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Instructors' self-efficacy, perceived benefits, and challenges in transitioning to online learning

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Abstract

Drawing on social cognitive theory, this study investigated instructors' online teaching self-efficacy during the sudden, COVID-19-induced transition to online teaching. The pandemic has forced instructors to shift to online teaching, arming them with valuable hands-on experience in this alternative teaching mode. This study examined instructors' online teaching self-efficacy, perceived benefits, intention to implement online teaching strategies in their future teaching, and the challenges encountered during this transition. A total of 344 instructors completed the developed and validated questionnaire. The data were analyzed using multiple linear regression modeling, using the stepwise estimation technique. The findings demonstrate that affiliated universities, the quality of online learning, and previous use of learning management systems (LMS) are significant predictors of instructors' online teaching self-efficacy. Online teaching self-efficacy, along with gender, quality of online learning, and professional training are significant predictors of the perceived benefits of online learning during emergencies. Meanwhile, the quality of online learning and professional training are significant predictors of instructors' intention to implement online teaching strategies and learning technology tools. Instructors ranked remote assessment as the most challenging factor in online teaching during emergencies, and internet access or internet speed as the first and most complicated hindrance for students in this transition. This study helps in understanding instructors' online teaching self-efficacy during the sudden transition and the positive consequences of shifting to the online mode due to the COVID-19 pandemic on the higher education field. Recommendations and implications are discussed.

Keywords Instructors' self-efficacy · Online teaching in higher education · Remote teaching · Multiple regression analysis · COVID-19 · Quality of online learning · Professional training

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1 Introduction

In January 2020, the World Health Organization (WHO) declared the spread of the COVID-19 virus a public health emergency. By March 2020, COVID-19 was proclaimed a global pandemic, leading to lockdowns and the shift to online learning as the main mode of instruction. The global crisis similarly affected Saudi Arabia, where all educational institutions shifted to full online teaching and learning to keep the learning environment safe. University instructors were required to teach remotely, despite their unpreparedness and lack of professional training or organizational support. Universities had no time to prepare and train professors and instructors to teach remotely. As such, instructors were suddenly forced to shift to remote teaching, using their existing ability and knowledge of information and communications technology (ICT), online teaching methods, and pedagogy. Prior to COVID-19, many instructors had not taught in any form other than traditional lectures (Howard et al., 2021, Naik et al., 2021). This lack of experience impacted their sense of efficacy and caused confusion in delivering online remote teaching to their students (Jung et al., 2021; Naik et al., 2021).

For most instructors, the sudden transition to online learning hindered the preparation and delivery of quality higher education content, as it required dealing with the unfamiliar technological and pedagogical aspects of online teaching. Thus, the sudden transition to online learning affected instructors' self-efficacy. Instructors' self-efficacy is a critical factor in online teaching, as it impacts the quality of teaching by way of the technology-related challenges encountered, unfamiliarity of online pedagogical aspects, doubts about the quality level of online learning, and the lack of face-to-face interactions (Eberle & Hobrecht, 2021; Horvitz et al., 2015; Shea, 2007). It is important to measure and predict the factors that can contribute to instructors' self-efficacy and successful teaching practices because knowledge of these factors can help higher education institutions take action to ensure better online learning quality during and after the pandemic. Nevertheless, this shift to online learning likely enriched instructors' knowledge of the technological and pedagogical aspects of online teaching, which they can apply as online instructors in the future. The benefits from applying this knowledge can be better gauged by examining the instructors' intention to implement online teaching and learning strategies, approaches, and technology tools beyond the COVID-19 pandemic period.

During the early part of the pandemic, some studies examined higher education instructors' experiences with emergency online learning and found that instructors experienced confusion and anxiety during their online teaching for emergencies, and struggled with the technological and pedagogical aspects of their teaching (Jung et al., 2021). Other studies, such as that of Culp-Roche et al. (2021), found that online nursing faculty perceived high self-efficacy to teach online as well as regarding to their computer skills and found that prior online teaching was a predictor of faculty online teaching self-efficacy. However, very limited studies have investigated and predicted factors that affect instructors' self-efficacy when teaching online during the sudden, COVID-19-induced transition to online teaching.

To contribute to the literature, this study measured university instructors' self-efficacy and sense of ability to teach remotely during the COVID-19 pandemic. The

study provides insights on the factors affecting instructors' self-efficacy when teaching online during the sudden transition to online teaching. Understanding the self-efficacy of university instructors is important to determine the technical and pedagogy support and professional training that would enable instructors to deliver effective and high-quality online teaching and learning (Ismayilova & Klassen, 2019). Specifically, this study investigated instructors' self-efficacy in designing, developing, evaluating, and teaching online courses and measured the demographic variables that affect instructors' self-efficacy during the COVID-19 pandemic.

In addition, limited studies have predicted the factors that might affect instructors' perceived benefits of online learning during emergencies and how they might implement what they have learned during the pandemic in their future teaching. To investigate COVID-19's positive effects on education from instructors' perspectives, this study explored the benefits derived from the sudden transition to online teaching and learning, such as the improvement of higher education learning processes and instructors' preparedness to teach in a fully online learning or blended learning environment. Instructors' perceived benefits can be understood as the extent to which instructors perceive online learning for emergencies to be beneficial for the learning and teaching processes, as well as their ability and preparedness to teach online. It is important to understand how instructors perceive the benefits from transitioning to online learning and how it would contribute to their online teaching. This will contribute to the literature by providing insights into the positive consequence of shifting to an online mode of teaching due to the COVID-19 pandemic in instructors' teaching practices, and how they might benefit from their experiences during the sudden transition. Therefore, the study investigated the factors that affect and predict instructors' positive perception of the benefits of online learning and teaching for emergencies.

This study also contributes to the literature by examining instructors' intentions for the future implementation of online teaching technologies and strategies beyond the pandemic period. The study provides insights on what can significantly predict their intention to use what they have learned and experienced during the sudden transition to online teaching.

Finally, this study reveals the challenges faced by higher education instructors and students during the sudden transition to online teaching, and discusses how to overcome those challenges.

The study, therefore, posed the following research questions:

1. What factors predict online teaching self-efficacy in a sudden transition to online learning such as that caused by the COVID-19 pandemic?
2. What factors determine instructors' perceived benefits of online learning during emergencies?
3. What factors predict instructors' intentions for the future implementation of online teaching technologies and strategies beyond the pandemic period?
4. What are the challenges encountered by instructors in the transition to online teaching during emergencies?

2 Literature review

2.1 Online learning

Because of the COVID-19 pandemic, most higher education institutions worldwide closed their campuses and shifted to online teaching and learning. The transition occurred suddenly, and without preparation or readiness by institutions and individuals. This sudden transition affected instructors' teaching and student learning and created several challenges for institutions and individuals (Adedoyin & Soykan, 2020; Busuttil & Farrugia, 2020; Dietrich et al., 2020; Guangul et al., 2020; Hodges et al., 2020; Jung et al., 2021; Lorenza & Carter, 2021; Naik et al., 2021; Paudel, 2020). Fortunately, online learning is available globally for most higher education institutions. Online learning has been implemented in higher education over the past two decades (Martin et al., 2019). However, many higher education instructors have not yet taught online, which might affect their teaching self-efficacy (Howard et al., 2021, Naik et al., 2021) and create challenges in teaching online and delivering high-quality instructions remotely (Adedoyin & Soykan, 2020; Coman et al., 2020; Guangul et al., 2020; Paudel, 2020). The fact that instructors were forced to teach online in a matter of weeks without preparation caused issues in the quality of online teaching and learning. The shift to online teaching and learning requires intensive instructor preparation concerning the pedagogical and technological aspects of this teaching mode. Instructors do not customarily possess knowledge and competencies to teach online and provide an effective online learning environment (Howard et al., 2021).

During the early part of the pandemic, Hodges et al. (2020) distinguished between online learning terminologies that emerged during the pandemic and concluded that *emergency remote teaching* was the most appropriate term to describe the delivery of instructions during the health crisis. Thus, Hodges et al. (2020) defined emergency remote teaching as "a temporary shift of instructional delivery to an alternate delivery mode due to crisis circumstances" (p. 6). This type of delivery method is what has been practiced in most universities worldwide amid COVID-19. This study adopted this definition as it applies to what universities in Saudi Arabia practiced during the emergency period, since the main objective of the transition was to ensure reliable instructional continuity. However, many other studies conducted during the pandemic have also used different terms (e.g., online learning, online teaching, remote teaching, emergency remote teaching, distance education, and distance learning), and all these terms are used interchangeably (Busuttil & Farrugia, 2020; Dietrich et al., 2020; Hodges et al., 2020; Jung et al., 2021; Lorenza & Carter, 2021; Naik et al., 2021; Paudel, 2020). Therefore, terms such as emergency remote teaching, online learning during emergencies, and online teaching are used interchangeably in this study.

Online learning requires time to be planned and designed to provide high-quality online learning experiences. However, during the COVID-19 pandemic, universities were not able to provide satisfying level of quality of online learning, which remains a critical issue in higher education (Qu, 2020). While some universities provided all the technological and pedagogical support for instructors to teach online/remotely, other universities provided lower support that led to instructors' confusion and lower

self-efficacy during the sudden transition. As a result, this may lead to instructors to experience lower quality of online learning (Crawford et al., 2020). In addition, Qu (2020) and Crawford et al. (2020) emphasized the concerns of faculty members regarding the quality of online learning as many universities transitioned to online learning during and after the COVID-19 pandemic. Dagiene et al. (2022) explored the sustainable quality factors that influenced higher education institutions online learning during the COVID-19 pandemic, and found that administrative actions, support for students, study process control, support for academics, collaboration of the academic community, and technical base and found that those factors have contributed to the success of online learning and teaching in higher education during the pandemic period. In this study, the quality of online learning is understood as the ability of higher education institutions to provide successful online teaching and learning processes, policies, technical infrastructure, instructional practices, and technological and pedagogical support during the COVID-19 pandemic.

