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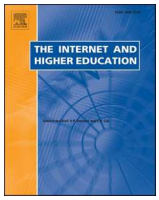

College online courses have strong design in scaffolding but vary widely in supporting student agency and interactivity

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ABSTRACT

This study develops a rubric comprising three quality concepts critical to addressing online learning challenges: *Scaffolding*, which supports student self-regulated learning processes; *Student Agency*, which promotes student choices and voices; and *Social Presence and Interpersonal Interaction*, which enhances student connection with peers and instructors. We then examine the extent to which college online courses reflect the three concepts following a 3-point scoring scale ("beginning," "developing," or "proficient") based on observation data collected from 100 randomly selected courses. Our results indicate that about two-thirds of the courses score at or above the developing level, demonstrating some but insufficient incorporation of design features that can enhance the three concepts. While most courses are above the developing level for "Scaffolding," less than half and less than one-third reach the developing level for the other two concepts. We further identify variations in course design based on instructor characteristics, where female instructors, instructors with higher educational attainment, and instructors teaching fewer credit hours had higher scores.

1. Introduction

Distance learning through online coursework has proliferated in postsecondary education, especially at broad access institutions (e.g., community colleges) that enroll a large proportion of non-traditional students who need to balance learning with work and life responsibilities (Allen & Seaman, 2015; Xu & Xu, 2020). However, existing studies consistently identify higher course withdrawal rates, poorer performance, and wider racial equity gaps associated with online delivery at broad access institutions (Hart, Friedmann, & Hill, 2018; Xu & Jaggars, 2013, 2014).

The accelerated expansion of online learning as a result of the COVID-19 pandemic, coupled with persistent poorer performance and wider equity gaps in semester-long online courses, prompts questions about improvements in online course quality at scale. Theoretical discussions and descriptive evidence based on surveys or interview data have highlighted two critical challenges to successful online learning: the need for stronger self-regulated learning (SRL) skills as well as the need for increased and more effective interpersonal interactions (Broadbent & Poon, 2015; Xu & Xu, 2020). In response to these challenges, three quality concepts have been widely discussed by online learning theories, empirical studies, and popular quality benchmarks: (1) "Scaffolding" for supporting students' SRL skills and guiding their learning process (Panadero, 2017), (2) "Student Agency" for promoting student choices and voices (Deci & Ryan, 2012; Lee, Pate, & Cozart, 2015), and (3) "Social Presence & Interpersonal Interaction" for enhancing interaction and psychological connections between students and their peers/instructors (Pacansky, Smedshammer, & Vincent-Layton, 2020; Richardson et al., 2015).

The discussions held have provided a solid foundation for the development of online courses of high quality. However, a dearth of empirical evidence regarding the extent to which current college online courses embody these concepts has made it challenging for educational institutions and policymakers to accurately assess the requirement for and formulate a comprehensive curriculum for professional development programs in the area of online instruction.

While a handful of studies have explored the design of online courses in higher education, they have largely relied on the subjective perceptions of students and instructors collected through surveys to evaluate the adequacy of the current design in meeting the needs of students (e.g.,

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Bolliger & Martin, 2021; Tudevdagva, Sodnom, & Erdenechimeg, 2021). However, it is important to consider the limitations inherent in subjective evaluations. Specifically, students may not have the necessary expertise to accurately assess the course design and instructional practices (Margaryan, Bianco, & Littlejohn, 2015). In addition, instructors may be prone to social desirability bias, leading to a biased representation of their own performance (Bolliger & Martin, 2021). In order to evaluate online courses more objectively, various rubrics have been developed (Phipps & Merisotis, 2000; Quality Matters, 2018). However, previous research has mainly focused on validating these rubrics or evaluating the impact of using them, rather than using them to systematically document the overall design of online courses (e.g., Bigatel & Edel-Malizia, 2018; Marciniak, 2018; Roehrs, Wang, & Kendrick, 2013; Shattuck, 2012; Zimmerman, Altman, Simunich, Shattuck, & Burch, 2020). Although a handful of studies have used existing rubrics to document the design of online courses, they mostly focus on course organization and interaction between students and instructors, and do not provide a complete picture of all the design features of online courses (e.g., Chao, Saj, & Tessier, 2006; Jaggars & Xu, 2016; Miller, 2012). Additionally, these studies often use small or convenient samples, which limits the generalizability of their findings.

In addition to the need for larger-scale studies that comprehensively depict college online course design features, the current literature also needs to provide more information regarding how online course design features may vary by instructor characteristics and course subjects. Determining the associations is essential, as it could pinpoint areas needing improvement for specific instructors or subject areas. The broad literature on instructional practices has highlighted the importance of considering course subjects (e.g., de Silva & Wickramasinghe, 2022; Eagan, 2016; Vu, 2017) and a variety of instructor characteristics (e.g., Feigenbaum & Iqani, 2015; MacNell, Driscoll, & Hunt, 2015; Vu, 2017) in relation to instructors' pedagogical approach. Yet, most of the evidence is limited to in-person instructional settings, and more research is needed to examine the associations between course/instructor characteristics and engagement of instructional practices suggested as beneficial in online learning.

This study addresses these gaps by directly documenting the design features and instructional practices of 100 randomly selected online courses offered at a large community college. To our knowledge, this is the first study that uses random sampling at this scale on this topic. Based on this unique dataset, we systematically examine the extent to which the design of these online courses reflects the concepts of "Scaffolding," "Student Agency," and "Social Presence & Interpersonal Interaction," as well as the extent to which course and instructor characteristics are associated with the implementation of the three concepts. Specifically, the unique dataset of archived online courses allows us to log into the course shell and record various course design features, teaching materials, and class activities in detail. To systematically capture various online course design features, we develop a rubric that defines the three concepts and six key course components that are typically included in an online course, resulting in a 3×6-matrix where each cell describes how a specific course component could be designed to optimize learning guided by a concept. Based on the rubric, a team of researchers systematically coded the design features in each course to answer the following three research questions (RQs):

RQ1. To what extent do the courses embody the three concepts, as evaluated through the total score?

RQ2. To what extent do the courses scaffold SRL skills, promote student agency, and foster social presence and interpersonal interaction based on each subscore?

RQ3. What instructor and course characteristics are associated with higher course design scores?

This paper contributes to the current literature on online instruction in three crucial ways: First, as mentioned above, this is the first study that collects observation data from a large swath of college online courses through random sampling. It thus renders a more objective and representative description of how an online course is taught. Specifically, our findings indicate greater variations among courses in promoting "Student Agency" and "Social Presence & Interpersonal Interaction." By examining the design features of courses receiving a high score in those areas, this study also reveals several specific ways instructors and college administrators can further improve their online courses. Second, unlike previous studies that mainly rely on instructor self-report data, this study is among the first to examine the extent to which course and instructors' characteristics can predict the implementation of design features and teaching practices measured by objective course observation and thus substantially reduce potential bias due to self-reporting. Lastly, this study also develops a comprehensive and theory-driven rubric with a holistic description of the quality expectations, along with concrete examples to help instructors think through a complex set of quality characteristics within each area in a more profoundly reflective fashion.

2. Literature review

2.1. A conceptual framework for quality online instruction

This study is motivated by the need to design online courses to better address the two critical challenges inherent to online learning: the requirement for stronger self-regulated learning skills and greater challenges for enabling effective interpersonal interactions. The literature on the design of online courses to address these two challenges includes three related lines of research. The *first* line draws on theory-based frameworks, such as self-regulated learning models (Panadero, 2017), the Transactional Distance Theory (Moore, 2013), and the Community of Inquiry (CoI) framework (Garrison, Anderson, & Archer, 1999) to provide a theoretical foundation for understanding the key design features that are critical for effective online learning. For instance, the Transactional Distance Theory emphasizes the importance of three design features - structure, autonomy, and dialogue - in reducing transitional distance in online learning. The *second* line provides empirical evidence regarding the relationships between online course design features and students' learning outcomes, further reinforcing the significance of quality features suggested by theory-based frameworks (e.g., Baker et al., 2020; Doo, Bonk, & Heo, 2020). The *last* line of research includes existing online course rubrics developed by various institutions (e.g., California State University, 2022; California Virtual Campus-Online Education Initiative (CVC-OEI) (2020); Quality Matters, 2018). These rubrics provide guidelines for evaluating the design of online courses and supporting student success. For example, Quality Matters (2018) includes eight general and 42 specific review standards and has been the most widely used guideline in evaluating the design of online courses.

While the three lines of research differ in their conceptualizations of online course quality, they consistently highlight three quality concepts as crucial for addressing the challenges inherent to online learning. These concepts include "Scaffolding," "Student Agency," and "Social Presence & Interpersonal Interaction." Below, we provide a review of the theoretical foundations, empirical evidence, and relevant rubrics for each of the three quality concepts. To clarify the interrelationships among these concepts, theories, empirical findings, and existing rubrics, we present a visual representation of these connections in Fig. 1.

2.1.1. Self-regulated learning and scaffolding strategies

Self-regulated learning (SRL) describes volitional activities of regulation in learning tasks and includes three distinct phases, namely goal setting and planning, monitoring of study strategies during task engagement, and reflection on the learning process and potential adaptations (Butler & Winne, 1995; Panadero, 2017; Zimmerman, 2000). While self-regulation is important in any learning context, the

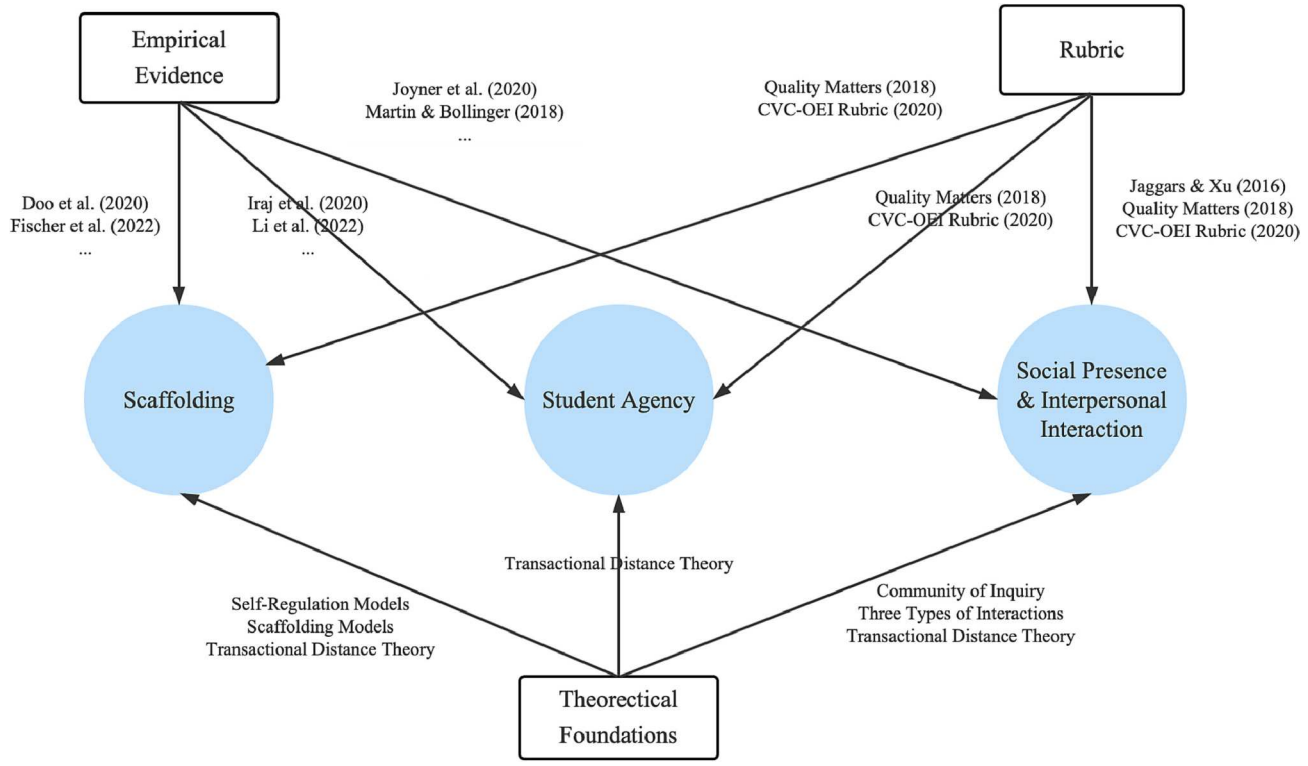

Fig. 1. Interrelationships among concepts, theories, research findings, and rubric elements.
Note. This figure only includes some literature examples. For detailed references, please refer to the literature review section.

autonomous nature of online learning environments requires students to be more independent and have more advanced competence in managing their learning process (Jaggars, 2011; Viberg, Khalil, & Baars, 2020). There is considerable empirical evidence suggesting that SRL relates to behavioral aspects of the learning process and academic performance in online settings (e.g., Baker et al., 2020; Kizilcec, Pérez-Sanagustín, & Maldonado, 2017). For example, Kizilcec et al. (2017) found that students with stronger SRL skills are more likely to revisit course materials. Broadbent and Poon (2015) found that SRL skills, such as time management, metacognitive monitoring, and effort regulation, are positively associated with academic performance in online courses.

