	(0.125)	(0.119)	(0.120)	(0.112)
Benefits: Student-centered motivation for online teaching	0.005	-0.001	0.211	0.339**	0.136	0.307**
	(0.121)	(0.127)	(0.129)	(0.123)	(0.124)	(0.116)
Feeling supported for online teaching	-0.019	0.139	0.104	-0.076	-0.243*	0.132
	(0.092)	(0.096)	(0.098)	(0.093)	(0.094)	(0.088)
Perception that F2F easier	-0.075	-0.066	0.044	-0.121	0.087	-0.218*
	(0.091)	(0.095)	(0.097)	(0.092)	(0.093)	(0.087)
Constant	-0.134	-0.024	0.028	-0.029	-0.095	0.040
	(0.110)	(0.115)	(0.117)	(0.111)	(0.113)	(0.105)
Observations	126	126	126	126	126	126
R^2	0.212	0.138	0.109	0.193	0.170	0.276
Adjusted R^2	0.144	0.063	0.031	0.123	0.097	0.213

Note: *p<0.05; **p<0.01; ***p<0.001

ISAI = instructor-student academic interaction; ISSI = instructor-student social interaction; ISCMI = instructor-student course management interaction; SSAI = student-student academic interaction; SSSI = student-student social interaction; SCAI = student-content academic interaction. All variables are standardized to have a mean of 0 and standard deviation of 1.

Figures

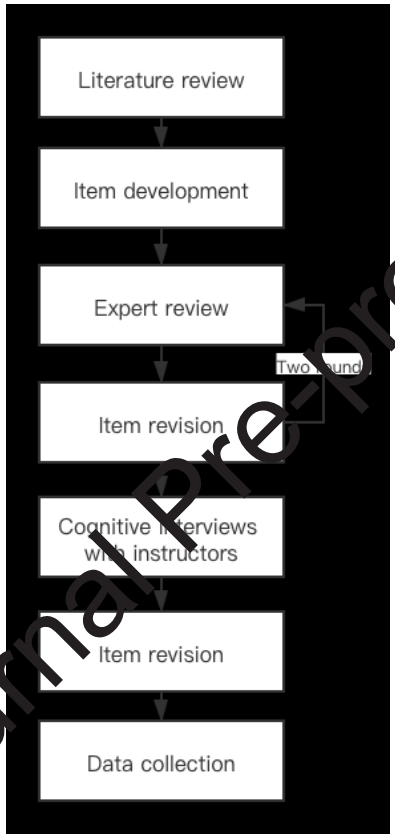

Figure 1. Procedure flow used in this study.

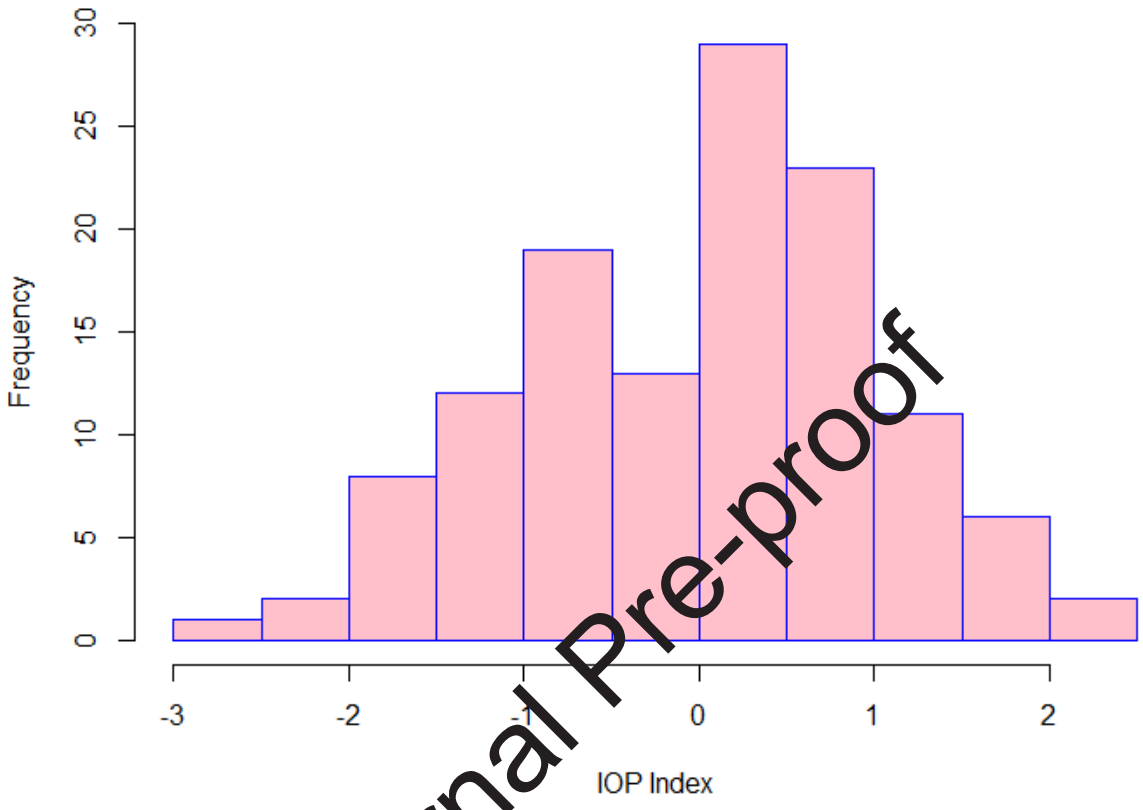

Figure 2. Distribution of the interaction-oriented practice (IOP) index. This variable is the combined standardized composite of the six sub-domains: ISAI, ISSI, ISCMI, SSAI, SSSI, and SCAI.