2.2 Self-efficacy

Bandura (1986) defined self-efficacy as "people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances" (p. 391). Meanwhile, Olivier and Shapiro (1993) described self-efficacy as the perception of one's own capabilities to organize and apply actions to perform certain tasks. The self-efficacy construct emerged from Bandura's social cognitive theory, which has been used in many fields including education (Dusick, 1998; Schunk, 1984). Social cognitive theory states that person's behavior can be a result of the choice to act according to the cognitively processed information and the environment, which can shape her/his actions (Bandura, 1986). Bandura (1986) theorized that human feelings of self-efficacy are an interplay of self-referent thoughts and perceptions, effects, and actions. Self-efficacy informs individuals of their self-appraisals or self-evaluation of their capabilities and functions as "cognitive mediators of action" (Bandura, 1986; Murphy et al., 1989). Information on individuals' self-appraisals can be obtained through verbal persuasion, affective arousal, experiences of previous successes or failures, or even observations of others' successes or failures (Bandura, 1986, Murphy et al., 1989). Bandura 1978 found that when people have high self-efficacy, they are more likely to persevere and exert greater effort to accomplish attended tasks, while people with low self-efficacy are less likely to accomplish such tasks because of their feelings of hopelessness. Bandura (1978) also stated that self-efficacy mediates human behaviors and how these behaviors change, which eventually affects and shapes one's actions.

2.3 Online teaching self-efficacy

Teaching self-efficacy is a construct that explains the confidence that teachers or faculty members hold regarding their ability to teach students to develop their knowledge, abilities, and values (Tschannen-Moran et al., 1998). Online teaching self-efficacy as a construct is rooted in human-computer interaction, which has been investigated by many studies to explore the factors that affect the use of computers

and technologies in learning and teaching (Compeau & Higgins, 1995; Deng et al., 2004; Faseyitan et al., 1996; Littrell, Olivier & Shapiro, 1993; Smith, 2001). Previous studies found that computer self-efficacy positively affects perceived ease of computer use (Terzis & Economides, 2011), behavioral intention to use computer software (Hsia et al., 2014; Zheng et al., 2018), and teaching online (Horvitz et al., 2015; Yeşilyurt et al., 2016). Instructors' online teaching self-efficacy can be influenced by their perceptions of their computer skills, synchronous and asynchronous online class management, and online teaching strategies that are appropriate and effective for an online environment (Hampton et al., 2020; Horvitz et al., 2015; Richter & Idleman, 2017). Lee and Tsai (2010) investigated instructors' self-efficacy by adding a web component to the Technological Pedagogical Content Knowledge (TPCK) framework (Mishra & Koehler, 2006), and results showed a significant correlation between instructors' web-based teaching self-efficacy score and instructors' positive attitudes toward teaching in web-based instruction environment.

Instructors' self-efficacy is important for effective teaching at the college level, and it is thus important to understand the factors that correlate with self-efficacy (Chang et al., 2011). Age, gender, academic discipline, years of teaching experience, college, affiliated university, semesters taught online, future interest in teaching online, satisfaction with teaching online, and previous use of LMSs have all been used by previous studies as independent variables to investigate their correlation and impact on instructors' online teaching self-efficacy (Horvitz et al., 2015; Kelm & Mclntosh, 2012; Richter & Idleman, 2017; Mehdinezhad, 2012, Chang et al., 2011, Zheng et al., 2018; Chung & Chen, 2018; Ali et al., 2017; Robinia, 2008). In recent studies, prior online teaching was found to be a predictor of higher online teacher self-efficacy, but not instructional support (Culp-Roche et al., 2021), and online teaching self-efficacy score correlates with additional qualifications, and online professional development (Dolighan & Owen, 2021). Mehdinezhad (2012) investigated certain factors and revealed that instructors with 20 years of teaching experience have significantly higher self-efficacy than instructors with less teaching experience; education professors have higher self-efficacy in curriculum and instruction and student assessment than professors in other colleges; assistant professors have higher self-efficacy than associate or full professors, and gender has no significant effect on self-efficacy. Chang et al. (2011) also found that the length of professors' teaching experience correlates with their self-efficacy; women have a higher level of self-efficacy than men, and education professors have a higher level of self-efficacy than those in other fields because of their ability to design and develop a learning environment. Both Chang et al. (2011) and Mehdinezhad (2012) found that years of experience is a significant factor that affects teaching self-efficacy. In a recent study, Fabelico and Afalla (2020) found that college instructors have high self-efficacy rates, moderate levels of burnout, and very satisfactory teaching results, regardless of age, gender, teaching experience, academic rank, or length of service. Using hierarchical multiple regression analysis, Šabić et al. (2022) found minor gender differences in self-efficacy related to ICT use among older teachers—but not among younger teachers—when controlling for the type of school and the perceived technical and professional support for using ICT.

Organizational support means providing technical and pedagogical support to instructors to teach online. Educational institutions provided different levels of technical and pedagogical support during COVID-19 that could lead to higher or lower perceived self-efficacy to teach online. Previous research has determined the importance of providing technical and pedagogical support (Compeau & Higgins, 1995; Ssekakubo et al., 2011). Al-Busaidi and Al-Shihi (2010) emphasized that technical support by providing instructional designers, computer specialists, and trained assistants is an important factor in encouraging instructors to accept LMS integration.

Providing ongoing professional development is an important way to increase instructors' online teaching self-efficacy and enhance their abilities to plan, design, and implement online courses (Horvitz et al., 2015; Richter & Idleman, 2017; Mehdinezhad, 2012; Šabić et al., 2022; Ismayilova & Klassen, 2019). Richter and Idleman, 2017 concluded that providing ongoing professional development opportunities and support to instructors can increase their online teaching skills, which will ensure the delivery of high-quality online courses. Dolighan and Owen (2021) found that online teaching self-efficacy correlates with online professional development and suggested that long-term professional development programs should be created to enhance teachers' abilities to design and plan online learning experiences.

Affiliation was found to be an independent variable that could impact instructors' self-efficacy. Horvitz et al. (2015) found that school affiliation played a significant role in their use of computer self-efficacy. The major difference between universities during the COVID-19 pandemic was the level and quality of technical and pedagogical support for instructors, which might have impacted their self-efficacy in teaching online. In their multilevel modeling study, Kelm and Mclntosh (2012) found that teachers' self-efficacy can be changed by school practices. Richter and Idleman (2017) found that when nursing instructors received support and training from their universities in designing and implementing online courses, the perceived themselves as having a higher level of self-efficacy in teaching online.

LMSs were broadly adopted by universities prior to the COVID-19 pandemic; however, not all instructors were required to integrate them into their teaching. Since the start of the pandemic, almost all universities worldwide have started to use LMSs to teach remotely and deliver online contents. Therefore, instructors who used LMSs prior the pandemic might have found it easy to integrate and use them during the pandemic, which would have affected their self-efficacy in teaching online during the pandemic. Some recent studies, such as that by Dolighan and Owen (2021), found that teachers' previous use of LMSs correlates with the highest online teaching self-efficacy score.

In addition, instructors' perspectives of online learning quality at their institutions are related to their teaching feelings and abilities which reflect on their online teaching performance. During the COVID-19-induced transition to online learning, almost all educational institutions moved to fully online learning without organization or instructors' experiences, and most higher education instructors have not yet taught online, which might affect their teaching self-efficacy (Howard et al., 2021; Naik et al., 2021). The sudden transition created challenges in teaching online and delivering high-quality instructions remotely (Adedoyin & Soykan, 2020; Coman et al., 2020; Guangul et al., 2020; Paudel, 2020). Many higher institutions had low-

quality instructional technology tools, which affected instructors' performance and their feelings and abilities to teach online. Meccawy et al. (2021) investigated student and faculty perceptions of online learning during the pandemic and found that the university provided a better quality of online learning (in three of the five pillars of the online learning quality framework); however, faculty tended to perceive online learning negatively. In addition, Qu (2020) and Crawford et al. (2020) emphasized that faculty in higher education institutions are concerned about the quality of online learning during the pandemic.

Based on previous literature that emphasizes the importance of self-efficacy's influence on instructors' online teaching and the factors that might influence such construct, there is a need to understand the factors that affect their online teaching self-efficacy during the sudden transition. Thus, this study proposes the following hypotheses.