Many college students are not equipped with sufficient SRL skills to succeed in online courses that require higher degrees of monitoring and self-discipline than face-to-face courses (Xu & Xu, 2020). However, a critical finding from the existing literature that somewhat alleviates the concern is that instructors can actively scaffold students in learning SRL skills with prompts and activities (e.g., Belland, Walker, Kim, & Lefler, 2017; Kizilcec et al., 2017). Scaffolding is inspired by Vygotskian sociocultural theories (van de Pol, Volman, & Beishuizen, 2010; Vygotsky & Cole, 1978) and describes an interactive process between learners and instructors where (i) tailored support structures are provided to the learner and (ii) are gradually withdrawn as the learner increases its competence (van de Pol et al., 2010). Three key types of scaffolding have been identified as crucial for facilitating the process of SRL, including metacognitive, procedural, and strategic scaffoldings (Doo et al., 2020; Hannafin, Land, & Oliver, 2013). Empirical evidence has confirmed that scaffolding can enhance students' learning outcomes (e.g., Doo et al., 2020; Kim, Belland, & Walker, 2018). A comprehensive meta-analysis of 64 studies (from 18 articles) identified large effect sizes of scaffolding on learning outcomes (Doo et al., 2020). Other studies have also demonstrated the positive effects of various types of scaffolding. For example, Zhou and Lam (2019) systematically reviewed 36 studies in K-12 and higher education and found that metacognitive scaffolding strategies effectively enhance information searching performance. In the context of online courses, researchers have proposed a number of instructional approaches aimed at scaffolding students' SRL skills. The first approach focuses on procedural scaffolding, such as building an intuitive and clear course structure (Fischer et al., 2022; Quintana, Zhang, & Krajcik, 2005). The second approach involves metacognitive scaffolding, such as providing guidance on appropriate time and order to complete assignments (Ralston-Berg, Buckenmeyer, Barczyk, & Hixon, 2015; Saint, Gašević, Matcha, Uzir, & Pardo, 2020), as well as implementing regular assignment deadlines to counteract procrastination (Uzir et al., 2020; Yao, Sahebi, & Behnagh, 2020).

The significance of scaffolding SRL skills and guiding learning processes has also been emphasized in various online course rubrics. For example, Quality Matters (2018) includes items indicating that "instructions make clear how to get started and where to find various course components" and "learners are introduced to the purpose and structure of the course" (pp. 1–2). These elements are expected to facilitate student orientation to system functions, resources, and tools. In a similar vein, California Virtual Campus-Online Education Initiative (CVC-OEI) (2020) specified that assessments should occur at regular intervals throughout the course, which can help students plan and remind them to reflect on the goals constantly.

2.1.2. *Student agency*

Grounded in motivational theories, student agency refers to students' ability to take an active and self-directed role in their own learning process (Deci and Ryan, 2012; Lee et al., 2015). Specifically, it encompasses individual autonomy to make choices, set goals, and take responsibility for their own learning outcomes. When students have a sense of agency and autonomy, they are more likely to be motivated, engaged, and develop a sense of purpose and ownership (Deci & Ryan, 2012; Lee et al., 2015; Lindgren & McDaniel, 2012). In online learning contexts, student agency and autonomy are particularly crucial due to the increased responsibility that students must take for their own learning. However, online learning also offers unique opportunities to

enhance student agency through personalized and self-directed learning experiences. Moore (1973, 2013) seminal Theory of Transactional Distance emphasizes the importance of student agency and autonomy in online learning environments. Transactional distance refers to the psychological and communication gaps between students and their peers/instructors, and its level depends on three factors: learner autonomy (i.e., the extent to which students share responsibilities for their own learning), structure (i.e., the design of the learning environment), and dialogue (i.e., the degree of interaction between students and their peers/teachers). Moore (2013) also explicated the interrelationships between structure and autonomy, where autonomy is augmented through independent study with personalized learning pathways (Cubukcu, 2009; Koslow & Piña, 2015; Moore, 2013). However, not all students have the capacity to act as fully autonomous and independent learners, and it is, therefore, necessary for instructors to provide adequate structure to facilitate informed decision-making (Moore, 2013). These considerations underscore the importance for online instructors to intentionally incorporate strategies to foster student agency and provide guidance in their course design.

In the empirical literature, the relationship between student agency and cognitive and affective outcomes has received increasing attention and research support. Recent systematic reviews, such as Marín, de Benito, and Darder (2020) and Stenalt and Lassesen (2022), have synthesized the literature on student agency in higher education. For example, the narrative review by Stenalt and Lassesen (2022) found strong evidence for the connection between student agency and student outcomes in both online and face-to-face settings, as reported in 29 studies. Additionally, research has shown that increasing student agency leads to improved perceived learning experiences and academic performance (Li et al., 2020; Lindgren & McDaniel, 2012; Luo, Yang, Xue, & Zuo, 2019). In practice, several approaches have been proposed to support student agency in online courses, including offering multiple topic options for weekly assignments (Lindgren & McDaniel, 2012), clearly communicating the reasoning behind course design and maintaining a clear purpose (Lee et al., 2015; Li, Bañuelos, Liu, & Xu, 2022), and regularly seeking and incorporating student feedback (Blau & Shamir-Inbal, 2018; Iraj, Fudge, Faulkner, Pardo, & Kovanović, 2020; Li et al., 2022).

Some online course rubrics have included course design features that can enhance student agency. For example, several rubrics have emphasized the importance of soliciting feedback from students to improve the course (e.g., California State University, 2022; California Virtual Campus-Online Education Initiative (CVC-OEI), 2020), which gives students voices in how they learn and empowers them in the learning process. Furthermore, California State University (2022), California Virtual Campus-Online Education Initiative (CVC-OEI) (2020), and Quality Matters (2018) have noted the importance of offering multiple modes of multimedia access, giving students the ability to choose their preferred medium for receiving information.

2.1.3. Social presence & interpersonal interaction

The study of instructional practices for promoting social presence and interpersonal interactions in online courses commonly draws from two theoretical frameworks. Moore's framework (1989) posits the significance of two types of interpersonal interactions: interactions between students and instructors (commonly referred to as instructor-student interaction), and interactions among students (commonly referred to as peer interactions). The Community of Inquiry (CoI) framework, on the other hand, classifies online learning experiences into three components: social presence, teaching presence, and cognitive presence. Social presence - the degree to which students and instructors in an online course feel like they are interacting with real people and building interpersonal relationships - is considered essential for creating an engaging and effective online learning environment interpersonal (Garrison, 2019; Garrison, Anderson, & Archer, 2010). In particular, an increased interpersonal interaction and social presence can help reduce the transactional distance between learners and instructors (Moore, 2013) and thus enhance student emotional engagement in online learning (Buelow, Barry, & Rich, 2018; Dewan, Murshed, & Lin, 2019).

In the empirical literature, numerous studies have shown that opportunities for interaction with instructors and peers play a significant role in promoting students' emotional well-being and online learning outcomes (e.g., Joyner et al., 2020; Strayhorn, 2018). A meta-analysis by Richardson, Maeda, Lv, and Caskurlu (2017) found a strong correlation between social presence and student satisfaction and perceived learning. Prior empirical evidence has also found that when students have opportunities to interact with their peers and instructors, their emotional engagement in the course increases (Hew, 2016; Lear, Ansorge, & Steckelberg, 2010; Martin & Bolliger, 2018). Interactivity with instructors and peers also leads to improved academic achievement as students are exposed to diverse perspectives and achieve a deeper understanding of the course content (Gray & DiLoreto, 2016; Kurucay & Inan, 2017; York & Richardson, 2012). In practice, instructors are encouraged to provide multiple digital channels to communicate with students and facilitate discussions among students, such as through the course website, online office hours, and an online discussion forum (Dennen & Wieland, 2007; Ho & Swan, 2007; Imlawi, Gregg, & Karimi, 2015; Osborne, Byrne, Massey, & Johnston, 2018). However, the effectiveness of student-instructor interactions largely depends on instructors' responses in a timely manner (Bernard et al., 2009; Dennen, Aubteen Darabi, & Smith, 2007; Swan, 2001). Additionally, to increase social presence, instructors are encouraged to record a video of themselves presenting the course materials to encourage positive affective responses for learners instead of a simple presentation screencast without an accompanying video (Kizilcec, Papadopoulos, & Sritanyaratana, 2014).

The role of interpersonal interaction and social presence in online courses is recognized as critical for enhancing students' engagement and academic success in several online course quality rubrics. For example, Jaggars and Xu (2016) articulated the importance of promoting interpersonal interactions and strengthening students' psychological connection to the course. Thus, they included "plentiful opportunities for students to meaningfully interact with the instructor and with other students" and "strategies to allow students to become familiar with the instructor's personalities" in their rubric (p.282). Phipps and Merisotis (2000) also highlighted student interaction as a key factor in their online course quality rubric, stating that it "should be facilitated through a variety of ways" (p. 9).

2.2. Existing studies on the quality of online course design and instructional practices

Previous research on the design of online courses in higher education primarily relies on two sources of information: (i) student or instructor perceptions collected through surveys, and (ii) course observation conducted with rubrics. Specifically, numerous studies have surveyed students/instructors who have enrolled/taught online courses to understand their perceptions and experiences toward online course design and instruction (Bolliger & Martin, 2021; Chen, Bastedo, & Howard, 2018; Kleen & Soule, 2010; Piña & Bohn, 2014; Tudevdagva et al., 2021). For instance, Bolliger and Martin (2021) designed an Online Course Design Elements Instrument with five subscales and used it to survey instructors about the frequency of design elements suggested as critical in online learning. Their results suggest that among the five subscales, courses scored the lowest on interaction and communication and the highest on content presentation.

To mitigate the limitations of self-reporting bias associated with survey data (Bolliger & Martin, 2021; Margaryan et al., 2015), various rubrics have been developed to evaluate online courses more objectively (e.g., California Virtual Campus-Online Education Initiative (CVC-OEI), 2020; Phipps & Merisotis, 2000; Quality Matters, 2018). Some research has used these rubrics to evaluate college online courses and can be put

under one of two categories depending on the aims of the study. First, several studies have used rubrics to evaluate the quality of online courses using either a small random sample or a large convenient sample (e.g., Chao et al., 2006; Kwon, DiSilvestro, & Tre, 2017; Miller, 2012). For instance, Chao et al. (2006) evaluated 18 randomly selected courses from a four-year university and found that around 20%, 50%, and 50% of the courses needed improvement in instructional design, website design, and course presentation, respectively. Miller (2012) evaluated a volunteer sample of 99 courses from one community college regarding three aspects: instructor presence, student interaction, and course design. They found that the mean score of the courses was 21 out of 40, with scores ranging from 8 to 36.

The second category includes a handful of studies that used rubrics as an intermediate step to validate the rubrics, evaluate the impact of using them, and understand the relationships between various course design features and student outcomes (e.g., Bigatel & Edel-Malizia, 2018; Jaggars & Xu, 2016; Lee, Recker, & Yuan, 2020; Perez-Butron, 2014; Roehrs et al., 2013; Shattuck, 2012; Zimmerman et al., 2020). Although not the primary goal, these studies still provide ample insights into the quality of courses examined in their sample. For instance, Jaggars and Xu (2016) evaluated 28 courses offered at a community college using a rubric developed by the researchers and found that the courses had higher scores for interpersonal interaction and learning objectives but lower scores for the use of technology and course organization/presentation. Using a rubric adapted from Quality Matters, Lee et al. (2020) randomly selected 121 courses from a public four-year university and found relatively high ratings for all factors except learner engagement and interaction.

To sum up, previous studies have laid a foundation for using quality rubrics to objectively document the design features of college online courses. Yet, very few studies were able to incorporate all three quality concepts described above in their evaluation. In addition, except for one study (Lee et al., 2020), all the studies included a relatively small number of courses and primarily relied on a convenience sampling scheme, limiting the generalizability of findings from these studies. Given the critical role of online learning and its rapid expansion at community colleges, there is an urgent need for larger-scale documentation of the current state of online course quality and a better understanding of areas that need improvement in this particular setting.

2.3. Variations in instructional practice by fields of study and instructor characteristics

Course instruction is often seen as a multi-faceted practice shaped by the features of the instructor and the instructional task (Cohen & Ball, 1999). Therefore, examining how course and instructor characteristics may relate to course design and instructional decisions is important. Overall, the current literature has indicated that instructional practices and course design features vary by the course subjects (e.g., de Silva & Wickramasinghe, 2022), as well as by instructor characteristics, including their demographics (e.g., MacNell et al., 2015), teaching experience and credentials (e.g., Martin, 2021), and employment status and teaching load (e.g., Feigenbaum & Iqani, 2015). While most studies were primarily conducted in in-person college classrooms, they provided a solid foundation for examining these relationships in online settings. Therefore, we review the key findings from this line of work in more detail below.

Previous literature has examined differences in instructional practices across fields of study and has generally observed noticeable disciplinary distinctions in both in-person and online settings (e.g., de Silva & Wickramasinghe, 2022; Eagan, 2016; Vu, 2017). Notably, a recent study conducted in online settings examined survey data from 241 academic staff during the COVID-19 pandemic and found that STEM courses have less student contact time but are more likely to embed voice in slides and have interactive materials (de Silva & Wickramasinghe, 2022).