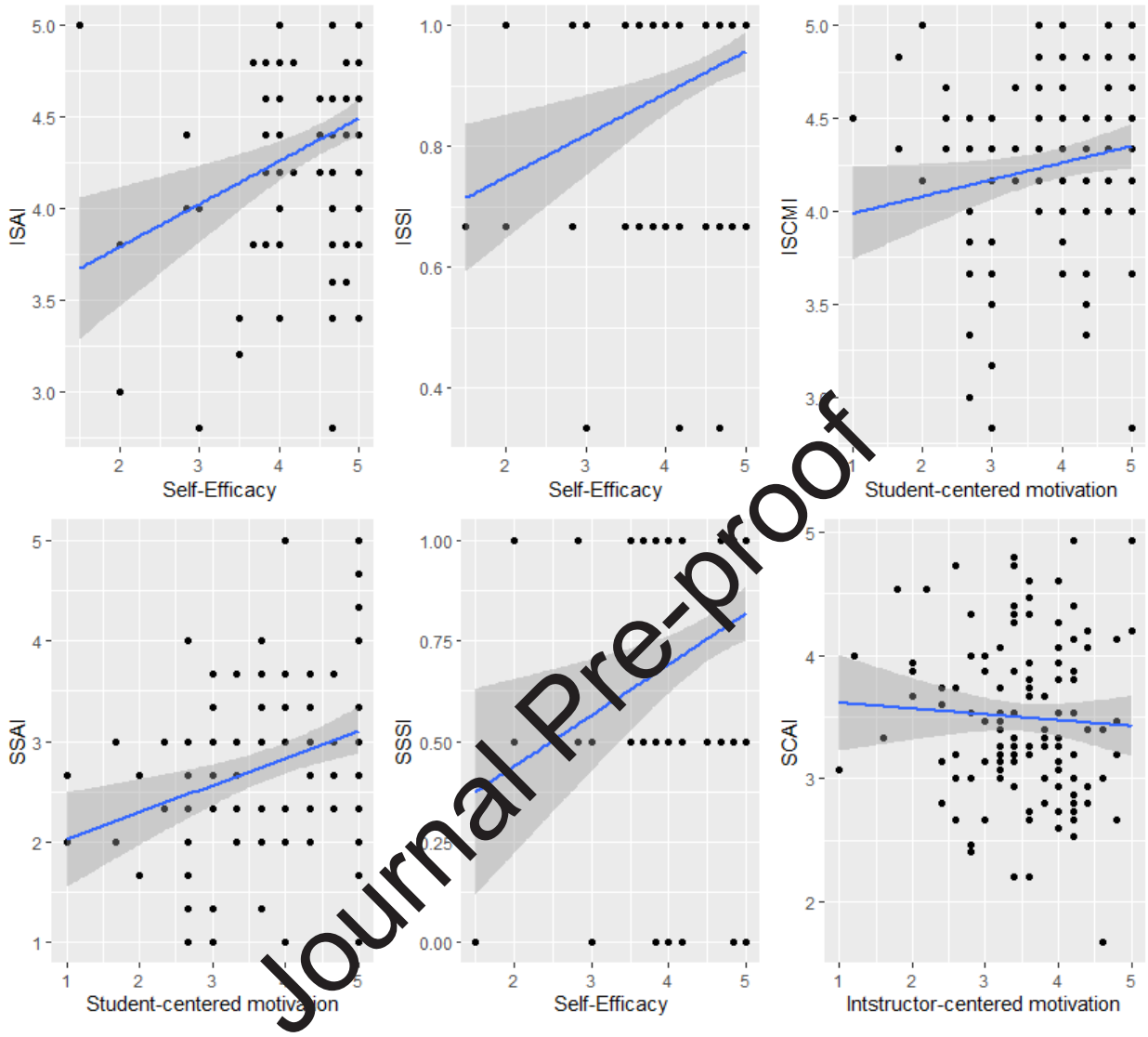

Figure 3. Largest predictors from the full model for each online instructional practice. The relationship with ISCMI is the only non-significant relationship, $p > .05$.

Highlights

- A novel person-purpose framework for understanding online pedagogy is introduced
- Instructor self-efficacy relates to greater use of interaction-oriented practices
- Student-centered motivation relates to greater use of interaction-oriented practices
- Employment stability relates to greater use of interaction-oriented practices
- Implications for enhancing adoption of effective online pedagogy is discussed