$\boldsymbol{H}_1$*Affiliated universities can significantly predict instructors' online teaching self-efficacy in a sudden transition to online learning such as that caused by the COVID-19 pandemic.*

$\boldsymbol{H}_2$*Previous use of LMSs can significantly predict instructors' online teaching self-efficacy in a sudden transition to online learning such as that caused by the COVID-19 pandemic.*

$\boldsymbol{H}_3$*Quality of online learning can significantly predict instructors' online teaching self-efficacy in a sudden transition to online learning such as that caused by the COVID-19 pandemic.*

2.4 Perceived benefits of emergency online learning

The concept of perceived benefits of information technology refers to the conceptualization of the impact of computer software or information system on one's work (DeLone & McLean, 1992, 2003; Torkzadeh & Doll, 1999). DeLone and McLean (2003) stated that the success of any system is determined by the benefits that the user perceives to contribute to their work. Zheng et al. (2018) defined instructor LMS perceived benefits as "the extent to which faculty perceive that the LMS can improve their own teaching and productivity and achieve instructional goals" (p. 313). This study, therefore, defined the concept as the instructors' perceived benefits of emergency online learning during the sudden transition due to the COVID-19 pandemic. Mouakket and Bettayed (2015) stated that few research efforts have been conducted to investigate the importance of organizational support and its effect on instructors' perceived benefits of LMS in online learning. Zheng et al. (2018) found that organizational support can significantly enhance faculty's LMS self-efficacy and technical support, and when faculty receive organizational support that improves their LMS self-efficacy and technical support, they will perceive the benefits of LMS integration into their teaching.

Some recent studies have addressed instructors' perceptions of the benefits of the sudden transition to online teaching and learning that resulted from the COVID-19 pandemic. For example, Busuttil and Farrugia (2020) found that instructors perceived beneficial outcomes of their online teaching experience during this transition by gaining knowledge and competencies in digital technologies and synchronous and asyn-

chronous online teaching approaches. Paudel (2020) found that this shift to online teaching benefited instructors and students in several ways, such as enhancing teaching convenience and allowing for increased communication with students. Eycan and Ulupinar (2021) investigated nurse instructors' perceptions of online learning during the pandemic and found that positive and negative experiences determine instructors' perceptions of the benefits of online learning. Fleck and Garris (2021) studied faculty perceptions of emergency remote instruction and found that they perceived lower enjoyment, learning, engagement, and perceived course quality.

Although seemingly unrecognized, there is a positive consequence of shifting to the online mode due to the COVID-19 pandemic in the higher education field. Specifically, the pandemic has forced instructors to shift to online teaching, arming them with valuable hands-on experience in this alternative teaching mode. However, the remaining unanswered question is to what extent higher education instructors perceive the benefits of emergency online learning during the sudden transition due to the COVID-19 pandemic and what factors might predict and influence their perceived benefits of online learning. Therefore, this study proposes the following hypotheses.

$\boldsymbol{H}_4$*Online teaching self-efficacy can significantly predict instructors' perceived benefits of emergency online learning.*

$\boldsymbol{H}_5$*Gender can significantly predict instructors' perceived benefits of emergency online learning.*

$\boldsymbol{H}_6$*The quality of online learning can significantly predict instructors' perceived benefits of emergency online learning.*

$\boldsymbol{H}_7$*Professional training can significantly predict instructors' perceived benefits of emergency online learning.*

2.5 Intention to future implementation

Most higher education instructors experienced online learning during the sudden COVID-19-induced transition to online teaching. Instructors who have taught online during the pandemic will have a higher potential to implement what they experienced in their future teaching, whether in traditional, online, or blended learning. Therefore, it is crucial to understand instructors' intentions to use online teaching technologies and implement them after their return to campus as well as the factors that could predict such construct. Previous researchers have already studied the construct of behavioral intention, which can be defined as "a measure of the strength of one's intention to perform a specific behavior (Fishbein & Ajzen, 1977, p. 288), and in this case, the intention to use online teaching technologies, systems, and strategies. An extensive number of studies have already explored the factors that can predict users' intention to use through the application of the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1977), Technology Acceptance Model (TAM) (Davis, 1989), and Expectation Confirmation Model (ECM) (Bhattacherjee, 2001). Some of these studies investigated instructors' intention to use online learning technologies, approaches, or teaching strategies. For example, Fathema et al. (2015) applied the TAM model to investigate how faculty members' beliefs and attitudes influence their intention and use of LMSs and found that LMS system quality, perceived self-efficacy, and facilitations conditions were predictors of faculty attitude and intention toward using

LMSs when it is not mandatory to use during their teaching. Nikou (2021) investigated instructors' continuance intention to use videoconferencing systems during the COVID-19 pandemic and found that user satisfaction and perceived usefulness were strong predictors of instructors' continuance intention to use videoconferencing in their teaching. Al-Maroof et al. (2021) found that teachers' perceived technology self-efficacy, technology ease of use, and technology usefulness were directly affecting continuous intention to integrate technology into teaching. Nelson and Hawk (2020) conducted a structural equation modeling study and found that prospective preservice teachers' beliefs about the utility of technology could directly predict their intentions to use technology as well as their intentions to use meaningful learning approaches to technology integration. In addition, they found that field experiences influenced their intention to use technology in their teaching. Other studies investigated university students' continuance intention, such as Dağhan and Akkoyunlu (2016), finding that information quality, system quality, and service quality are predictors of confirmation of the usage of online learning environments and their satisfaction, and satisfaction has a predictive effect on continuance intention to use online learning systems. However, despite the above findings, it is important to investigate the related factors that could be associated with and affect instructors' intention to implement what they have learned during the pandemic, whether it is new digital technology, synchronous and asynchronous online teaching approaches, or assessment and evaluation strategies. Therefore, this study proposes the following hypotheses.

H$_8$*The quality of online learning can significantly predict instructors' intention to implement online teaching strategies and technology tools in their future teaching (traditional, online, or blended learning).*

H$_9$*Professional training can significantly predict instructors' intention to implement online teaching strategies and technology tools in their future teaching (traditional, online, or blended learning).*

2.6 Proposed models

Based on the above hypotheses, this study proposes three research models. First, the study proposes model (1) (hypotheses H_1, H_2, and H_3) to predict instructors' online teaching self-efficacy during the COVID-19-induced transition to online learning. It is important to understand the factors that might affect instructors' online teaching self-efficacy. Other studies have already revealed factors that affect instructors' self-efficacy (Tschannen-Moran et al., 1998; Chang et al., 2011; Mehdinezhad, 2012); however, there is still a need to understand the factors that have specifically affected instructors' online teaching self-efficacy during the COVID-19-induced transition to online learning (Crawford et al., 2020; Hampton et al., 2020; Howard et al., 2021; Dolighan & Owen, 2021; Meccawy et al., 2021; Naik et al., 2021). Drawing on social cognitive theory, teaching self-efficacy refers to the judgement and confidence that instructors hold in their capabilities to execute educational tasks to develop students' knowledge, abilities, and values (Tschannen-Moran et al., 1998). Therefore, identifying the factors that might affect instructors' online teaching self-efficacy would assist our understanding of the forms of assistance and support needed during and after the

pandemic. Further, it would also aid in informing higher education institutions with respect to the critical factors that could cause issues to instructors' online teaching.

Second, the study proposes model (2) (hypotheses H_4, H_5, H_6, and H_7) to predict instructors' perceived benefits of emergency online learning or teaching during the COVID-19 pandemic. The pandemic resulted in a positive consequence of shifting to the online mode of learning, during which most instructors taught online for the first time. Consequently, this resulted in instructors gaining knowledge and competencies in online teaching and online assessment methods (Busuttil & Farrugia, 2020; Eycan & Ulupinar, 2021; Fleck & Garris, 2021; Paudel, 2020). The sudden transition to online learning armed instructors with valuable hands-on experience in this alternative teaching mode. This model, then, predicted the factors that might affect instructors' perceived benefits of emergency online learning or teaching during the pandemic.

Third, the study proposes model (3) (hypotheses $H_8$and H_9) to predict instructors' intention to implement online teaching strategies and learning technology tools—which they experienced while teaching remotely during the COVID-19 pandemic—in their future teaching (traditional, online, or blended learning). This model proposes that instructors who taught online during the pandemic will have a higher potential to implement what they experienced into their future teaching, whether in traditional, online, or blended learning. Instructors experienced new digital technologies and synchronous and asynchronous online teaching approaches, and this model proposes that there are certain factors that might affect their intention to implement what they have experienced into their future teaching (Al-Maroof et al., 2021; Dağhan & Akkoyunlu, 2016; Fathema et al., 2015; Fishbein & Ajzen, 1977; Nelson & Hawk, 2020; Nikou, 2021). Independent variables such as *age*, *gender*, *years of teaching experience*, *affiliated university*, *college*, *previous use of LMSs*, *professional training*, and *quality of online learning* during the pandemic were investigated to predict the outcomes of the above three models.

3 Methods

3.1 Participants

A total of 344 university instructors with different majors, ranks, and teaching experiences participated in a web-based survey, at the beginning of the COVID-19 lockdowns. All participants were recruited from the four largest universities in Saudi Arabia (King Saud University, King Abdulaziz University, Imam Mohammad Ibn Saud Islamic University, and King Fahd University of Petroleum & Minerals) during the transition to online teaching. There were 178 men and 166 women, and most participants were between 31 and 50 years old. The participants were mainly majors in humanities (195, 56.7%), science (107, 31%), medicine and health (27, 7.8%), and others (15, 4.3%). Of the 344 participants, 217 (58%) had more than 10 years of teaching experience at the college or university level, and 273 (79.4%) had used LMSs prior to the transition to online teaching, while 71 (20%) had not. Approximately 248 (72%) of the participants received professional training before and during

this transition, and only 96 (28%) did not receive technical or pedagogical training to teach online. Of those who received online training and support, 83 (33.46%) received training and support before the transition, 67 (27.01%) during the first weeks of the transition, and 98 (39.51%) before and during the transition. Of those who received training and support, 27 (10.88%) trained themselves independently by self-training (e.g., YouTube); 59 (23.79%) enrolled in online live workshops, and approximately 162 (23.79%) received training through both methods. When participants were asked to evaluate the effectiveness of the received training (measured using a five-point Likert scale), almost 84% of those who received training and support believed that the effectiveness was moderate to weak ($M=2.78$, $SD=0.792$) (see Table 1).