In addition to disciplinary variations, existing literature on in-person college courses has also identified associations between instructional practices and several key instructor demographic characteristics and employment features. First, demographic characteristics such as gender and race/ethnicity predict instructional designs in college classrooms (e.g., MacNell et al., 2015; Nelson Laird, Garver, & Niskodé-Dossett, 2011). For example, Nelson Laird et al. (2011) analyzed survey data from >9000 faculty members and found that female and multiracial faculty are more likely to use active learning practices. Second, instructors' prior teaching experience and credentials correlate with instructional practices (e.g., Martin, 2021; Vu, 2017). For example, Vu (2017) analyzed data from >250 courses at a large public university and found that senior instructors incorporate less promising teaching practices (such as teaching about epistemology and metacognition, incorporating formative assessments, and affording collaboration) compared to their junior colleagues. Prior research on the relationships between teaching credentials and course instruction is scarce. However, work that examines different types of instructors' impacts on student performance indicates that instructors with higher educational attainment are associated with better student performance in college (Martin, 2021). Third, studies have shown that instructors' teaching load and employment status may influence instructional arrangements (e.g., Benjamin, 2002; Feigenbaum & Iqani, 2015; Schuetz, 2002; Umbach, 2007). For example, Schuetz (2002) examined 1500 responses to the Center for the Study of Community Colleges survey to find that part-time instructors use fewer laboratory investigations or collaborative learning activities than full-time instructors. Based on interviews with >40 faculty members, Feigenbaum and Iqani (2015) found that increased teaching loads are associated with reduced interpersonal interactions and worse instructor-student relationships.

While a growing number of studies have examined the relationship between instructor characteristics and their instructional practices, most aforementioned studies focused on in-person settings. Accordingly, there is limited knowledge regarding these relationships in the online setting, which poses unique challenges to instructors and students that differ from those in other settings. For instance, while supporting students' SRL skills is important in all instructional contexts, the flexibility of online courses often requires higher levels of SRL skills and therefore requires instructors to scaffold such skills more intentionally and proactively (Broadbent, 2017; Parkes, Stein, & Reading, 2015). To our knowledge, only one study has examined the relationship between instructor-level factors and college online course design empirically. Based on survey data collected from online instructors from a large community college, Orona, Li, McPartlan, Bartek, and Xu (2022) examined how self-efficacy, motivation, and employment stability relate to instructor course design choices. They found that instructors with greater employment stability are more likely to use interaction-oriented practices. The current study builds on this line of work and further contributes to it by examining instructional design choices in online community college courses.

3. Method

3.1. Research context and course sample

Data for this study were collected in an anonymous community college (referred to as "ACC" hereafter) in the southeast. ACC is a national pioneer in online learning: As of 2019 Fall, around 35% of ACC's enrollments were in distance courses, and 51% of the students enrolled in at least one online course, both of which were higher than the national averages (21% and 36% respectively; Integrated Postsecondary Education Data System (IPEDS), 2019). Similar to other colleges, ACC has been subject to a persistent performance gap between online and in-person classes. In response, ACC has committed resources to enhance student's success in online courses, such as an online training certification program to help instructors develop engaging and effective online courses. The design process of the courses varied, with some designed by

individual instructors and others by a team of instructors from the same department. Although a course quality standard was offered as a guide, instructors had significant autonomy in how they applied the standard's emphasized practices.

The current study includes 100 randomly selected online courses from the 805 online courses taught in the Fall semester of 2018 at ACC. The study received IRB approval from the institution, allowing the use of deidentified student and instructor information, including demographic characteristics and transcript data. Table 1 summarizes the characteristics of students, instructors, and courses in our analytical sample (column 1) compared to the characteristics of all the other courses taught in the same semester (column 2). In column 3, we examined whether sample courses significantly differed from other courses taught in the same semester. The characteristics of the sample courses were found to not significantly differ from those of other courses, except for two discipline variables that were only marginally significant, indicating a random selection of courses.

Student Characteristics. Panel A of Table 1 shows that, on average, students in the analytical sample were primarily female (65%). The majority of students were White (49%), followed by African American (28%), Hispanic (9%), Asian (5%), and Native American (1%). Students were, on average, 28 years old. The average persistence rate and grade point of students in the analytical sample were 82% and 2.4 (on a 0–4 grading scale), respectively.

Instructor Characteristics. Panel B of Table 1 shows the demographic characteristics of the instructors in our analytical sample. Most instructors were female (64%), White (78%), had a master's degree or above (88%), and were hired on a full-time basis (79%). Instructors were, on average, around 46 years old.

Course Characteristics. Panel C of Table 1 shows that, on average, courses in the analytical sample were primarily in the field of Computer Sciences & Networks (24%), followed by Arts (12%), Business (12%), and Social Sciences (11%). The average course credit hours were 2.96 (on a 1–5 scale). Course difficulty was measured by the average grade and persistence rate for a specific course across three years prior to the current quarter. The average persistence rate for the courses in our analytical sample was 84%, and the average grade point was 2.45 (on a 0–4 grading scale).

3.2. *Using a rubric to capture course design features*

Building on existing literature on online course design, we developed a rubric to examine the extent to which the 100 courses addressed the three concepts of "Scaffolding," "Student Agency," and "Social Presence & Interpersonal Interaction" (See Table 2 for the rubric; see Xu et al., 2020 for the full version of the rubric). The rubric further consists of six key components that are typically included in an online course or existing rubrics (e.g., California Virtual Campus-Online Education Initiative (CVC-OEI), 2020; Quality Matters, 2018), such as "Learning Objectives," "Instructional Materials," and "Learning Activities." Appendix A presents the detailed definitions of the six components. The three concepts and six components result in a 3 × 6 matrix and a total of 19 elements, with each element describing how a specific component could be designed to optimize learning guided by each concept. For example, the intersection between the concept "Social Presence & Interpersonal Interaction" and the component "Instructional Materials" results in "Element 3.3 Instructor Presence in Content Delivery," which specifies how instructors strengthen their presence in instructional materials and activities to engage with students actively and visibly.

For each element, the rubric provides detailed criteria for rating scales following a 3-point scale (1 - "beginning," 2 - "developing," and 3 - "proficient"). Specifically, the three levels are differentiated based on whether the key design features that can address a targeted concept are (1) fully covered, (2) frequently applied, (3) regularly used, and/or (4) sufficiently/thoroughly implemented. The "developing" level denotes that some efforts have been applied, but more significant efforts would

Table 1
Student, instructor, and course descriptive statistics.

	(1) Sample Courses	(2) Other Courses in the Same Semester	(3) Difference
Panel A: Student Demographic Characteristics			
Female	0.645	0.603	0.042
	(0.217)	(0.232)	(0.025)
White	0.491	0.520	−0.029
	(0.125)	(0.154)	(0.016)
African American	0.283	0.254	0.028
	(0.151)	(0.147)	(0.016)
Hispanic	0.092	0.098	−0.006
	(0.056)	(0.068)	(0.007)
Asian	0.045	0.037	0.008
	(0.048)	(0.046)	(0.005)
Native American	0.007	0.007	0.000
	(0.016)	(0.017)	(0.002)
Age	27.660	27.450	0.217
	(4.844)	(4.740)	(0.508)
Persisted to the End of the Course	0.815	0.800	0.014
	(0.120)	(0.143)	(0.015)
Grade Point	2.358	2.249	0.109
	(0.623)	(0.642)	(0.068)
Panel B: Instructor Demographic Characteristics			
Female	0.640	0.652	−0.012
	(0.482)	(0.477)	(0.051)
Age	45.670	46.970	−1.304
	(10.150)	(11.300)	(1.193)
White	0.780	0.752	0.028
	(0.416)	(0.432)	(0.046)
African American	0.110	0.085	0.025
	(0.314)	(0.279)	(0.030)
Hispanic	0.010	0.033	−0.023
	(0.100)	(0.178)	(0.018)
Asian	0.020	0.034	−0.014
	(0.141)	(0.181)	(0.019)
Highest Degree is Bachelor's or Below	0.120	0.104	0.016
	(0.327)	(0.305)	(0.033)
Full Time	0.790	0.750	0.040
	(0.409)	(0.433)	(0.046)
Observations	100	705	805
Panel C: Course Characteristics			
Discipline			
Computer Sciences & Networks	0.240	0.243	−0.003
	(0.429)	(0.429)	(0.046)
Arts	0.120	0.054	0.066+
	(0.327)	(0.226)	(0.026)
Business	0.120	0.138	−0.018
	(0.327)	(0.345)	(0.037)
Social Sciences	0.110	0.099	0.011
	(0.314)	(0.299)	(0.032)
Humanities	0.090	0.084	0.006
	(0.288)	(0.277)	(0.030)
English	0.080	0.094	−0.014
	(0.273)	(0.292)	(0.031)
Public Services Technologies	0.050	0.043	0.007
	(0.219)	(0.202)	(0.022)
Health Sciences	0.030	0.027	0.003
	(0.171)	(0.162)	(0.017)
Mathematics	0.030	0.051	−0.021
	(0.171)	(0.220)	(0.023)
Natural Sciences	0.030	0.023	0.007
	(0.171)	(0.149)	(0.016)
Public Safety Education	0.030	0.030	0.000
	(0.171)	(0.170)	(0.018)

(*continued on next page*)

Table 1 (*continued*)

	(1) Sample Courses	(2) Other Courses in the Same Semester	(3) Difference
Engineering & Technologies	0.020	0.004	0.016
	(0.141)	(0.065)	(0.008)
Physical Education	0.010	0.003	0.007
	(0.100)	(0.053)	(0.007)
Foreign Languages	0	0.051	−0.051+
	(0)	(0.220)	(0.022)
Other Subjects	0.040	0.058	−0.018
	(0.197)	(0.234)	(0.025)
Credit Hours	2.960	2.864	0.096
	(0.634)	(0.679)	(0.072)
Course Difficulty			
Average persistence rate	0.844	0.846	−0.002
	(0.054)	(0.062)	(0.007)
Average grade point	2.445	2.369	0.076
	(0.354)	(0.489)	(0.051)
Observations	100	705	805

Note. Column 1 presents the student, instructor, and course characteristics of the 100 courses in our analytical sample, while Column 2 presents the characteristics of all the other courses taught during the same semester. In Column 3, we regress the indicator of sample courses against student, instructor, and course characteristics to examine whether the differences between the sample courses (Column 1) and other courses (Column 2) reach statistical significance. Standard deviations are presented in parentheses for Columns 1 and 2. Standard errors are shown in parentheses for Column 3. + $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

have been made to support student success to achieve the "proficient" level. For instance, "Element 3.3 Instructor Presence in Content Delivery" concerns how instructors can establish and strengthen their presence with content delivery, which encompasses three critical design features: (i) leveraging multimedia to explain course content, (ii) using friendly and conversational tones when explaining course content, and (iii) offering a step-by-step demonstration of problems and their solutions. Thus, for Element 3.3, a course at the "proficiency" level would consistently use a variety of multimedia to establish instructor presence, use friendly and conversational tones to explain course content, and offer a step-by-step demonstration of how to format solutions to problems when applicable. A course at the "developing" level may use texts (such as slides and handouts) as the primary method to deliver course content while only incorporating multimedia occasionally, with a limited step-by-step demonstration of solutions. A course at the "beginning" level would primarily rely on texts to deliver instruction and rarely incorporate multimedia.

We conducted a comprehensive expert review of our rubric's validity by inviting seven experts to evaluate each quality concept, course component, and rubric element in terms of relevance, importance, and clarity. The experts concurred with the three concepts and six components, while offering specific suggestions for some elements. These recommendations included combining two original elements, adding two new elements, revising element naming and definitions, revising criteria for rating scales, and changing element placement. The expert review process resulted in a rubric with 22 elements, which was reduced to 19 for this study due to data availability. Further details about the expert team's composition, specific changes made to the elements, and the results of the review are presented in Appendix B.

3.3. Data collection and coding process

3.3.1. Course observation and documentation

The research team had access to 100 archived course shells, which included the course syllabus, course materials, learning modules, discussion forums, announcements, and other learning resources provided through the course website. The use of course shells as data sources for online course evaluation is in line with the current literature (Lowenthal & Hodges, 2015; Margaryan et al., 2015). However, this approach did not capture information and interactions outside the course website, such as email exchanges, text messages, and synchronous discussions, which may introduce bias into the rating, especially the concept of "Social Presence & Interpersonal Interaction." For instance, during the pandemic, ACC implemented synchronized learning through Microsoft Teams that might improve the scores on "Social Presence & Interpersonal Interaction." However, such communication and relevant information were not recorded in the course shells available to the research team. In the result section, we explained in more detail how this might limit our ability to precisely assess the concept of "Social Presence & Interpersonal Interaction" and how we addressed this issue.

Table 2
Online course evaluation rubric.

	Website Organization and Presentation	Learning Objectives	Instructional Materials	Learning Activities	Logistics and Course Management	Targeted Support for Online Learning
Panel A: **Scaffolding Self-Directed Learning Skills and Guiding the Learning Process**	1.1 Course material organization and presentation 1.2 Guidance on course navigation	2.1 Articulation of learning objectives	3.1 Guidance on how to work with instructional materials	4.1 Regular and various learning Activities 4.2 Clear instruction on learning Activities and articulation of expectations	5.1 Articulation of course policies, expectations, and course details 5.2 Clear communication of course schedule, predictable routine	6.1 Learner support and opportunities for scaffolding learning skills
Panel B: **Student Agency**			3.2 Diversified content delivery media			6.2 Facilitation and incorporation of ongoing feedback from students 6.3 Opportunities for self-reflection on learning goals, process, and performance
Panel C: **Presence & Interactivity**			3.3 Instructor presence in content delivery	4.3 Instructor presence in learning Activities and quality feedback 4.4 Collaborative learning and interaction opportunities	5.3 Regular announcements and reminders	6.4 Approachable and responsive instructor 6.5 Progress monitoring and proactive outreach 6.6 Non-content-related social interaction opportunities

To document the course design and teaching practices, we developed a protocol that mapped guiding questions to specific elements in the rubric (as seen in Appendix C). For example, to document course organization and presentation, the protocol included questions regarding course content segmentation, use of headings, subheadings, and consistency of course organization. For each course, two researchers used the protocol to document the course design details, with one researcher providing detailed descriptions and screenshots, and the other researcher reviewing and revising the description.