3.2 Instrumentation

3.2.1 Demographics

The questionnaire consisted of demographic variables such as affiliated university, gender, age, major, teaching experience, previous use of LMS, received professional training, time of online training and support received, methods of online training and support received, effectiveness of online training received (poor, moderate, good, and excellent), and type of online training (technical or pedagogical).

3.2.2 Online teaching self-efficacy construct

The online teaching self-efficacy construct was developed and validated based on the self-efficacy that emerged from Bandura's social cognitive theory to measure instructors' online teaching self-efficacy during emergencies, such as the sudden COVID-19-induced transition to online learning (Bandura, 1986; Dusick, 1998; Schunk, 1984; Tschannen-Moran et al., 1998). The online teaching self-efficacy construct consisted of 18 items as follow: online course design self-efficacy (4 items), online teaching self-efficacy (7 items), online teaching tools self-efficacy (4 items), online evaluation and assessment self-efficacy (3 items) (see Appendix A). A five-point Likert scale (strongly disagree, disagree, neutral, agree, strongly agree) was administered to measure the construct.

3.2.3 Perceived benefits of emergency online learning construct

The perceived benefits of emergency online learning construct were developed and validated based on the previous studies on this construct and their correlation with other variables such as self-efficacy (DeLone & McLean, 1992, 2003; Torkzadeh & Doll, 1999; Zheng et al., 2018). The construct consisted of 6 items that measure the instructors' perceived benefits of emergency online learning during emergencies such as COVID-19 (see Appendix B). A five-point Likert scale was administered to measure the construct.

Table 1 Demographics of Study Samples

Variable	Sub-variable	Number	Percentage
Affiliated university	KSU	99	28.77%
	KAU	75	21.80%
	IMSIU	89	25.87%
	KFUPM	81	23.54%
Gender	Male	178	52.0%
	Female	166	48.0%
Age	20–30 years old	21	6.0%
	31–40 years old	119	35.0%
	41–50 years old	110	32.0%
	51–60 years old	76	22.0%
	60 and older	18	5.0%
Major	Humanities	195	56.7%
	Science	107	31.0%
	Medicine and Health	27	7.80%
	Others	15	4.30%
Teaching experience	1–5 years	57	16.56%
	6–10 years	70	20.34%
	11–15 years	74	21.51%
	16–20 years	50	14.53%
	21–25 years	39	11.33%
	26–30 years	54	15.69%
Previous use of LMS	Yes	273	79.36%
	No	71	20.64%
Received professional training	Yes	248	72.0%
	No	96	28.0%
Time of online training and support received	Before the transition	83	33.46%
	First weeks of the transition	67	27.01%
	Before and during the transition	98	39.51%
Methods of online training and support received	Independently by self-training (e.g., YouTube)	27	10.88%
	Online live workshops	59	23.79%
	Both methods	162	65.32%
Effectiveness of online training received	Excellent	103	41.53%
	Good	106	42.74%
	Moderate	32	12.50%
	Poor	8	3.22%
Type of online training	Technical training	81	32.66%
	Pedagogical training	48	19.35%
	Both	119	47.98%

3.2.4 Intentions for the future implementation of online teaching strategies Construct

This construct measures instructors' intentions regarding the future implementation of online learning strategies and technology tools, which consisted of 2 items (see Appendix C). A five-point Likert scale was administered to measure the construct.

3.2.5 Quality of online learning

The quality of online learning at the participants' university was measured by one item: "How do you rate quality of online learning at your university during the COVID-19-induced transition to online learning [in terms of policy, infrastructure, practices]?". A five-point rating scale was administered (poor, fair, good, very good, and excellent).

3.2.6 Challenges

One ranking item was administered to measure the challenges faced by instructors to teach remotely during emergencies such as COVID-19. Another ranking item was administered to measure the challenges faced by students to learn remotely "from instructors' perspectives."

3.3 Validity and reliability

This study followed several procedures to conduct validity and reliability of the developed questionnaire. First, the questionnaire was evaluated and piloted by five experts in the field to ensure readability and content validity. The experts were consulted on the revised version of the questionnaire until a consensus was reached on its contents and readability.

Second, exploratory factor analysis (EFA) was conducted to validate the factor structure of online teaching self-efficacy construct, the perceived benefits of online learning for emergency construct, and the instructors' intentions for the future implementation of online teaching technologies and strategies beyond the pandemic period construct (Cronbach, 1951; Meyers et al., 2016). SPSS was used to conduct EFA using exaction as the technique and varimax rotation to achieve construct validity (Meyers et al., 2016). The item cut-off loading was set as 0.40 and an eigenvalue greater than 1 (Cronbach, 1951; Meyers et al., 2016). The EFA analysis demonstrated that the best solution for the instructors' online teaching self-efficacy construct was the four-factor model. After conducting the maximum likelihood extraction and varimax rotation procedures, the model produced the best factor structure for the instructors' online teaching self-efficacy construct with 18 items, with loadings ranging from 0.49 to 0.81, cumulatively accounting for 61.83% of the total variance associated with instructors' online teaching self-efficacy. Based on these findings, the self-efficacy construct was confirmed to consist of four factors. Four items formed the course design self-efficacy factor; seven items formed the online teaching self-efficacy factor; four items formed the online teaching tools self-efficacy factor, and

three items formed the online evaluation and assessment self-efficacy factor. A total of three items were deleted from the construct due to cross-loadings (see Appendix A).

The EFA analysis also showed that the perceived benefits of an online learning construct was a one-factor model, as theorized. The best solution was achieved by conducting exaction as the technique and varimax rotation to achieve construct validity. The model produced six items with loadings ranging from 0.69 to 0.78, cumulatively accounting for 52.28% of the total variance associated with instructors' perceived benefits of online learning during emergencies. The findings confirmed that the construct consists of six items that form instructors' perceived benefits of online learning for emergency constructs (see Appendix B).

The EFA analysis showed that the instructors' intentions for the future implementation of online teaching technologies and strategies beyond the pandemic period construct was a one-factor model, as theorized. The model produced two items with loadings ranging from 0.90 to 0.93, cumulatively accounting for 88% of the total variance associated with instructors' intentions for the future implementation of online teaching technologies and strategies (Cronbach, 1951; Meyers et al., 2016). The findings confirmed that the construct consists of two items that form instructors' intentions for the future implementation of online teaching technologies and strategies beyond the pandemic period constructs (see Appendix C).

Third, Cronbach's alpha was used to determine the internal consistency of the instrument (Cronbach, 1951). The results demonstrated acceptable Cronbach's alphas, as follows: course design self-efficacy ($\alpha=0.901$), online teaching self-efficacy ($\alpha=0.913$), online teaching tools self-efficacy ($\alpha=0.783$), and online evaluation and assessment self-efficacy ($\alpha=0.839$). The Cronbach's alpha for the overall online teaching self-efficacy construct was acceptable ($\alpha=0.947$). Meanwhile, the Cronbach's alpha for the perceived benefits of online learning for emergency construct was acceptable ($\alpha=0.812$). The Cronbach's alpha for the construct of instructors' intentions for the future implementation of online teaching technologies and strategies beyond the pandemic period was also acceptable ($\alpha=0.860$). The reliability of the whole instrument was $\alpha=0.946$, which is considered reliable (an instrument is

Table 2 Cronbach's Alphas of the Measurements

Measurement	Items	Cronbach's Alpha
Overall Online Teaching Self-Efficacy Construct	18	0.947
Factor (1): Self-Efficacy – Online Course Design	4	0.901
Factor (2): Self-Efficacy – Online Teaching	7	0.913
Factor (3): Self-Efficacy – Online Teaching Tools	4	0.783
Factor (4): Self-Efficacy – Online Evaluation & Assessment	3	0.839
Perceived Benefits of Online Learning for Emergency Construct	6	0.812
Intentions for the Future Implementation of Online Teaching Technologies and Strategies Construct	2	0.860
The Overall Instrument	26	0.946

considered reliable when Cronbach's alpha coefficients exceed 0.70; see Meyer et al., 2016 and Table 2).

3.4 Data collection

The developed questionnaire was distributed to instructors who were teaching online as a result of the COVID-19 crisis. On March 7, 2020, all educational institution campuses in Saudi Arabia were closed, and all classes were shifted to online learning. During the fourth week of the lockdown that resulted from the spread of the COVID-19 virus, the questionnaire survey was administered to the targeted sample through e-mail invitations. This process lasted for three weeks, which then yielded 344 participants—a response rate of 7.64%. All instructors from different ranks were invited to participate in the study. Personal information that might permit the identification of participants was not collected.

3.5 Data analysis

Data were analyzed using descriptive analysis for all items. Multiple linear regression analysis, using the stepwise estimation technique with backward elimination, was used to explore the independent variables that might contribute to predicting the dependent variables. Linear regression analysis using the stepwise estimation technique is a mathematical approach to fitting regression models by adding independent variables to predict the model one-by-one (Efroymson, 1960; Hocking, 1976). In this study, using SPSS, each multiple linear regression model was constructed using stepwise estimation technique, in which all possible variables were added to the model, while eliminating $p \geq .2$ variables and adding $p < .1$ variables. To construct the final regression models, the test statistics of the coefficients were measured and used to decide whether to add or eliminate each variable in the model. All demographic variables were used as independent variables in this study (*age, gender, years of teaching experience, affiliated university, college, previous use of LMSs, and professional training*) to predict each model. Finally, all statistical methods for testing multiple linear regression assumptions were conducted and reported (Efroymson, 1960; Hocking, 1976).

4 Results

4.1 Multiple regression analysis

RQ1: What factors predict online teaching self-efficacy in a sudden transition to online learning such as that caused by the COVID-19 pandemic?

A multiple regression model was run to predict instructors' online teaching self-efficacy during the COVID-19-induced transition to online learning. The model analysis started with stepwise regression using backward elimination, eliminating $p \geq .2$ variables and adding $p < .1$ variables. Independent variables such as *age (Ag), gender (Gn), years of teaching experience (Yx), affiliated university (Au), college (Co), pre-*

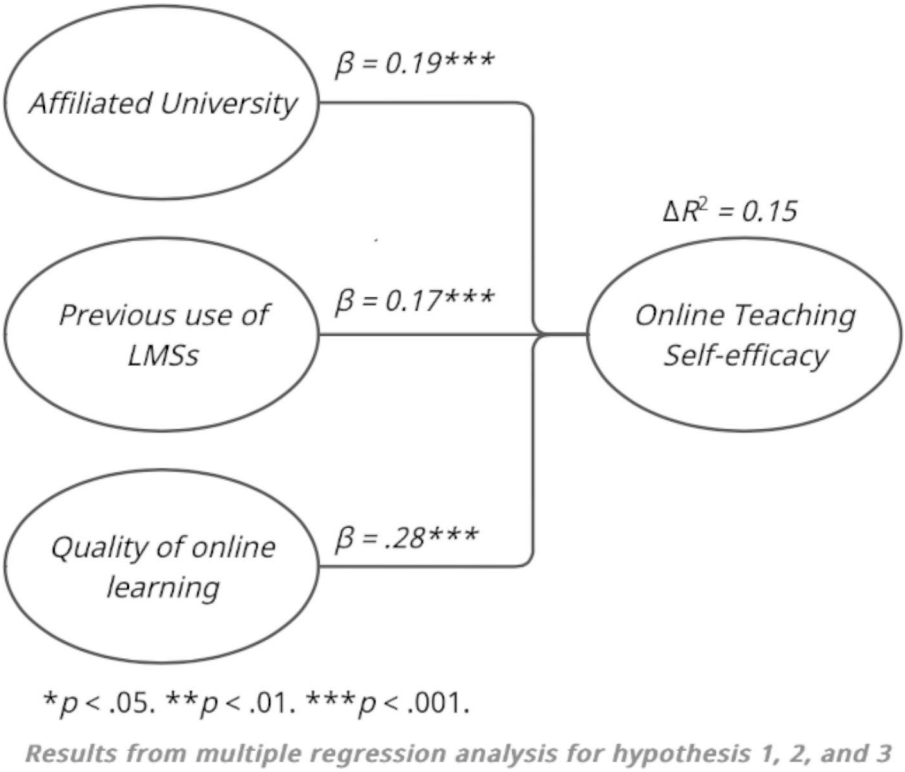

Fig. 1 Multiple Regression Results for Instructors' Online Teaching Self-efficacy

vious use of LMSs (Pu), professional training (PT), and quality of online learning (QL) were inputted in the model as predictors, and instructors' online teaching self-efficacy (SE) was inputted as the dependent variable. Linearity was assessed using a plot of studentized residuals against the predicted values and partial regression plots. The Durbin–Watson statistic was used with a score of 1.849, which indicated that residuals were independent. A plot of studentized residuals versus unstandardized predicted values was inspected visually to measure homoscedasticity. The model did not show tolerance values greater than 0.1, which confirmed that it has no multicollinearity cases. The studentized deleted residuals indicator presented no values

Table 3 Regression Results of the Affiliated University, Previous Use of LMSs, and Quality of Online Learning on Instructors' Online Teaching Self-efficacy

Model		Sum of Squares	*df*	Mean Square	*F*	Sig.
1	Regression	3	3	7.299	20.884	.000[b]
	Residual	340	340	0.349		
	Total	343	343			

Note. Dependent variable: Online teaching self-efficacy. Predictors: (Constant), affiliated university, previous use of learning management systems, and quality of online learning

Table 4 Multiple Regression Results for Instructors' Online Teaching Self-efficacy

Variables	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	LU				
Model						0.16	0.15
Constant	2.815	2.462	3.169	0.178			
University	0.096***	0.045	0.146	0.026	0.19***		
Previous use of LMSs	0.266***	0.108	0.423	0.079	0.17***		
Quality of online learning	0.359***	0.233	0.486	0.064	0.28***		

Note. Model = "Enter" methods in SPSS Statistics; *B* refers to unstandardized regression coefficients; CI=confidence interval; LL=lower limit; UL=upper limit; *SE B*=standard error of the coefficient; β=standardized coefficients; R^2=coefficient of determination; ΔR^2=adjusted R^2

*$p<.05$. **$p<.01$. ***$p<.001$.

greater than ±3 standard deviations, no leverage scores greater than 0.2, and Cook's distance values were above 1. Finally, normality was assessed by a Q–Q plot and the assumption was met. The model statistically significantly predicted the instructors' online teaching self-efficacy: $F(3, 340)=20.884$, $p<.00$, and adjusted $R^2=0.15$. *Affiliated university*, *previous use of LMSs*, and the *quality of online learning* were the three independent variables that were added statistically significant to the prediction ($p<.00$), and all other independent variables were eliminated from the model as they were not significant at the cutoff point $p<.05$. Therefore, hypotheses H_1, H_2, and $H_3$are accepted (see Figure 1). Finally, a multiple regression model (Model 1) was constructed as Eq. 1. The regression coefficients and standard errors are shown in Tables 3 and 4.

Equation 1: $\widehat{Y}_i = \widehat{\beta}_0 + \widehat{\beta}_1\widehat{X}_{i1} + \widehat{\beta}_2\widehat{X}_{i2} + \widehat{\beta}_3\widehat{X}_{i3}$where, for i=1,2,3 observations:

$\widehat{Y}_i$ = the expected dependent variable (*Online Teaching Self-efficacy*).

$\widehat{\beta}_0$ = the constant, which represents the value that would be predicted for the dependent variable if all the independent variables were simultaneously equal to zero.

$\widehat{X}_{i1}$= *Affiliated University*, $\widehat{X}_{i2}$= *Previous Use of LMSs*, $\widehat{X}_{i3}$= *Quality of Online Learning*,

$\widehat{\beta}_i$ the slope of each of the independent variables respectively.

RQ2: What factors determine instructors' perceived benefits of online learning during emergencies?

A multiple regression model was conducted to identify the predictors of instructors' perceived benefits of emergency online learning or teaching during the COVID-19 pandemic. The model analysis started with stepwise regression using backward elimination, eliminating $p\geq.2$ variables and adding $p<.1$ variables. Independent variables such as *age (Ag), gender (Gn), years of teaching experience (Yx), affiliated university (Au), college (Co), previous use of LMSs (Pu), professional training (PT), quality of online learning (QL), and online teaching self-efficacy (SE)* were all inputted in the model to predict the instructors' perceived benefits (PB) of emergency online learning or teaching during the COVID-19 pandemic. Linearity was assessed using a plot of studentized residuals against the predicted values and partial regression plots. The Durbin–Watson statistic was used with a score of 2.001, which indicated that residuals were independent. A plot of studentized residuals versus unstandardized predicted values were inspected visually to measure homoscedasticity. The model did not show tolerance values greater than 0.1, which confirmed that

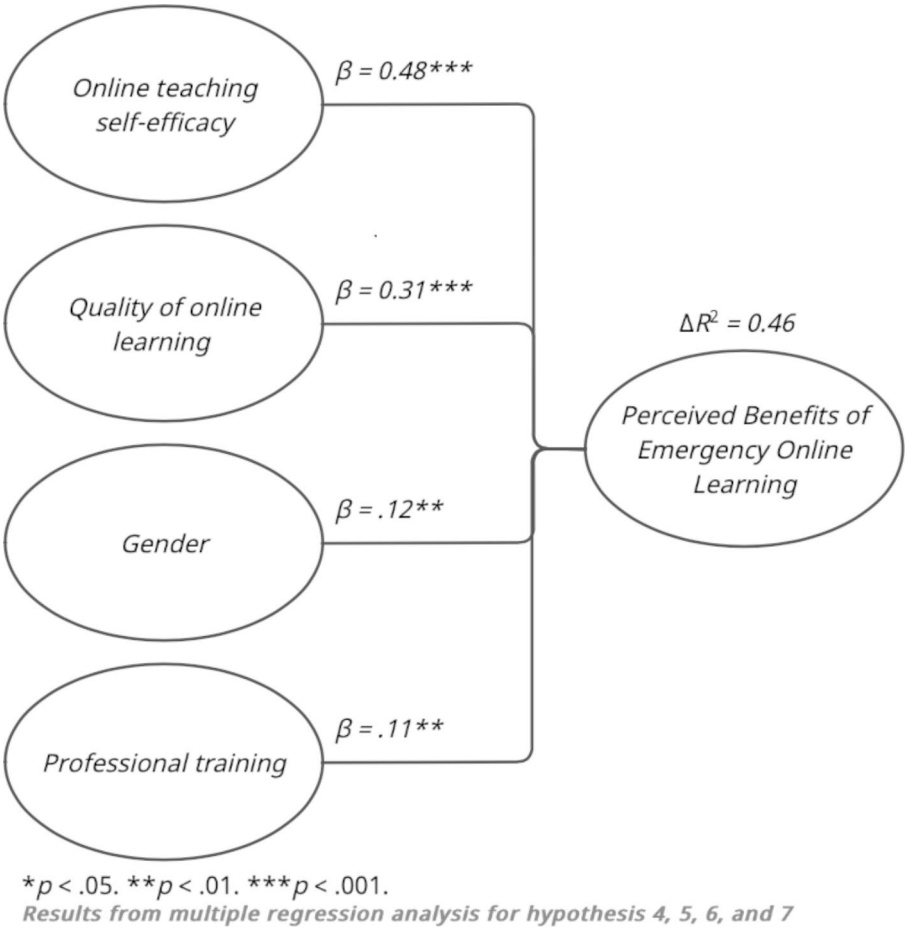

Fig. 2 Multiple Regression Results for the Perceived Benefits of Emergency Online Learning

the model has no multicollinearity cases. The studentized deleted residuals indicator did not present values greater than ±3 standard deviations, or leverage scores greater than 0.2, while Cook's distance values were above 1. Finally, normality was assessed by a Q–Q plot and the assumption was met. The model statistically significantly