3.3.2. The coding process

At the coding stage, we used the detailed documentation of the course shells to assess the extent to which each course addressed the three concepts. Specifically, a team of four raters went through the documented course details from the protocol and then provided a numeric rating for each element. Fig. 2 illustrates the process of assessing the courses. To ensure *reliability* and consistency in rating, we randomly selected eleven courses to set standards before the formal course evaluation. The four raters evaluated the eleven courses independently, compared their scoring, and discussed the evaluation standards until they agreed on a rating for each element. Then, the four raters were divided into two pairs to conduct the formal course evaluation based on the evaluation standards for the rest of the courses. Each pair focused on two to four components. To evaluate the courses, we employed a multi-stage process that placed a strong emphasis on closely monitoring agreement levels throughout each stage. At every stage, raters independently evaluated the course elements and calculated their agreement level. In the initial stages, we calculated agreement rates between coders.[1] As the number of courses being evaluated increased, we added kappa values to monitor agreement levels. Specifically, we used a kappa threshold of 0.60 (as recommended by Landis & Koch, 1977) and an agreement rate threshold of 80%. When the kappa values and/or the agreement rates met the acceptable levels, the raters would reconcile any discrepancies and move on to the next stage. In cases where the raters could not reach an agreement, a third rater would intervene. However, if the kappa values and/or the agreement rates fell below the threshold, the raters would engage in discussions to identify the sources of disagreement and revise the evaluation process accordingly until the kappa statistics reached the threshold. When an evaluation standard was revised, all courses that had been evaluated would be re-coded using the new standards. The final kappa statistics for all the codes range from 0.65 to 0.96, with 84% of the codes having a kappa value higher than 0.7. Further details about the recorded kappa values during the coding process are presented in Appendix D.

3.4. Data analysis

3.4.1. Descriptive statistics (RQs 1&2)

To understand how the courses reflect the three concepts overall and individually, we created three sets of course design scores: (i) scores for each of the nineteen elements included in the rubric; (ii) scores for each of the three concepts by adding up the scores from the elements corresponding to a given concept; and finally (iii) a total score that summarizes the scores across all of the nineteen elements.

The descriptive statistics, including the range, mean, and median, were calculated for the total score and the scores of each of the three concepts. These statistics were compared to the developing level threshold to determine the proportion of courses that met the criteria. This analysis provided an overview of the extent to which the courses addressed the three concepts and each individual concept.

[1] Agreement rate instead of kappa value was calculated at the initial stage of the coding process because the kappa value can be heavily influenced by instances of disagreements when the sample size is small, providing limited insight into how to improve the coding process.

3.4.2. Regression analysis (RQ 3)

We used Eq. (1) to assess what instructor and course characteristics are associated with higher course design scores.

$$\text{Scorei} = \text{STEMi} + \text{Instri} + \varepsilon\text{i} \quad (1)$$

where *Scorei* represents course design scores for course *i*, which include the total design score and subscores for the three concepts. All the course design scores were standardized to have a mean of zero and a standard deviation of one. *STEMi* indicates whether course *i* is a STEM course or not. *Instri* represents instructor characteristics for course *i*, including gender, age, race, employment status, teaching experience, educational degree, and current term teaching load (measured by the total number of credit hours an instructor is teaching in the current term).

4. Results

4.1. To what extent do courses reflect the three concepts overall?

We start by examining the total score of the courses, which provides an overview of the extent to which a course addresses the three concepts overall. The smallest score a course could receive is 19 (if a course is at the beginning level for all the nineteen elements); the score for reaching the "developing" level is 38 (if a course is at the developing level for all elements), whereas the highest score a course could receive is 54 (if a course is at the proficient level for all elements). It is important to note that three elements follow a 2-point scale ranging from 1 ("beginning") to 2 ("developing or above") instead of the 3-point scale because these elements primarily focus on whether certain practices are present or not, thus following a dichotomous nature. As a result, the highest score a course could possibly receive is 54 instead of 57.

Fig. 3 presents the distribution of the total scores for the courses in our sample. The score ranges from 29 to 52, with the mean and median both at 39, which are right above the developing level of 38. This suggests that the courses are generally aligned with the three concepts. Indeed, almost two-thirds of the 100 courses receive a score above the developing level, indicating that most courses meet the basic requirements in addressing the unique challenges of online learning, while one-third require substantial improvement.

4.2. To what extent do courses scaffold SRL skills and guide the learning process?

We then examine the extent to which the courses address each of the three concepts. Nine elements, spreading across six components, address the concept of "Scaffolding" (Panel A of Table 2). Each element indicates how a specific course component can be designed to address the concept of "Scaffolding."

Fig. 4 presents the distribution of the total scores of the nine elements under "Scaffolding." The courses receive a mean score of 21.27, where >90% of the courses are above the developing level (i.e., a score of 18), and seven courses receive a score close to the full score of 27. These results suggest that the courses are generally aligned with the concept of "Scaffolding."

Table 3 further presents the summative score of "Scaffolding" for each of the six components. Five of the six components are above the developing level (i.e., a score of 2), again indicating that "Scaffolding" is well addressed in the courses. In particular, the component of "Logistics and Course Management" has an average score of 2.84 out of 3 for the concept of "Scaffolding," indicating that almost all the courses are at the proficient level of addressing "Scaffolding" in course management – that is, besides clearly communicating the course policies, expectations, and schedules, these courses also provide additional interactive tasks to help students get familiar with the course logistics and teach students about SRL skills.

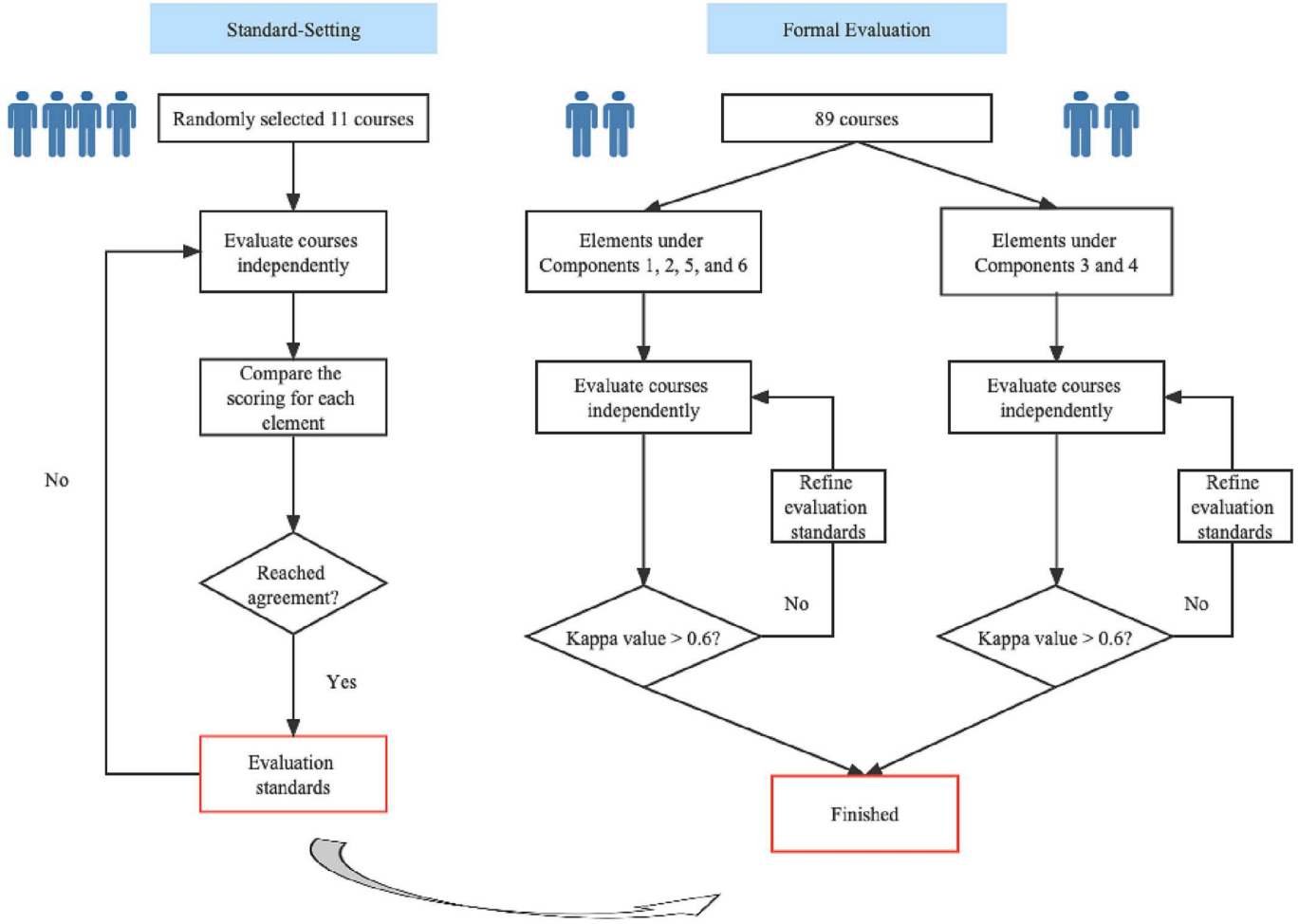

Fig. 2. Course assessment process.
Note. Component 1 - Website Organization and Presentation; Component 2 - Learning Objectives; Component 3 - Instructional Materials; Component 4 - Learning Activities; Component 5 - Logistics and Course Management; Component 6 - Targeted Support for Online Learning.

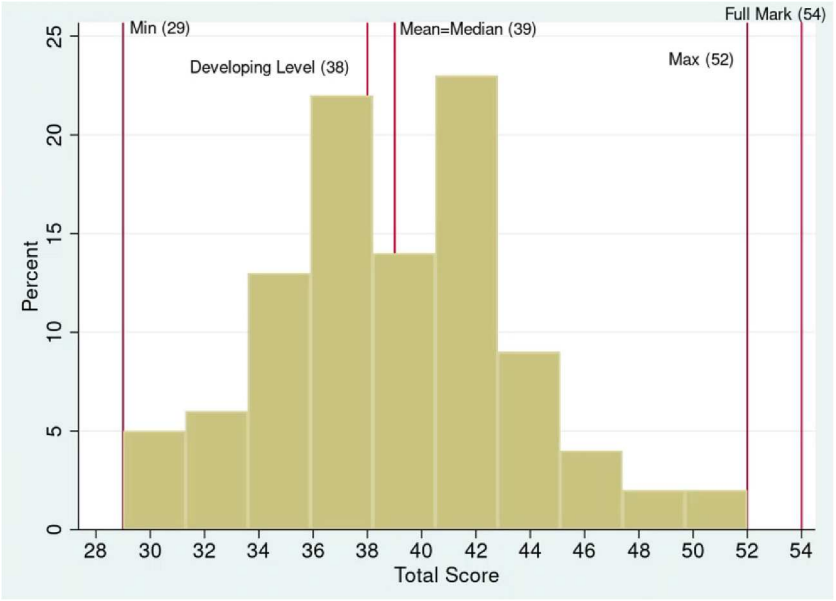

Fig. 3. The distribution of total score.

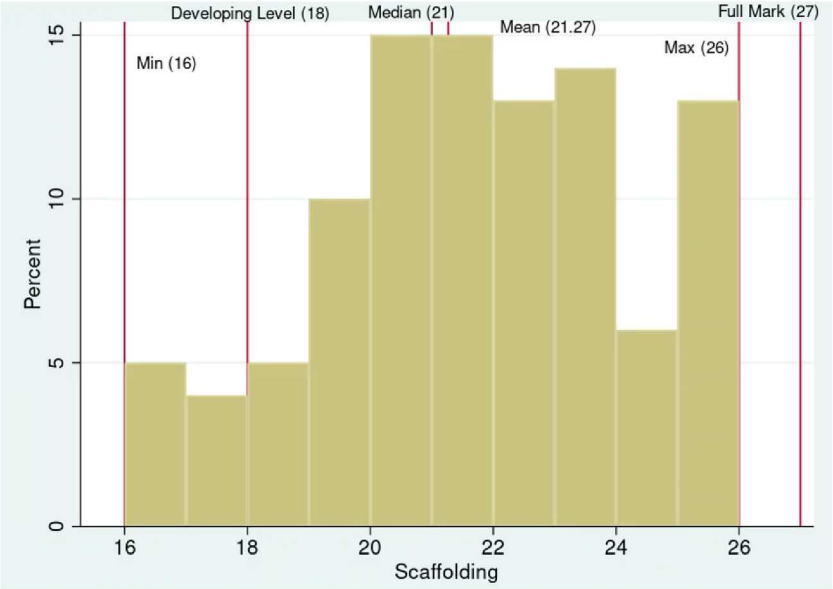

Fig. 4. The distribution of "Scaffolding".

Table 3
Descriptive statistics of the elements under "Scaffolding".

	Mean	SD	Developing Level
Scaffolding	2.36	0.29	2
Website Organization and Presentation	2.33	0.64	2
1.1 Guidance on Course Navigation	2.40	0.65	2
1.2 Course Material Organization and Presentation	2.26	0.44	2
Learning Objectives	2.25	0.93	2
2.1 Articulation of Learning Objectives	2.25	0.93	2
Instructional Materials	1.76	0.73	2
3.1 Guidance on How to Work with Instructional Materials	1.76	0.73	2
Learning Activities	2.22	0.60	2
4.1 Regular and Various Learning Activities	2.17	0.75	2
4.2 Clear Instruction on Learning Activities and Articulation of Expectations	2.27	0.68	2
Logistics And Course Management	2.84	0.35	2
5.1 Articulation of Course Policies, Expectations, and Course Details	2.86	0.51	2
5.2 Clear Communication of Course Schedule, Predictable Routine	2.82	0.44	2
Targeted Support for Online Learning	2.48	0.52	2
6.1 Learner Support and Opportunities for Scaffolding Learning Skills	2.48	0.52	2
Observations	100		

Note. All the elements follow a 3-point scale (1 - "beginning," 2 - "developing," and 3 - "proficient").