Table 5 Regression Results of Online Teaching Self-efficacy, Gender, Quality of Online Learning, and Remote Teaching Training on the Perceived Benefits of Emergency Online Learning

Model		Sum of Squares	*df*	Mean Square	*F*	Sig.
1	Regression	84.753	4	21.188	73.406	.000[b]
	Residual	97.851	339	0.289		
	Total	182.603	343			

Note. Dependent variable: perceived benefits of emergency online learning. Predictors: (Constant), online teaching self-efficacy, gender, quality of online learning, and professional training

Table 6 Multiple Regression Results for the Perceived Benefits of Emergency Online Learning

Variables	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	LU				
Model						0.46	0.46
Constant	0.424	−0.024-	0.872	0.228			
Online teaching self-efficacy	0.547	0.454	0.640	0.047	0.48***		
Quality of online learning	0.458	0.337	0.580	0.062	0.31***		
Gender	0.169	0.053	0.285	0.059	0.12**		
Professional training	0.184	0.054	0.314	0.066	0.11**		

Note. Model = "Enter" methods in SPSS Statistics; *B* refers to unstandardized regression coefficients; CI=confidence interval; LL=lower limit; UL=upper limit; *SE B*=standard error of the coefficient; β=standardized coefficients; R^2=coefficient of determination; ΔR^2=adjusted R^2

*$p<.05$. **$p<.01$. ***$p<.001$.

predicted the instructors' perceived benefits of emergency online learning during the COVID-19 pandemic: $F(4, 339)=73.406$, $p<.000$, and adjusted $R^2=0.46$. Four independent variables (*online teaching self-efficacy*, *gender*, *quality of online learning*, and *professional training*) were added statistically significant to the prediction ($p<.00$), and all other independent variables were eliminated from the model as they were not significant at the cutoff point $p<.05$. Therefore, hypotheses H_4, H_5, H_6, and H_7 are accepted (see Figure 2). Finally, a multiple regression model (Model 2) was constructed as Eq. 2. The regression coefficients and standard errors are shown in Tables 5 and 6.

Equation 2: $\widehat{Y}_i = \widehat{\beta}_0 + \widehat{\beta}_1\widehat{X}_{i1} + \widehat{\beta}_2\widehat{X}_{i2} + \widehat{\beta}_3\widehat{X}_{i3} + \widehat{\beta}_4\widehat{X}_{i4}$where, for i=1, 2, 3, 4 observations:

$\widehat{Y}_i$= the expected dependent variable (*Perceived Benefits of Emergency Online Learning*).

$\widehat{\beta}_0$ = the constant, which represents the value that would be predicted for the dependent variable if all the independent variables were simultaneously equal to zero.

$\widehat{X}_{i1}$= *Online Teaching Self-Efficacy*, $\widehat{X}_{i2}$= *Quality of Online Learning*, $\widehat{X}_{i3}$= *Gender*, $\widehat{X}_{i4}$= *Professional Training*.

$\widehat{\beta}_i$ the slope of each of the independent variables respectively.

RQ3: What factors predict instructors' intentions for the future implementation of online teaching technologies and strategies beyond the pandemic period?

The descriptive statistics reveal that the participants ranked direct teaching and synchronous communication (virtual classroom) as the most used remote teaching strategy (299, 86.9%), followed by PowerPoint presentation (PPT) through virtual classroom (260, 75.5%), online assignments (245, 66.95), learning based on online quizzes and exams (207, 60%), discussion forums (139, 40%), and recorded lectures (126, 36.6%). The use of whiteboard in virtual classrooms was the least used strategy (107, 31%).

Multiple regression analysis was conducted to identify the factors that might predict instructors' intention to implement online teaching strategies and learning technology tools—that they experienced while teaching remotely during the COVID-19 pandemic—in their future teaching (traditional, online, or blended learning). The model analysis started with stepwise regression using backward elimination, eliminating $p\geq.2$ variables and adding $p<.1$ variables. Independent variables such as *age*

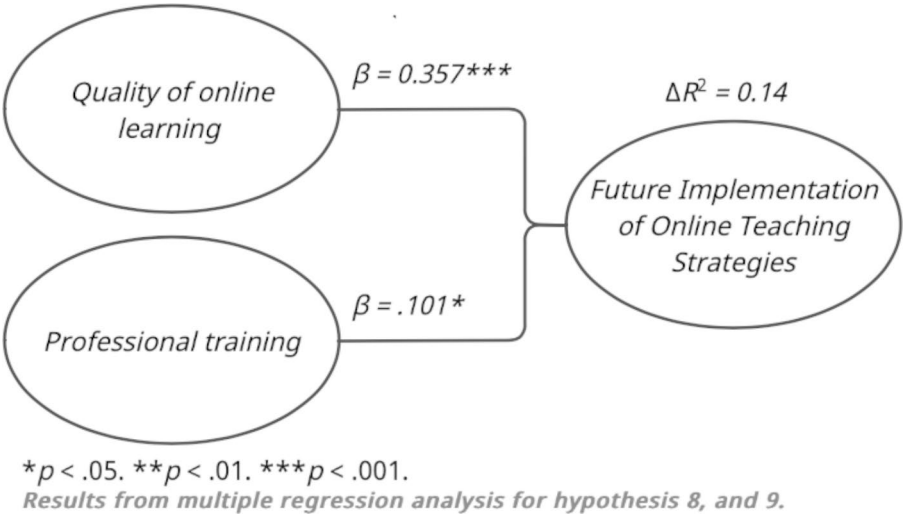

Fig. 3 Multiple Regressions Predicting the Future Implementation of Online Teaching Strategies

Table 7 Regression Results of Quality of Online Learning and Professional Training on Future Implementation of Online Teaching Strategies

Model		Sum of Squares	*df*	Mean Square	*F*	Sig.
1	Regression	44.862	2	22.431	29.942	.000[b]
	Residual	255.463	341	0.749		
	Total	300.326	343			

Note. Dependent variable: Future implementation of online teaching strategies. Predictors: (Constant), quality of online learning and remote teaching training

(Ag), gender (Gn), years of teaching experience (Yx), affiliated university (Au), college (Co), previous use of LMSs (Pu), professional training (PT), quality of online learning (QL), and online teaching self-efficacy (SE) were all inputted in the model to predict instructors' future implementation (FI) of online teaching strategies. Linearity was assessed using a plot of studentized residuals against the predicted values and

Table 8 Multiple Regressions Predicting the Future Implementation of Online Teaching Strategies

Variables	*B*	95% CI for *B*		*SE B*	β	R^2	ΔR^2
		LL	LU				
Model						0.15	0.14
Constant	2.662	2.229	3.094	0.220			
Quality of online learning	0.673	0.485	0.860	0.095	0.357***		
Professional training	0.210	0.003	0.416	0.105	0.101*		

Note. Model = "Enter" methods in SPSS Statistics; *B* refers to unstandardized regression coefficients; CI = confidence interval; LL = lower limit; UL = upper limit; *SE B* = standard error of the coefficient; β = standardized coefficients; R^2 = coefficient of determination; ΔR^2 = adjusted R^2

*$p < .05$. **$p < .01$. ***$p < .001$.

partial regression plots. The Durbin–Watson statistic was used with a score of 1.914, which indicates that residuals were independent. A plot of studentized residuals versus unstandardized predicted values were inspected visually to measure homoscedasticity. The model did not show tolerance values greater than 0.1, which confirms that the model has no multicollinearity cases. The studentized deleted residuals indicator did not present values greater than ±3 standard deviations, or leverage scores greater than 0.2, while Cook's distance values were above 1. Finally, normality was assessed by a Q–Q plot to meet the assumption. The model statistically significantly predicted the instructors' intention to implement online teaching strategies and learning technology tools in their future teaching (traditional, online, or blended learning): $F(2, 341)=29.942$, $p<.00$, adjusted $R^2=0.14$. Only two independent variables (*quality of online learning* and *professional training*) were added statistically significant to the prediction ($p<.00$), and all other independent variables were eliminated from the model as they were not significant at the cutoff point $p<.05$. Therefore, hypotheses H_8 and H_9 are accepted (see Figure 3). Finally, a multiple regression model (Model 3) was constructed as Eq. 3. The regression coefficients and standard errors are shown in Tables 7 and 8.