4.3. To what extent do the courses promote student agency?

Fig. 5 presents the distribution of the total scores for "Student Agency," which is the summation of the three elements in Panel B of Table 2. The three elements fall under two course components: "Instructional Materials" and "Targeted Support for Online Learning." Overall, the mean score for "Student Agency" is 5.5, where more than half score lower than six and are thus below the developing level.

Table 4 further presents the summative score of "Student Agency" by course components. "Element 3.2 Diversified Content Delivery Media" under "Instructional Materials" receives an average score of 2.23, which is above the developing level (i.e., a score of 2). This means that the courses use a variety of media, such as text, audio, video, and images, to deliver content and that for some (but not the majority) of the learning units, students are provided with multiple media to receive the same information, which allows students to choose their preferred way of accessing the information.

As for the component of "Targeted Support for Online Learning," courses receive an average score of 2.02 for "Element 6.2 Facilitation of Incorporating Ongoing Feedback from Students," which is right at the developing level of 2. This means that a typical course in our sample provides students with some opportunities to give feedback throughout the course, but the process is not thoughtfully designed to improve the response rate and encourage diverse opinions. In contrast, the average score for "Element 6.3 Opportunities for Self-reflection on Learning Goals, Process, and Performance" is only 1.25, which is way below the developing level of 2. This indicates that most instructors in our sample do not provide explicit opportunities for students to reflect on their performance and learning process, nor are students guided and encouraged to set individual learning goals and plans to achieve them.

4.4. To what extent do courses foster social presence & interpersonal interaction?

Fig. 6 presents the distribution of the total scores for "Social Presence & Interpersonal Interaction," which sum across seven elements (Panel C of Table 2). It is important to note that since some interactive activities might happen outside the course website, such as email exchange, text messages, and synchronous discussions, rating the courses based on the information from the course shell only may underestimate the actual number of interactions in a course. Therefore, we use a 2-point scale (1 - "beginning" and 2 - "developing or above") for three elements (i.e., Elements 3.3, 4.3, and 6.5), where the scoring primarily focuses on whether certain practices are present at all or not. Although this cannot fully address the underestimation problem, focusing on the presence (versus absence) could assuage the problem by avoiding making judgments on the amount or quality of activities. The courses receive a mean score of 12.24 for "Social Presence & Interpersonal Interaction," where nearly three-quarters of the courses are below the developing level (i.e., a score of 14).

One possible reason for the low score for "Social Presence & Interpersonal Interaction" is that some courses' interactive activities might happen entirely outside the course shell. To address this concern, we further conduct a robustness check by excluding the three elements we are most concerned about missing information. As shown in Fig. 7, while

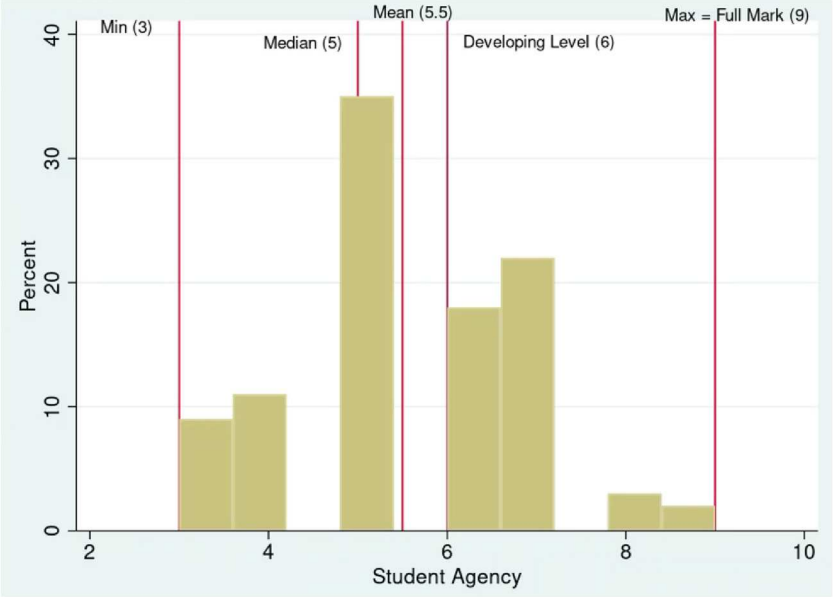

Fig. 5. The distribution of "Student Agency".

Table 4
Descriptive statistics of the elements under "Student Agency".

	Mean	SD	Developing Level
Student Agency	1.83	0.46	2
Instructional Materials	2.23	0.85	2
3.2 Diversified Content Delivery Media	2.23	0.85	2
Targeted Support for Online Learning	1.64	0.55	2
6.2 Facilitation and Incorporation of Ongoing Feedback from Students	2.02	0.88	2
6.3 Opportunities for Self-Reflection on Learning Goals, Process, and Performance	1.25	0.63	2
Observations	100		

Note. All the elements follow a 3-point scale (1 - "beginning", 2 - "developing," and 3 - "proficient").

many courses move above the developing level in this robustness check, more than a quarter of the courses still score below the developing level (i.e., a score of 8).

Table 5 further presents the summative score of "Social Presence & Interpersonal Interaction" by course components. Among the four course components, only "Logistics and Course Management" reaches the developing level (i.e., a score of 2.38). Among all the elements, only Element 4.4 and Element 6.4 are above the developing level. In particular, the instructors' proactive outreach level is surprisingly low (an average score of 1.04 for "Element 6.5 Progress Monitoring and Proactive Outreach").

These results suggest that instructors in our sample have demonstrated some efforts in facilitating presence and interactions, which include using course announcements and reminders to help students stay on track, providing multiple ways for students to communicate with the instructor, and promoting collaborative learning. However, besides these practices, only a small proportion of the instructors can visibly enhance instructor presence in either content delivery or learning activities. In other words, most instructors still rely heavily on texts (such as slides and text-based handouts) to deliver instruction, thus presenting students with an overwhelming amount of information in a disengaging way. Similarly, most instructors provide limited personalized feedback on assignments and performance, which presents a missed opportunity to show a sense of caring and engage students both academically and socially. Finally, most instructors in our sample do not provide students with sufficient levels of proactive outreach and non-content-related social interaction opportunities, implying that students receive inadequate targeted support to help them overcome the challenge of lacking a sense of community in online learning.

4.5. What instructor and course characteristics are associated with higher course design scores?

Finally, we examine the extent to which instructor and course characteristics are related to course design and teaching practices. Specifically, Fig. 8(a) presents the estimated coefficients of how instructor and course characteristics predict the total score as well as subscores for the three concepts. Fig. 8(b) further decomposes how instructor and course characteristics predict each course component under the three concepts. Detailed regression statistics are presented in Table 6. For most of the instructor and course characteristics, their relationships with course design scores are small and insignificant. For instance, the overall score of full-time instructors is not significantly different from that of part-time instructors ($b = 0.18$, $p > 0.1$). However, three instructor characteristics stand out and consistently show significant relationships with course design scores.

Firstly, as shown in Fig. 8(a), courses taught by female instructors, on average, receive significantly higher total scores than those taught by male instructors ($b = 0.46$, $p < 0.05$). Although only the coefficient for "Social Presence & Interpersonal Interaction" is significant ($b = 0.44$, $p < 0.05$), courses taught by female instructors consistently receive higher scores across the three concepts. In particular, as shown in Fig. 8(b), compared to courses taught by male instructors, courses taught by female instructors score significantly higher on providing targeted support for online learning under "Social Presence & Interpersonal Interaction" ($b = 0.50$, $p < 0.05$), indicating that female instructors are more responsive, outreach to students more frequently, and provide more social interaction opportunities.

Secondly, as shown in Fig. 8(a), courses taught by instructors with a bachelor's degree or below tend to have lower total scores ($b = -0.93$, $p < 0.01$) compared to those taught by instructors with higher degrees. Courses taught by instructors with a bachelor's degree or below also score lower across the three concepts, where the coefficients for "Student Agency" ($b = -0.65$, $p < 0.05$) and "Social Presence & Interpersonal Interaction" ($b = -1.06$, $p < 0.001$) are significant. Akin to the results from the analysis of total score and concept scores, Fig. 8(b)

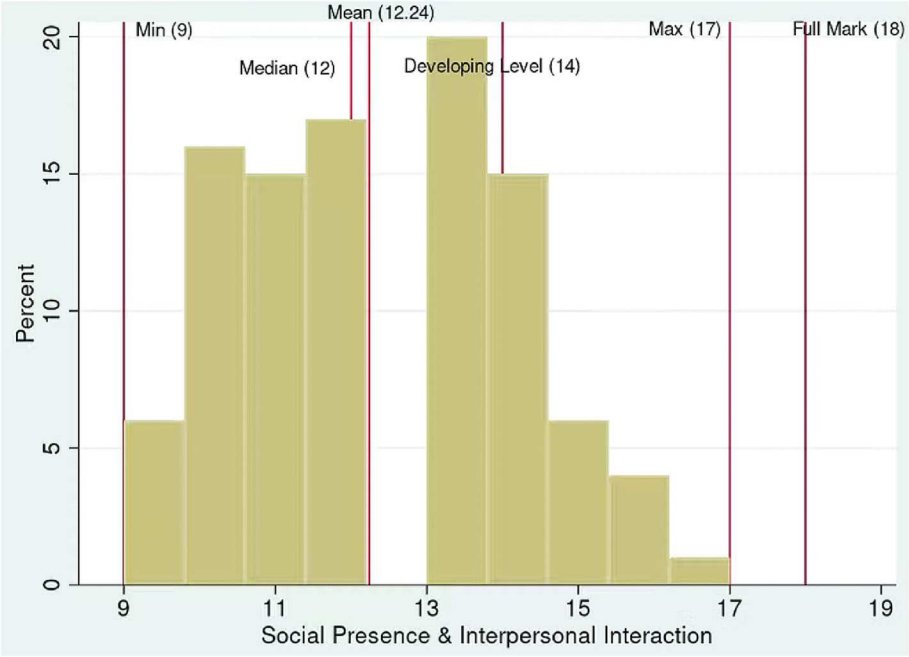

Fig. 6. The distribution of "Social Presence & Interpersonal Interaction".

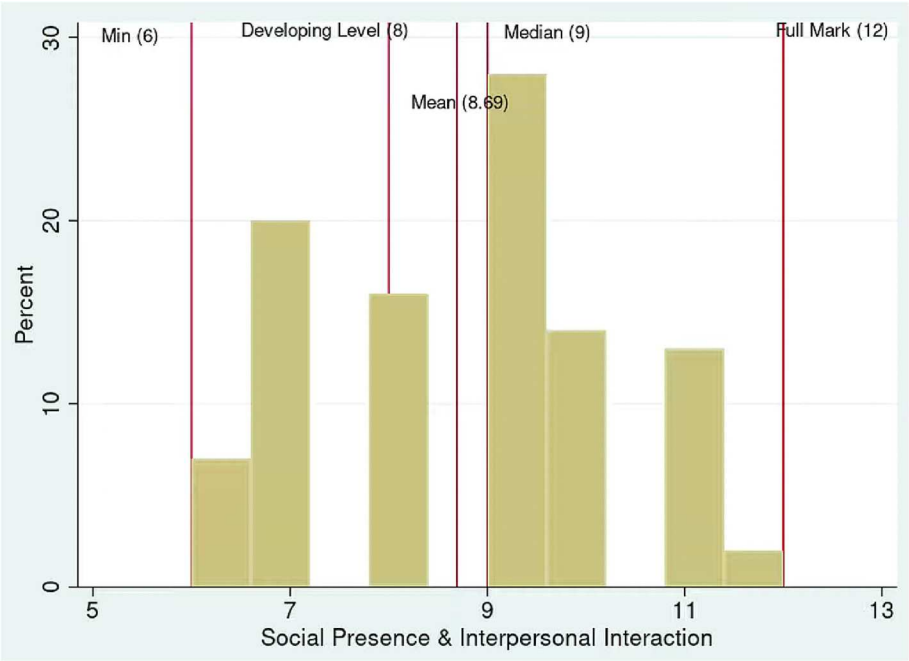

Fig. 7. The distribution of "Social Presence & Interpersonal Interaction" (Robustness Check).

shows that courses taught by instructors with a bachelor's degree or below get significantly lower course design scores on several components compared to instructors with higher degrees. For example, under "Social Presence & Interpersonal Interaction," courses taught by instructors with a bachelor's degree or below get significantly lower scores on learning activities ($b = -0.94$, $p < 0.01$) and targeted support for online learning ($b = -0.98$, $p < 0.01$). These results indicate that courses taught by instructors with lower educational attainment tend to provide fewer interpersonal interactions and collaborative learning opportunities.

Thirdly, the teaching load is negatively associated with the total score. Specifically, one standard deviation (SD) increase in current term teaching load is associated with a 0.23 SD decrease in the total score ($b = 0.23$, $p < 0.1$), which is primarily due to the lower scores on "Social Presence & Interpersonal Interaction" ($b = -0.24$, $p < 0.05$). These results indicate that instructors assuming a greater amount of teaching load are less likely to provide quality feedback, design collaborative learning opportunities, and design courses in a way that intentionally and visibly establishes teacher presence in learning activities.