Equation 3: $\widehat{Y}_i = \widehat{\beta}_0 + \widehat{\beta}_1\widehat{X}_{i1} + \widehat{\beta}_2\widehat{X}_{i2}$ where, for i = 1, 2, observations:

$\widehat{Y}_i$ = the expected dependent variable (*Future Implementation of Online Teaching*).

$\widehat{\beta}_0$ = the constant, which represents the value that would be predicted for the dependent variable if all the independent variables were simultaneously equal to zero.

$\widehat{X}_{i1}$ = *Quality of Online Learning*, $\widehat{X}_{i2}$ = *Professional Training*.

$\widehat{\beta}_i$ the slope of each of the independent variables respectively.

4.2 Analysis of challenges

RQ4: What are the challenges encountered by instructors in the transition to online teaching during emergencies?

4.2.1 Instructor-related challenges

This study examined the challenges encountered by college instructors when transitioning to online learning as a result of crises and emergencies. During the transition to online learning, the variable *remote assessment* was the biggest challenge encountered by college instructors (188, 54.7%), followed by *communication with students*

Table 9 Statistical Frequencies of the Challenges Encountered by Instructors during the Sudden Transition to Online Learning

Challenges	Mode	Percentage	Rank
Remote assessment	188	54.7%	1
Communication with students	130	37.8%	2
Designing and developing online courses	115	33%	3
Instructional technology technical issues	103	29.9%	4
Create and manage virtual classrooms	77	22.4%	5
Did not find appropriate support and training from my university	41	11%	6

(130, 37.8%), *designing and developing online courses* (115, 33%), and *technical issues* related to instructional technology (103, 29.9%) (see Table 9).

4.2.2 Student-related challenges

The study also examined the challenges faced by students while transitioning to online learning, from their instructors' perspectives. The majority of instructors who participated in this study ranked the lack of internet or internet speed as the first and most complicated hindrance for students during the sudden transition to online learning (288, 83.7%). This was followed by the inadequate home environment attributable to the students' social and economic status (185, 53.8%), students' lack of devices (computer, iPad, and phones; 175, 50.9%), students' motivation to study online (152, 44%), and students' lack of training in the use of educational technology (138, 40%). The least ranked challenge was students' willingness to study online (92, 26.7%) (see Table 10).

Table 10 Statistical Frequencies of the Challenges Faced by Students during the Transition to Online Learning (From Their Instructors' Perspectives)

Challenges	Mode	Percentage	Rank
Lack of internet or internet speed was a hindrance for many students during the sudden transition to online learning	288	83.7%	1
Inadequate home environment attributable to the students' social and economic status	185	53.8%	2
Students' lack of devices (computer, iPad, and phones)	175	50.9%	3
Students' motivation to study online	152	44.2%	4
Students' lack of training in the use of educational technology	138	40.1%	5
Students' willingness to study online	92	26.7%	6

5 Discussion

5.1 Model 1: factors that predict online teaching self-efficacy in the sudden transition to online learning

The multiple linear regression results demonstrated that instructors' online teaching self-efficacy was significantly impacted by the *affiliated universities*, *previous use of LMSs*, and *quality of online learning*. The *affiliated university* was a significant predictor in this model, which indicates that instructors' online teaching self-efficacy deferred from one university to another. This result is understandable as universities differ in their professional training and organizational support, which affects online teaching self-efficacy (Horvitz et al., 2015; Kelm & Mclntosh, 2012; Richter & Idleman, 2017). The significant difference in the participants' level of online teaching self-efficacy from different universities shows the necessity to prepare instructors

and provide high quality training to increase their online teaching self-efficacy. The second predictor was *previous use of LMSs*. Instructors who reported greater use of LMSs in the past had a higher level of self-efficacy than those who reported less usage of LMSs. This result means that those who experienced LMSs before the pandemic had a positive feeling of their own ability to perform and manage online teaching during the transition to online learning, which is similar to previous studies' results (Culp-Roche et al., 2021; Dolighan & Owen, 2021). The third predictor in this model was *quality of online learning*, indicating that those who experienced better quality of online learning at their university perceived higher self-efficacy in teaching online during the transition to remote teaching. Instructors who gave a lower rating for the quality of online learning at their university perceived lower self-efficacy in teaching online. This finding raises a flag for universities to improve the quality of online learning (in terms of policy, infrastructure, practices, etc.) as it not only affects students' learning, but also instructors' teaching practices (Adedoyin & Soykan, 2020; Coman et al., 2020; Crawford et al., 2020; Guangul et al., 2020; Meccawy et al., 2021; Paudel, 2020; Qu, 2020). This model and its findings reveal the significant factors of online teaching self-efficacy. The model also suggests the importance of improving the quality of online learning, provide professional training focusing on technology-related and pedagogical competencies (Coman et al., 2020; Jung et al., 2021; Walsh et al., 2021), and organizational support (including intensive technical support) to increase instructors' online teaching self-efficacy (Chiasson et al., 2015; Hampton et al., 2020; Horvitz et al., 2015; Robinia & Anderson, 2010; Walsh et al., 2021; Zheng et al., 2018) as well as preparing instructors to be ready for any future transitioning to online learning or blended form of learning.

5.2 Model 2: factors that predict instructors' perceived benefits of online learning

The multiple linear regression results showed that *online teaching self-efficacy* was a significant predictor of instructors' perceived benefits of online learning or teaching during emergencies. *Online teaching self-efficacy* was entered into the model as an independent variable to predict participants' perceived benefits of online learning or teaching during emergencies. The results showed that online teaching self-efficacy was a statistically significant predictor. Instructors who reported higher online teaching self-efficacy had higher positive perceptions of the benefits of online learning during emergencies such as the sudden transition cause by COVID-19. In other words, instructors' sense of efficacy can predict their perception of online teaching effectiveness, which signifies a positive association between instructors' online teaching self-efficacy and their attitude toward the usefulness of online learning or teaching during emergencies. Thus, instructors' online teaching self-efficacy can serve as a key predictor for online teaching, and supporting such a factor can ensure better results for higher education institutions. This is also similar to the findings of previous studies (Yeşilyurt et al., 2016; Zheng et al., 2018) that the teacher self-efficacy, academic self-efficacy, and CSE can significantly predict teachers' attitudes and perceived benefits toward the use of online learning technologies and strategies in their teaching.

The second predictor in this model, the *quality of online learning*, significantly predicted instructors' positive perceptions of the benefits of online learning or teaching during emergencies. Instructors who experienced better quality of online learning at their university reported higher positive perceptions of the benefits of online teaching or learning during emergencies. This result aligns with the findings of previous research on the quality of online learning, which emphasizes the professors' concern about the quality of online learning (Crawford et al., 2020; Horvitz et al., 2015; Qu, 2020; Shea, 2007).

Gender was also a significant predictor in this model, indicating that female instructors had a higher perception and better impression of the benefits of online learning or teaching during emergencies. Demographic factors, such as gender, may also influence instructors' online teaching self-efficacy and relate to their attitudes and perceptions of online learning or teaching benefits. Some studies have found gender to be a predictor of the attitude toward online learning (Horvitz et al., 2015). Others found that female instructors are more amenable to online learning or teaching than male instructors (Shea, 2007).

Professional training was found to be a statistically significant predictor. Specifically, instructors who received technological and pedagogical online teaching training at the beginning of the transition to remote teaching reported higher positive perceptions of the benefits of online learning or teaching during emergencies. This is similar to the findings of Horvitz et al. (2015) and Coman et al. (2020) that organizational support and professional training should address instructors' technical concerns when teaching online.

This model fills the literature gap by identifying the factors that predict instructors' positive perception of the benefits of online learning and teaching for emergencies (Busuttil & Farrugia, 2020; DeLone & McLean, 1992, 2003; Eycan & Ulupinar, 2021; Fleck & Garris, 2021; Mouakket & Bettayed, 2015; Paudel, 2020; Torkzadeh & Doll 1999; Zheng et al., 2018). The model revealed four significant factors (*online teaching self-efficacy, quality of online learning, gender and professional training*) that directly affect instructors' perceptions of the usefulness of online learning for emergencies, which affect the success of online teaching. Identifying these factors provides knowledge on the factors that should be addressed by the universities when transitioning to online learning as a solution for emergencies, and how to provide support for such factors. University administrative should be mindful of these factors as what instructors perceive (positively or negatively) will determine their online teaching practices. For example, improving quality of online learning (in terms of policy, infrastructure, practices, etc.; Dagiene et al., 2022) will increase instructors' positive perception of online learning.