Table 5
Descriptive statistics of the elements under "Social Presence & Interpersonal Interaction".

	Mean	SD	Developing Level
Social Presence & Interpersonal Interaction	1.75	0.27	2
Instructional Materials	1.15	0.36	2
3.3 Instructor Presence in Content Delivery [a]	1.15	0.36	2
Learning Activities	1.69	0.53	2
4.3 Instructor Presence in Learning Activities and Quality Feedback [a]	1.36	0.48	2
4.4 Collaborative Learning and Interaction Opportunities	2.01	0.80	2
Logistics And Course Management	2.38	0.53	2
5.3 Regular Announcements and Reminders	2.38	0.53	2
Targeted Support for Online Learning	1.78	0.29	2
6.4 Approachable and Responsive Instructor	2.60	0.49	2
6.5 Progress Monitoring and Proactive Outreach [a]	1.04	0.20	2
6.6 Non-Content Related Social Interaction Opportunities	1.70	0.60	2
Observations	100		

Note. All the elements except for elements 3.3, 4.3, and 6.5 follow a 3-point scale (1 - "beginning", 2 - "developing," and 3 - "proficient").

[a] Elements 3.3, 4.3, and 6.5 follow a 2-point scale (1 - "beginning" and 2 - "developing or above").

5. Discussion

5.1. Key findings and connection to the current literature

This study assesses the design quality of college online courses by observing the course design features and instructional practices of 100 randomly selected courses, extending the current literature that mainly relies on students' and instructors' perceptions about the quality of college online courses (e.g., Bolliger & Martin, 2021; Tudevdagva et al., 2021) or small-scale observation (e.g., Jaggars & Xu, 2016).

Our results indicate that the overall quality of courses is at or surpasses the developing level. However, our findings highlight noticeable disparities in the quality of online courses across the three instructional quality concepts: while most courses are above the developing level for "Scaffolding" students' SRL processes, less than half and less than one-third of the courses reach the developing level for "Student Agency" and "Social Presence & Interpersonal Interaction," respectively. These results align with prior studies, such as Lee et al. (2020), Miller (2012), and Perez-Butron (2014), which suggest that online courses generally perform better in terms of course organization and structure than in promoting interpersonal interactions and creating a strong sense of instructor presence. These findings, however, differ from the findings from Jaggars and Xu (2016) and Kwon et al. (2017), who report that course organization and orientation receive lower average ratings compared to interpersonal interaction. Several factors may contribute to these differences. One possible explanation is between-institution variations in their emphasis on different quality concepts in online course design, leading to varying levels of quality with regard to a specific instructional concept. Another possibility is that the observed improvement in "Scaffolding" in our study may be a result of increased efforts by institutions nationwide to improve online course quality, which heavily focuses on a clear course structure and organization (e.g., American River College, 2021; Saddleback College, 2017).

We also propose several possible explanations for the higher ratings on "Scaffolding" and lower ratings on "Student Agency" and "Presence & Interactivity." First, we find that many courses use a standardized course shell and structure, which seems recommended by ACC's online training certification program. An in-depth examination of the certification training materials indicates that they primarily focus on imparting technical skills and course organization strategies while including limited information on promoting student agency and facilitating interactions in an online course. Indeed, comparisons between our rubric and the certification training materials indicate that the training materials have covered all the elements under "Scaffolding" in our rubric but only fewer than half of the elements under "Student Agency" and "Presence & Interactivity." Appendix E shows the overlap between our rubric and ACC training content. Accordingly, it is not surprising that the courses perform better in addressing the concept of "Scaffolding" than the other two concepts. Moreover, recommended practices under "Scaffolding," such as an easy-to-navigate interface and an appropriate module organization, are fairly generalizable across courses and can be easily adapted from a sample course. In contrast, to enhance "Student Agency" or promote "Social Presence & Interpersonal Interaction," instructors often need to cater the recommended practices to the specific course content and students' characteristics (Li et al., 2022), which imposes greater difficulties and more time to implement.

Additionally, we examine how instructor and course characteristics relate to course design and teaching practices. We find that instructors' gender, educational attainment, and teaching load explain differences in course design and teaching practices. Our analyses indicate that female instructors are more responsive and more likely to reach out to their students and provide social interaction opportunities. This contrasts with MacNell et al.'s (2015) findings that female instructors are rated lower than their male colleagues in interpersonal interaction. However, the rating scores in MacNell et al.'s (2015) study are from students' teaching evaluations, which often show bias against female instructors (Chávez & Mitchell, 2020; Sandier, 1991). Thus, our study provides a more objective view of how female and male instructors perform differently in course design and teaching practices. Our results also reveal that instructors with bachelor's degrees or below underperform on all concepts compared to colleagues with higher degrees. This finding aligns with existing literature that teachers with graduate degrees are more likely to facilitate student learning and establish a respectful environment (Bastian, 2019). Thus, providing sufficient support to instructors with lower educational attainment is crucial to improve online course quality. Our results further indicate that instructors are less likely to use interaction-oriented practices as their teaching loads increase. This is consistent with Lorenzetti (2017), who suggests that overextended online instructors are unable to offer the presence and feedback needed to promote success. Thus, colleges should consider assigning instructors a more appropriate teaching load to ensure online teaching quality.

5.2. Implications

These findings have several pedagogical and research implications. First, our results call for instructors to facilitate "Student Agency" and increase "Social Presence & Interpersonal Interaction" more intentionally in online courses. To promote "Student Agency," instructors may wish to make learning relevant for diverse groups of students and allow them to have more agency in how to meet course objectives. In particular, our analysis revealed low scores on "Element 6.3 Opportunities for Self-reflection on Learning Goals, Process, and Performance." Instructors may address this issue by incorporating self-assessment opportunities and guidance for students to reflect on and improve their performance, efforts, and learning process. For example, instructors may implement self-evaluation surveys that allow students to reflect on their learning progress to enhance student engagement and motivation (Bonk & Khoo, 2014). As for "Social Presence & Interpersonal Interaction," instructors could incorporate more interaction opportunities tailored to individual needs, such as proactive outreach to struggling students to strengthen students' connection to the course both academically and socially. Specifically, instructors may wish to use analytic tools available on learning management systems that automatically record students' interactions with the learning platform to identify struggling students and provide personalized advice based on a student's specific learning behaviors (Li, Jung, & Friend Wise, 2021; van Leeuwen, Teasley, &

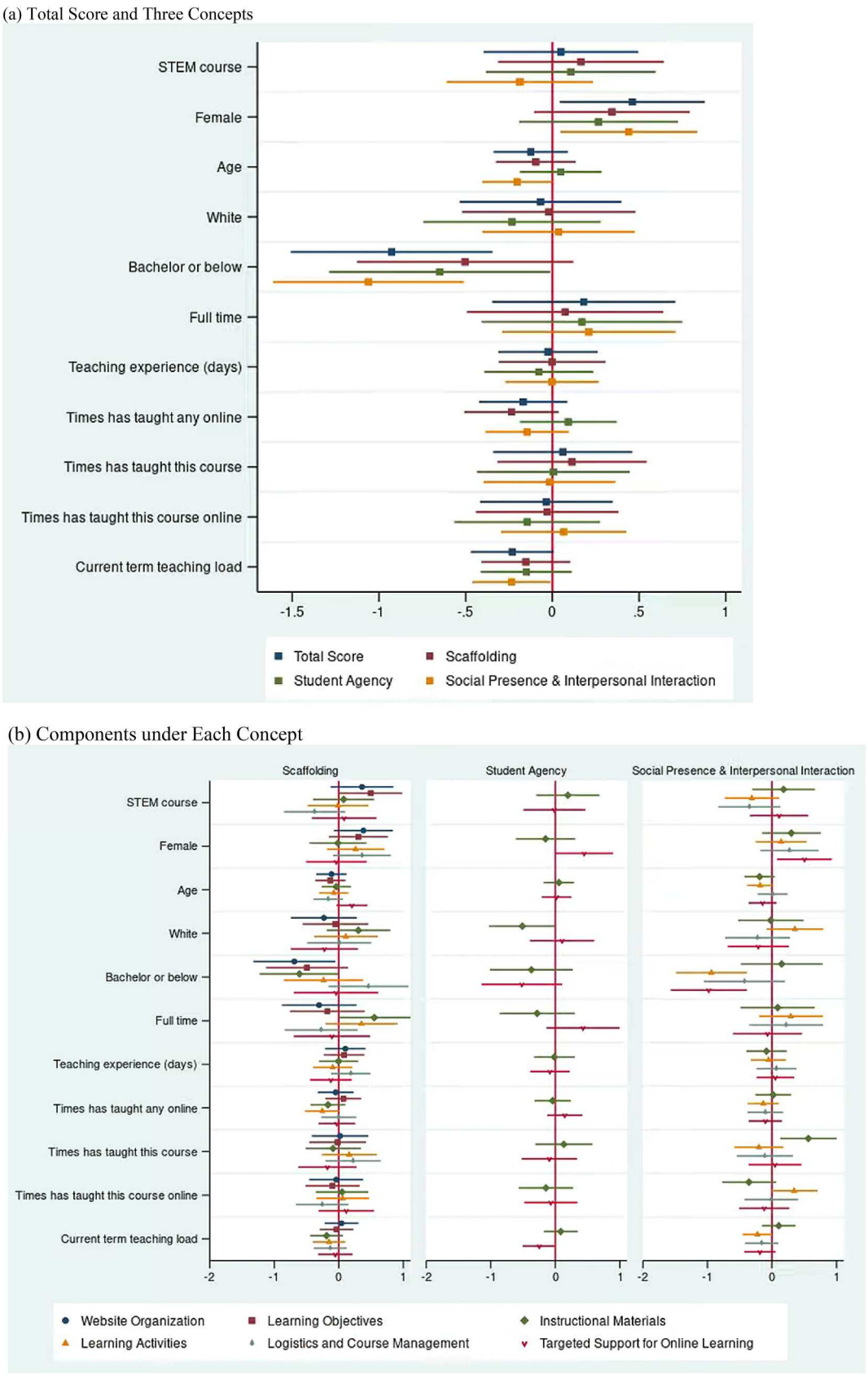

Fig. 8. The estimated relationships between course design scores and course and instructors' characteristics.
Note. All course design scores are standardized. Age, teaching experience, times has taught any online, times has taught this course, times has taught this course online, and current term teaching load are standardized. The markers are the point estimates generated from regression analyses, and the spikes are the confidence intervals.

Table 6
The relationship between course design scores and course and instructor characteristics.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Total Score	**Scaffolding**						
		Scaffolding Total Score	Website Organization and Presentation	Learning Objectives	Instructional Materials	Learning Activities	Logistics and Course Management	Targeted Support for Online Learning
STEM course	0.049	0.165	0.360	0.496*	0.075	−0.013	−0.376	0.083
	(0.224)	(0.241)	(0.245)	(0.245)	(0.238)	(0.238)	(0.239)	(0.252)
Female	0.461*	0.343	0.382	0.304	−0.014	0.262	0.361	−0.038
	(0.211)	(0.226)	(0.230)	(0.230)	(0.223)	(0.223)	(0.225)	(0.236)
Age	−0.125	−0.096	−0.113	−0.129	−0.038	−0.077	−0.164	0.206+
	(0.108)	(0.116)	(0.118)	(0.118)	(0.115)	(0.114)	(0.115)	(0.121)
White	−0.068	−0.021	−0.230	−0.051	0.304	0.109	0.007	−0.222
	(0.234)	(0.251)	(0.256)	(0.256)	(0.249)	(0.248)	(0.250)	(0.263)
Bachelor's or below	−0.927**	−0.503	−0.688*	−0.492	−0.609+	−0.236	0.460	−0.040
	(0.293)	(0.314)	(0.320)	(0.320)	(0.311)	(0.310)	(0.312)	(0.328)
Full time	0.181	0.073	−0.305	−0.177	0.550+	0.352	−0.274	−0.106
	(0.266)	(0.285)	(0.291)	(0.291)	(0.282)	(0.282)	(0.283)	(0.298)
Teaching experience (days)	−0.026	−0.002	0.102	0.083	−0.003	−0.094	0.187	−0.122
	(0.144)	(0.155)	(0.158)	(0.158)	(0.153)	(0.153)	(0.154)	(0.162)
Times has taught any online	−0.168	−0.235+	−0.047	0.072	−0.167	−0.257+	−0.001	−0.030
	(0.128)	(0.137)	(0.140)	(0.140)	(0.136)	(0.136)	(0.137)	(0.144)
Times has taught this course	0.060	0.113	0.020	−0.018	−0.088	0.162	0.220	−0.175
	(0.202)	(0.217)	(0.221)	(0.221)	(0.214)	(0.214)	(0.215)	(0.227)
Times has taught this course online	−0.034	−0.030	−0.039	−0.098	0.051	0.060	−0.256	0.117
	(0.193)	(0.207)	(0.211)	(0.211)	(0.204)	(0.204)	(0.206)	(0.216)
Current term teaching load	−0.231+	−0.153	0.043	−0.033	−0.188	−0.151	−0.132	−0.053
	(0.120)	(0.129)	(0.132)	(0.132)	(0.128)	(0.128)	(0.128)	(0.135)
Observations	100	100	100	100	100	100	100	100

	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Student Agency			**Social Presence & Interpersonal Interaction**				
	Student Agency Total Score	Instructional Materials	Targeted Support for Online Learning	Presence & Interactivity Total Score	Instructional Materials	Learning Activities	Logistics and Course Management	Targeted Support for Online Learning
STEM course	0.106	0.194	−0.017	−0.188	0.179	−0.312	−0.350	0.110
	(0.246)	(0.247)	(0.241)	(0.212)	(0.244)	(0.212)	(0.243)	(0.228)
Female	0.265	−0.152	0.446+	0.441*	0.300	0.141	0.271	0.504*
	(0.231)	(0.232)	(0.226)	(0.199)	(0.229)	(0.199)	(0.228)	(0.214)
Age	0.048	0.055	0.018	−0.203*	−0.192	−0.184+	0.010	−0.145
	(0.118)	(0.119)	(0.116)	(0.102)	(0.118)	(0.102)	(0.117)	(0.110)
White	−0.233	−0.512+	0.104	0.035	−0.018	0.355	−0.225	−0.212
	(0.257)	(0.258)	(0.252)	(0.221)	(0.255)	(0.222)	(0.254)	(0.238)
Bachelor's or below	−0.650*	−0.371	−0.520	−1.061***	0.150	−0.939**	−0.426	−0.979**
	(0.321)	(0.323)	(0.314)	(0.277)	(0.319)	(0.277)	(0.317)	(0.297)
Full time	0.170	−0.283	0.428	0.210	0.088	0.292	0.220	−0.069
	(0.292)	(0.293)	(0.285)	(0.251)	(0.289)	(0.251)	(0.288)	(0.270)
Teaching experience (days)	−0.078	−0.016	−0.084	−0.003	−0.085	−0.053	0.069	0.053
	(0.158)	(0.159)	(0.155)	(0.136)	(0.157)	(0.137)	(0.156)	(0.146)
Times has taught any online	0.092	−0.042	0.146	−0.146	0.019	−0.134	−0.102	−0.102
	(0.140)	(0.141)	(0.137)	(0.121)	(0.139)	(0.121)	(0.139)	(0.130)
Times has taught this course	0.006	0.131	−0.094	−0.016	0.564*	−0.203	−0.112	0.047
	(0.222)	(0.223)	(0.217)	(0.191)	(0.220)	(0.191)	(0.219)	(0.205)
Times has taught this course online	−0.146	−0.146	−0.069	0.065	−0.356+	0.342+	−0.011	−0.121
	(0.211)	(0.212)	(0.207)	(0.182)	(0.210)	(0.182)	(0.209)	(0.196)
Current term teaching load	−0.150	0.083	−0.250+	−0.236*	0.104	−0.226+	−0.160	−0.187
	(0.132)	(0.133)	(0.129)	(0.114)	(0.131)	(0.114)	(0.131)	(0.122)
Observations	100	100	100	100	100	100	100	100

Note. All course design scores are standardized. Age, teaching experience, times has taught any online, times has taught this course, times has taught this course online, and current term teaching load are standardized. Standard errors are in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Wise, 2023). In addition, instructors will need to identify ways to strengthen instructor presence in instructional materials and activities to engage with students more visibly, such as using media-rich graphics, audio, or video to deliver content and, when applicable, offering a step-by-step demonstration of how to format solutions to problems (Gemmell, Sandars, Taylor, & Reed, 2011; Huan, Shehane, & Ali, 2011; Yang, 2017).

Second, our findings have implications for institutions seeking to improve online teaching and learning outcomes through institutionalized structures. To produce more favorable outcomes, colleges may consider adopting a more comprehensive curriculum that covers various topics, especially specific ways to promote student agency and enhance interactivity more visibly in an online learning space. In recent years, many PD programs across the United States have been geared toward a

comprehensive preparation of online instructors. For example, several community colleges in California have launched comprehensive PD programs intending to equip online instructors with a rich set of skills, including how to promote effective interaction and how to integrate a variety of web resources and media in online classes (American River College, 2021; Saddleback College, 2017).

Finally, our rubric has two advantages over previous rubrics and thus serves as an additional tool for online instructors and institutions seeking ways to improve online instruction. Compared to existing rubrics, our rubric attempts to explicitly link key course components with online learning theory. Furthermore, instead of focusing on surface-level characteristics, our rubric provides an overall description of the quality expectations and concrete examples to help course instructors to reflect on whether course components adhere to quality standards. Our rubric could also be used as a tool for PD offered to college instructors, whereas PD coordinators may further tailor the rubric to accommodate the institutional contexts and local needs.

5.3. Limitations and future research

Several limitations of the current study are worth mentioning. First of all, the rubric used in our study has limited ability to assess the quality of course content, such as the relevance of learning objectives to the course level, or whether instructional materials represent up-to-date theories and practices in the field of study. Future research can focus on refining rubrics to reflect on the quality of course content.

Second, our sample was drawn from a community college, which may limit the generalizability of our results to other types of institutions. For example, community college students tend to have lower academic preparation than four-year students (Fike & Fike, 2008). This may lead instructors to provide more support to navigate the online course, thus receiving higher scores on "Scaffolding" than instructors in four-year universities. In addition, due to limited professional development opportunities and institutional support, community college instructors may rely more on text-heavy slide presentations, resulting in fewer opportunities for student engagement and interaction (Cox, 2006; Rucks-Ahidiana, Barragan, & Edgecomb, 2013), and lower scores on "Social Presence & Interpersonal Interaction" compared to four-year college courses. While this study provides an important benchmark for online course quality, future research should consider refining the results based on the specific context of each institution and conducting local evaluations of online teaching to identify areas for improvement.

Finally, while our study documents online course design features that online teaching and learning theories suggest are critical to student learning experiences and success, empirical evidence on the relationship between these features and student performance outcomes in college online contexts still needs to be collected. Accordingly, future research that can link course design features with course performance outcomes will provide additional insights into the importance of these features.

5.4. Conclusion

Based on a sample of 100 randomly selected online courses from a community college, this study contributes to a more nuanced and systematic understanding of the extent to which college online courses are designed to address three quality concepts, namely "Scaffolding," "Student Agency," and "Social Presence & Interpersonal Interaction." To our knowledge, none of the existing studies are able to use random sampling to recruit a large sample like the current study. Our findings highlight the need to enhance online course quality in the areas of "Student Agency" and "Social Presence & Interpersonal Interaction," pinpoint areas needing improvement for specific instructors or courses, as well as shed light on specific ways through which instructors can better address the unique challenges associated with online learning.

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Appendix A

Online Course Quality Rubric (With Examples)

Overall Goal

This online course quality rubric was developed to provide a systematic and descriptive benchmark for researchers and practitioners who are striving to develop a culture of high-quality college-level online courses. This rubric differentiates itself from others as it identifies the unique challenges associated with learning in a virtual environment and provides concrete details of how to optimize the design features and instructional practices to ease the challenges. Practitioners and researchers increasingly acknowledge two critical challenges to successful online teaching and learning: the need for stronger self-directed learning skills and greater difficulties in enabling effective interpersonal interactions. These challenges call for the importance of better **scaffolding** the self-directed learning skills necessary for online success as well as providing clear guidance to navigate the learning process, promoting **student agency** to engage students actively throughout their learning, and improving **social presence & interpersonal interaction** intentionally and visibly. Recognizing the critical role of these three concepts in addressing the unique challenges of online learning, this rubric intends to explain how a particular course component (e.g., learning objective) can be designed to address these concepts. Accordingly, the rubric offers a set of unique features:

- **Explicit connection to online learning theory:** This rubric explicitly links key course components with online learning theory. Specifically, the rubric identifies three concepts that theories and emerging empirical evidence suggest are critical to addressing the unique challenges of online learning; the rubric also consists of six key course components that are typically included in an online course, allowing for a three-by-six matrix. As a result, each rubric element is defined as an intersection between a concept and a course component, thus explicitly describing how a specific course component could be designed to optimize learning guided by a concept.
- **Holistic approach:** Instead of focusing on the presence or absence of surface-level characteristics, this rubric provides an overall description of the quality expectations and concrete examples to help the course instructor to think through a complex set of quality characteristics within each area in a more deeply reflective fashion than is required by a yes/no checklist. Similarly, rather than checking off each specific practice, the instructor considers whether a course component seems to adhere to the conception of quality.

➢ **Flexibility in assessing a whole course or a specific concept area/course component:** This rubric, in the format of a three by six matrix, is a flexible tool that can be used to assist the general course design, the design of a specific course component, or the design features with regard to a specific online learning concept. Similarly, instructors can focus on a particular area that they wish to improve without overwhelming, prescriptive requirements.

Structure of the Rubric

➢ ***Six key course components:*** The rubric consists of six main components of course design and implementation that are commonly incorporated in an online course.

(1) *Website organization and presentation*: The organization and presentation of course content, instructional materials, and learning activities, and guidance provided to students to help them navigate the course website and manage course requirements.
(2) *Learning objectives*: The design and communication of the expected goals of the course or specific units within a course in terms of knowledge and demonstrable skills that will be acquired by a student.
(3) *Instructional materials*: Materials (e.g., slides, textbooks, and video lectures) that deliver course content and the guidance on how to use them.
(4) *Learning activities*: The design and implementation of various learning-related activities and assignments, such as self-assessment, presentation, discussion forum posts, discussion, projects, etc. (*collectively referred to as "Activities"*), which help reinforce and review what was taught in class, get students ready for the next class, keep track of progress, and apply knowledge in authentic and relevant contexts.
(5) *Logistics and course management*: The management of communication of policies, course expectations, and course details, such as assignment deadlines and late work policies.
(6) *Targeted support for online learning*: The additional support provided to students to help them better understand and overcome the challenges associated with online learning and learn more effectively in a virtual environment (e.g., training on time management skills).

➢ ***Three online learning concepts:*** Drawing from existing literature on the effectiveness of online teaching and learning, this rubric defines three concepts in response to the unique challenges associated with online learning.

(1) *Scaffolding self-directed learning skills and guiding the learning process*: Course components are designed and implemented to provide clear guidance on how to fulfill the course requirements, as well as to facilitate successful online learning by incorporating resources for developing self-directed learning skills. This concept is rooted in psychological and cognitive theories that acknowledge a crucial challenge to successful learning in an online environment: online learning is a highly learner autonomous process that requires stronger self-direction and self-discipline to succeed (Guglielmino & Guglielmino, 2004; Song & Hill, 2007; Zimmerman, 1989). As a result, clear and well-designed course structure and navigation, as well as explicit guidance on overcoming the challenges associated with online learning is crucial to online learning success (Azevedo, Cromley, & Seibert, 2004; Grandzol & Grandzol, 2006; Moore, 2013; Smissen & Sims, 2002).
(2) *Student agency*: Students are provided with choices of learning materials and activities, and opportunities to reflect on their own learning and various aspects of the course. This concept is rooted in psychological theories that motivation and interests are fostered when individuals are offered voices and choices during the learning process (Deci & Ryan, 2012; Lindgren & McDaniel, 2012). As a highly learner-autonomous environment, online courses have the potential to enhance student agency by allowing personalized learning paths and greater discretion from the students during the learning process (Lindgren & McDaniel, 2012; Martin, 2004). In the meantime, however, the physical separation between the instructor and students in a virtual environment imposes greater challenges for instructors to facilitate students' decision-making process and adjust the course instruction based on students' voices (Bennett & Folley, 2019). These challenges highlight the importance for online instructors to encourage and facilitate student self-reflection, to provide clear explanation and guidance about various options of instructional materials and activities to help students make informed decisions about their learning paths, and to intentionally collect ongoing feedback from students and incorporate it into the course (Lee et al., 2015).
(3) *Social Presence & Interpersonal Interaction*: A course is designed and delivered in ways that facilitate interpersonal interactions and strengthen students' psychological connection to the course by enhancing the "social presence" of both the instructor and students. Computer-mediated communication is often criticized for being impersonal and cold as nonverbal and relational cues—common in face-to-face communication—are generally missing, which may lead to feelings of isolation and low levels of engagement (Huguet, Dumas, Monteil, & Genestoux, 2001; Moore, 1989; Nissenbaum & Walker, 1998; Trinkle, 1999). Thus, practices that facilitate interpersonal interaction and foster social presence are essential for online learning (Pacansky et al., 2020; Richardson et al., 2015).

How to Use the Rubric

Elements in this rubric are the products of intersections between online learning concepts and course components through a three-by-six matrix.

➢ The three concepts are presented in the first column and the six course components are presented in the first row.
➢ Specific essential elements in each cell in the matrix are defined by the intersection of the course component in a specific column and the concept in a specific row. For instance, the element in the first cell (i.e., course material organization and presentation) is defined by the intersection between the course component of "Website organization and presentation" and the concept of "Scaffolding self-directed learning skills and guiding the learning process."
➢ For each essential element, scoring guidance is provided using a 3-point scale ranging from 1 (beginning) to 3 (proficient). Detailed explanations and concrete examples for each level can be found in each section below the table.

Online Course Quality Rubric Matrix

	Website Organization and Presentation	Learning Objectives	Instructional Materials	Learning Activities	Logistics and Course Management	Targeted Support for Online Learning
Scaffolding Self-Directed Learning Skills and Guiding the Learning Process	1.1 Course material organization and presentation 1.2 Guidance on course navigation	2.1 Articulation of learning objectives	3.1 Guidance on how to work with instructional materials	4.1 Regular and various learning Activities 4.2 Clear instruction on learning Activities and articulation of expectations	5.1 Articulation of course policies, expectations, and course details 5.2 Clear communication of course schedule, predictable routine	6.1 Learner support and opportunities for scaffolding learning skills
Student Agency			3.2 Diversified content delivery media 3.3 Flexible content and student choice	4.3 Flexible performance tasks and student choices		6.2 Facilitation and incorporation of ongoing feedback from students 6.3 Opportunities for self-reflection on learning goals, process, and performance
Social Presence & Interpersonal Interaction	1.3 Instructor presence in the structure of the website		3.4 Instructor presence in content delivery	4.4 Instructor presence in learning Activities and quality feedback 4.5 Collaborative learning and interaction opportunities	5.3 Regular announcements and reminders	6.4 Approachable and responsive instructor 6.5 Progress monitoring and proactive outreach 6.6 Non-content-related social interaction opportunities

Course Component 3: Instructional Materials

Elements in this section examine the materials (e.g., slides, textbooks, and video lectures) that deliver course content and the guidance on how to use them.

3.2 Diversified Content Delivery Media

1. Definition and importance

The online learning environment provides a setting in which multimedia, characterized by the presence of a variety of media, such as text, pictures, sound, animations, and videos in content delivery, could be used to enhance the learning process and experience. Specifically, research from cognitive science suggests that multimedia learning allows individual students to connect verbal and visual representations of content, therefore strengthening the retention of information and achieving a deeper understanding of the knowledge. The use of visual presentations, such as images, video, and animations, in addition to texts also helps improve student attention during the learning process. Additionally, students with different learning habits and technological proficiency may prefer different media for receiving information. As a result, providing students with multiple choices of media for the same content allows students to study it in ways that they prefer.

2. Features

Beginning	The instructor primarily uses only one medium, most often texts (including slides) to deliver all course content, providing little choice in content delivery media.
Developing	The instructor uses a variety of media, such as text, audio, video, and images/graphics, to deliver content. For some of the learning units, students are provided with multiple media to receive the same information, which allows students to choose their preferred way of accessing the information.
Proficient	The instructor uses a variety of media, such as text, audio, video, and images/graphics, to deliver course content. For most of the learning units, students are provided with multiple media to receive the same information, which allows students to choose their preferred way of accessing the information.

3. Examples

Beginning	The instructor primarily assigns readings from an online textbook. Most content is text-based.
Developing	In addition to assigned readings from an online textbook, the instructor also provides weekly PowerPoint slides. In the slides, the instructor provides images and graphics frequently to explain difficult concepts in a visual way. In 5 weeks out of 16 weeks, the instructor also uses videos to explain more complicated concepts that may be challenging to students.

(*continued on next page*)

(*continued*)

Proficient	The instructor uses multimedia to cover the same content for each learning unit. Specifically, the instructor provides readings from an online textbook about a set of concepts, a video where the instructor directly explains these concepts, and the slides used in the videos. Students can choose to use their preferred media to learn these concepts. * Please see "Adding Some TEC-VARIETY 100+ Activities for Motivating and Retaining Learners Online" for more examples: ● Activity 57 (Chapter 9): Instructor Online Video Demonstrations ● Activity 72 (Chapter 10): Interactive Multimedia Glossaries ● Activity 75 (Chapter 10): Exploring Animations, Simulations, and Pop-Up Media ● Activity 78 (Chapter 10): Online Subject-Specific Picture Galleries ● Activity 91 (Chapter 13): Cartoon and Animated Movie Productions ● Activity 93 (Chapter 13): Course Video Summaries and Movie Festivals

3.3 Instructor Presence in Content Delivery

1. Definition and importance

Unlike traditional face-to-face courses where students meet and interact with the course instructor during lectures, online learning creates a physical separation between the instructor and students during the instructional process, which often leads to greater challenges for students to develop a personal connection with the instructor. To address these challenges, it is critical for online instructors to strengthen instructor presence in instructional materials and activities to engage with students actively and visibly. The use of multimedia such as audio, video, and other interactive technologies (e.g., synchronous meetings) allow students to develop a sense of personal connection with the instructor, which in turn would motivate students to reciprocate and dedicate effort to the course materials.

2. Features

Beginning	The instructor primarily relies on texts (such as slides and text-based handouts) to deliver instruction, presenting students an overwhelming amount of information in a disengaging way with no direct support and explanation from the instructor.
Developing	The instructor uses texts as the main method to deliver course content, but sometimes uses other media-rich and personalized modes, such as audio, video, and synchronous meetings, to directly explain the course content in some of the learning units.
Proficient	The instructor consistently infuses a variety of visual, media-rich, and personalized modes, such as graphics, audio, video, synchronous meetings, and narrated slides, throughout lectures to allow for a thorough explanation of concepts in an engaging manner and also to create a strong instructor presence. In addition, the instructor uses a friendly and conversational tone when explaining the course content. When applicable, the instructor provides sample problems and offers step-by-step demonstration of how to format solutions to problems.

3. Examples

Beginning	For each learning unit, the instructor assigns readings from the textbook and provides PowerPoint slides to highlight the key concepts covered in these readings.
Developing	In addition to readings from the textbook and PowerPoint slides, the instructor occasionally provides short videos to explain difficult concepts and show herself on camera, and a whiteboard app with a voice-over to go through concepts that are particularly challenging to most of the students in class. The instructor also offers two synchronous review sessions where she uses screen sharing to illustrate relevant content. In addition, the instructor sends out periodic "Q&A" emails summarizing questions students have raised and answering them in a friendly, personable way.
Proficient	For each learning unit, the instructor explains key concepts covered in that unit and shows herself on camera in addition to assigning readings from the textbook and providing PowerPoint slides. The instructor uses conversational voice (an active voice and shorter sentences) and a warm and friendly tone in the lecture videos, such as using interjections "Yay!" and "Phew". The course materials also include short examples of worked problems with voice-over by the instructor explaining the steps being taken and why. * Please see "Adding Some TEC-VARIETY 100+ Activities for Motivating and Retaining Learners Online" for more examples: ● Activity 16 (Chapter 5): Screencasted Supports and Directions

Appendix B

Expert Review for the Rubric

Seven experts were invited to review the rubric for validity. These experts were selected from one public research university and two community colleges based on their experience and expertise in online teaching and learning, course design, and faculty development. These experts include researchers, online instructors, faculty mentors for online instructors, and college administrators. They were asked to evaluate the validity of each quality concept, course component, and element in the rubric in terms of its relevance, importance, and clarity and provide detailed suggestions for improvement.

The experts all concurred with the three concepts and six components and offered specific suggestions for some of the elements. Initially, 21 elements were created to address the three quality concepts, and two major changes were made based on the experts' feedback. First, two of the original elements were combined: "Skill Scaffolding for Successful Online Learning" and "Academic-Related Support" became a new element named "Learner Support and Opportunities for Scaffolding Learning Skills." In addition, two new elements were added. For instance, the element "Approachable and Responsive Instructor" was added to address the concept of "Social Presence & Interpersonal Interaction" to emphasize the importance of supporting the development of a personal connection between the instructor and students and facilitating positive instructor-student relationships.

Furthermore, several minor modifications were made based on experts' suggestions. These changes are mainly related to (1) the naming and definitions of specific elements, (2) the criteria for rating scales, and (3) the placement of the elements. For example, the original element, "The Use of Multimedia," was renamed to "Diversified Content Delivery Media" and was moved from the concept of "Scaffolding" to the concept of "Student Agency." The experts suggested these changes to emphasize the need to allow students to choose from different media in receiving information based on their learning habits and technological proficiency.

Finally, the expert review process led to a rubric of 22 elements, which was further reduced to 19 elements for this study due to data availability.

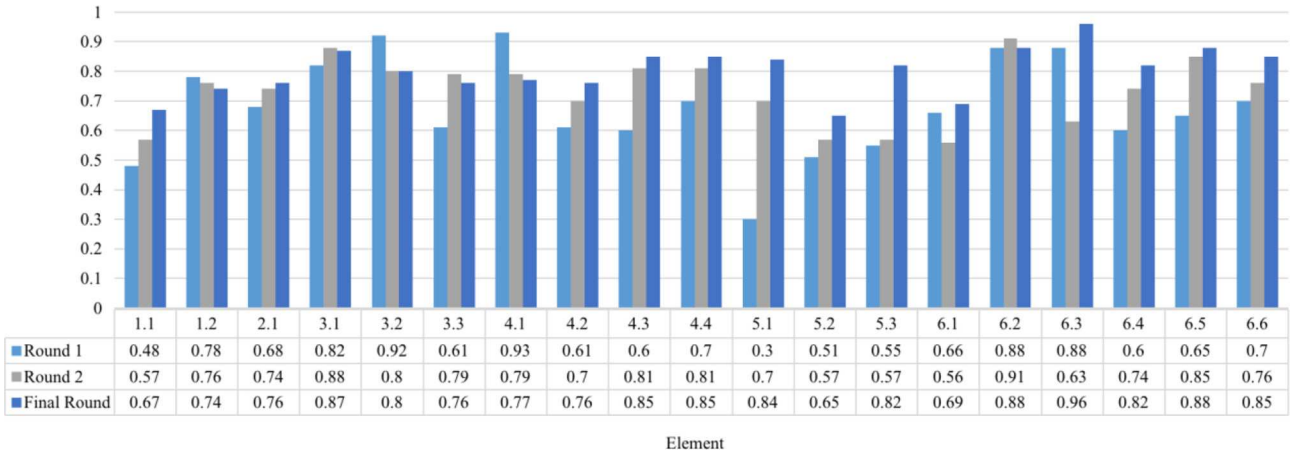
Appendix C

Online Course Observation Protocol (With Examples)

Website Organization and Presentation	
Elements	**Related Questions to Observe**
Panel A: Placement, clarity, and organization	
1.1 Course navigation instruction (e.g., getting started tab, syllabus)	1. Does the course provide any overall navigational guidance about the course (e.g., how to get started and where to find various course components)? a. If so, what guidance does the course site provide? b. If so, when does this information appear to have been provided (i.e., prior to the start of the class, early in the class, etc.)? c. If so, where does this information appear to have been provided?
1.2 Course organization (unit- and page-level chunking)	1. Are the course content and learning materials segmented into distinct chunks (e.g., unit-level chunking)? If so, describe. 2. Does the instructor use headings, subheadings, or other ways (e.g., folder description) to enhance students' understanding of the materials? If so, describe. 3. Is the course organization consistent? If not, describe.
Instructional Material	
Elements	**Related Questions to Observe**
Panel A: Scaffolding Self-Directed Learning Skills and Guiding the Learning Process	
3.1 Guidance on how to work with instructional materials	1. Does the instructor provide guidance on how to use the instructional materials or suggestions on specific learning strategies (e.g., reminding students to review course content before taking a quiz, guiding students to take notes during a video, explaining what to look for in an article, suggesting students to highlight key points, etc.)? a. If so, what kind of guidance/suggestion is provided? b. If so, where is the information provided?
3.2 Diversified content delivery media	1. Does the course site provide any instructional material to deliver course content? a. If so, what resources are included? 2. What types of media (e.g., audio or video files, PowerPoint files, etc.) are used throughout the course to deliver course content? a. How is each media used?
Panel B: Student Agency	
3.3 Instructor presence in content delivery	1. Does the instructor use any media (e.g., videos and photos of the instructors, audios from the instructor, and texts using conversational writing in first person) to show the presence of the instructor in the instructional material? a. If so, what approaches does the instructor use and how is each of these approaches used? b. If so, how often is each of these approaches used?

Appendix D

Kappa Values for Each Element



	1.1	1.2	2.1	3.1	3.2	3.3	4.1	4.2	4.3	4.4	5.1	5.2	5.3	6.1	6.2	6.3	6.4	6.5	6.6
Round 1	0.48	0.78	0.68	0.82	0.92	0.61	0.93	0.61	0.6	0.7	0.3	0.51	0.55	0.66	0.88	0.88	0.6	0.65	0.7
Round 2	0.57	0.76	0.74	0.88	0.8	0.79	0.79	0.7	0.81	0.81	0.7	0.57	0.57	0.56	0.91	0.63	0.74	0.85	0.76
Final Round	0.67	0.74	0.76	0.87	0.8	0.76	0.77	0.76	0.85	0.85	0.84	0.65	0.82	0.69	0.88	0.96	0.82	0.88	0.85

Element

Kappa Values for Each Element

Note. Round-1 kappa values were calculated after coding 37 courses; Round-2 kappa values were calculated after coding 67 courses; and Final Round kappa values were calculated after coding 100 courses.

Appendix E

Overlap between the Rubric in this Study and ACC's Professional Training Content

	Website Organization and Presentation	Learning Objectives	Instructional Materials	Learning Activities	Logistics and Course Management	Targeted Support for Online Learning
Panel A: Scaffolding	* 1.1 Course Material Organization and Presentation	* 2.1 Articulation of Learning Objectives	* 3.1 Guidance on How to Work with Instructional Materials	* 4.1 Regular and Various Learning Activities	* 5.1 Articulation of Course Policies, Expectations, and Course Details	* 6.1 Learner Support and Opportunities for Scaffolding Learning Skills
	* 1.2 Guidance on Course Navigation			* 4.2 Clear Instruction on Learning Activities and Articulation of Expectations	* 5.2 Clear Communication of Course Schedule, Predictable Routine	
Panel B: Student Agency			3.2 Diversified Content Delivery Media			6.2 Facilitation and Incorporation of Ongoing Feedback from Students
						6.3 Opportunities for Self-Reflection on Learning Goals, Process, and Performance
Panel C: Presence & Interactivity			3.3 Instructor Presence in Content Delivery	* 4.3 Instructor Presence in Learning Activities and Quality Feedback	* 5.3 Regular Announcements and Reminders	* 6.4 Approachable and Responsive Instructor
				* 4.4 Collaborative Learning and Interaction Opportunities		6.5 Progress Monitoring and Proactive Outreach
						6.6 Non-Content-Related Social Interaction Opportunities

Overlap between the Rubric in this Study and ACC's Professional Training Content

Note. * indicates the overlap between the rubric used in this study and ACC's professional training content.

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