5.3 Model 3: instructors' intentions for the future implementation of online teaching technologies and strategies

Instructors' intention to use has been defined and studied in the literature (Fishbein & Ajzen, 1977), and has been investigated in the field of online learning (Al-Maroof et al., 2021; Dağhan & Akkoyunlu, 2016; Fathema et al., 2015; Nelson & Hawk, 2020; Nikou, 2021). Instructors who participated in this study engaged in online teach-

ing in emergency situations specifically caused by the COVID-19 pandemic, which allowed them to experience teaching in an online learning environment. Does a sudden transition to online learning impact instructors' attitudes and intention to implement the technological and pedagogical aspects they learned while teaching online? Can instructors benefit from this experience in terms of online learning strategies and familiarization with technology tools to improve the learning process at the higher education level? To answer these questions, a multiple linear regression analysis was performed. The results demonstrated that *the quality of online learning* was a significant predictor of instructors' intention to implement online teaching strategies in future teaching (face-to-face, online learning, or blended learning. The results of this study as well as other previous studies emphasize the concerns of faculty members regarding the quality of online learning (Dağhan & Akkoyunlu, 2016) as many universities transitioned to online learning during and after the COVID-19 pandemic (Crawford et al., 2020; Dagiene et al., 2022; Qu, 2020). *Professional training* was the second most significant factor that impacted instructors' intention to implement online teaching strategies. This is similar to the findings of Sims and Baker (2021), which indicate that university training and technical support can affect the success of online learning. The results of this study imply that when higher education institutions ensure the quality of online learning and provide better professional training, instructors are likely to incorporate what they learned from the transition into their future teaching. Further research is needed to observe instructors' teaching practices and how they benefited from what they learned during the COVID-19-induced transition to online learning.

5.4 Challenges

The descriptive statistics results indicate that higher education institutions need to remove the barriers that might prevent instructors from achieving better online teaching quality, such as *remote assessment*, *communication with students*, and the *technical issues of instructional technology*. Professional development and organizational support should specifically address the challenges identified in this study, as these challenges will continue to affect instructors' online teaching self-efficacy when transitioning to online or blended learning (Adedoyin & Soykan, 2020).

This study found that *remote assessment* was the most challenging factor for instructors. The instructors in this study encountered challenges with the methods, policies, and technology infrastructure in their affiliated universities concerning the provision of valid online assessments. Previous studies had similar findings (Dagiene et al., 2022; Dietrich et al., 2020; Guangul et al., 2020), which indicate that higher education institutions need to solve such challenges. Instructors, especially those experiencing online teaching for the first time, feared that remote assessment would not be valid compared with face-to-face evaluation. While there are well-developed strategies and approaches for online assessment and evaluation, many universities in Saudi Arabia and other countries faced this challenge of ensuring effective assessment strategies at the beginning of the transition to online learning.

For instructors, communication with students was the second most challenging aspect of the sudden transition to online teaching. Instructors had difficulty applying

the methods or tools necessary to establish effective communication with students. This result is particularly relevant to instructors who teach online for the first time and do not have the required skills to use online communication tools effectively. It suggests that higher education institutions must provide support to instructors in the communication aspect of online learning to maintain an appropriate level of online learning quality.

Designing and developing online courses ranked third among the challenges encountered in this study. This is understandable, as many instructors in Saudi Arabia have not taught online, and the transition was sudden. It is recommended that higher education institutions invest in ICT and instructor training on instructional design, and provide support by engaging professional instructional designers to assist in the design and teaching of online courses. Many universities in Saudi Arabia and other countries are starting to transition several courses to online and blended learning modes. This requires designing appropriate courses for each type of learning format and training instructors so that they can design and teach such courses.

Instructors ranked the lack of internet or internet speed as the first and most complicated challenge for students during the sudden transition to online learning. Higher education institutions and instructors may investigate this challenge and provide support as needed. The issues of internet access is not surprising, as this was commonly reported worldwide, and many students had similar issues (Eberle & Hobrecht, 2021; Paudel, 2020). Generally, instructors reported several challenges that might prevent or hinder students from learning (Culp-Roche et al., 2021; Eberle & Hobrecht, 2021). As many educational institutions are tending toward online and blended learning, it is necessary to investigate this matter further and provide solutions to ensure better learning outcomes. Instructors also reported that students lacked motivation and engagement, as has been found by other studies as well (Culp-Roche et al., 2021), and this should be considered in future research to understand how to motivate and engage students when teaching remotely.

6 Theoretical and practical implications

6.1 Theoretical implications

While other studies investigated students' self-efficacy or K-12 teachers' self-efficacy during the sudden, COVID-19-induced transition to online teaching (Punjani & Mahadevan, 2022; Cardullo et al., 2021), this study investigated instructors' online teaching self-efficacy during the pandemic. Therefore, based on social cognitive theory (Bandura, 1986), this study provides a theoretical basis that instructors' online teaching self-efficacy is affected by several factors, such as affiliated universities, previous use of LMSs, and the quality of online learning. Further, this study contributes to the academic body of knowledge by investigating instructors' perceived benefits (DeLone & McLean, 1992, 2003; Torkzadeh & Doll, 1999) of online learning for emergencies (Eycan & Ulupinar, 2021; Fleck & Garris, 2021), and the results indicated several factors that might predict their perception of the benefits of online learning during the sudden, COVID-19-induced transition to online

teaching. The results contribute to the literature by revealing that instructors' online teaching self-efficacy was a significant predictor of instructors' perceived benefits of online learning for emergencies, along with gender, the quality of online learning, and professional training. Thus, instructors' online teaching self-efficacy can affect several factors and can concurrently be affected by other factors. In addition, this study contributes to the literature by revealing the factors that might predict instructors' intention (Fishbein & Ajzen, 1977) to implement online teaching strategies and learning technology tools—which they experienced while teaching remotely during the COVID-19 pandemic—in their future teaching (traditional, online, or blended learning). This study theorizes that if instructors are provided with professional training and conducted online teaching in high quality online learning, they will have the intention to implement better online teaching strategies and technology tools into their future teaching.

6.2 Practical implications

The study's results lead to practical implications for higher education institutions and instructors. First, the study shows that the quality of online learning plays a major role in instructors' teaching performance and their feelings of their ability to conduct better online teaching. Investing in online learning infrastructure and improving online learning policies will increase the quality of online learning, which will affect instructors' sense of efficacy and their ability to conduct high-quality online teaching. Second, this study emphasizes that teaching self-efficacy can directly impact instructors' teaching quality, and universities should pay attention to such a factor to ensure the quality of online learning. Third, online learning professional training played a significant role in instructors' perceptions of online learning for emergencies; instructors who had better professional training had positive perceptions of online learning for emergencies. Therefore, universities should invest in providing high-quality professional training for instructors in instructional design and online teaching to design, develop, and teach online courses. Fourth, higher education instructors should be involved in continuous professional development to obtain the needed skills and competencies to teach online. Fifth, the sudden transition to online learning has caused several challenges (such as *remote assessment*, *communication with students*, and the *technical issues of instructional technology*) that has also led to critical issues during the pandemic. Overcoming these challenges is a must as they will continue to be challenging in the future of online learning in Saudi Arabia as well as many other countries. For example, remote assessment is still considered challenging, which led many universities to conduct assessments within their campuses during the pandemic, as they faced critical issue with policies and assessment technology tools.

7 Conclusion

As the transition from face-to-face teaching owing to the COVID-19 pandemic occurred suddenly, universities were not prepared to transition to a fully online learning format. The rapid transition affected instructors' online teaching self-efficacy and their ability to deliver quality online learning, as they had not received organizational support and professional training prior to the pandemic. The results show that the affiliated university, quality of online learning, and previous use of LMSs were significant predictors of instructors' online teaching self-efficacy. Online teaching self-efficacy, gender, quality of online learning, and professional training were significant predictors of the perceived benefits of online learning or teaching during emergencies. This finding emphasizes the need for instructors' ongoing professional development in remote teaching and online learning tools and systems. The findings also emphasize that universities need to improve the quality of online learning, as it directly affects instructors' online teaching self-efficacy. Further research is needed to understand the relationship between the quality of online learning at higher education institutions and instructors' online teaching self-efficacy, as well as the sub-factors of quality of online learning that affect instructors' online teaching self-efficacy.

As instructors practiced online teaching during the pandemic, this study measured their intention to implement what they learned about online teaching in their future teaching. The results suggest that the quality of online learning and professional training determine instructors' intention to implement what they learned in their future teaching. Instructors who taught in a higher quality online learning environment and received professional training have the potential to implement what they experienced in their future teaching. This finding suggests that higher education institutions should improve online learning infrastructures, policies, and practices and provide professional training and support to ensure the future implementation of online teaching strategies in their institutions. Further research is needed to explore more factors that might predict future implementation of online teaching and learning strategies and that are associated with online learning instructors' self-efficacy.

This study identified several challenges and barriers (e.g., *remote assessment*) that might complicate instructors' online teaching self-efficacy and prevent them from providing better online teaching and learning. Students also experienced several challenges (e.g., internet connection or internet speed). It is recommended that higher education institutions investigate the aforementioned challenges and provide the needed support to achieve better remote teaching outcomes, whether for emergencies, or even when activating online learning and blended learning.

8 Limitations

The first limitation of this study was that it was conducted with a non-probabilistic sample from only the four largest universities in Saudi Arabia; hence, the results are difficult to generalize for all universities, especially for smaller ones. The four universities had previous experiences with online learning, both technologically and pedagogically, and this could be a factor differentiating them from other smaller uni-

versities. Second, this study was conducted with participants from Saudi Arabia only; results should therefore be interpreted with caution as other factors (such as culture) could have influenced them. In addition, this study identified several predictors for each model, and it is assumed that instructors' online teaching self-efficacy, perceived benefits of online learning, and future implementation of online learning and teaching strategies can be affected by factors beyond the scope of this study. Finally, as this study found that improving the quality of online learning would increase the instructors' online teaching self-efficacy, positive perception of online learning, and future implementation of online learning and teaching strategies and approaches, experimental and longitudinal studies should be conducted to further investigate the identified factors after improving the quality of online learning. Conducting longitudinal studies could be useful in tracking instructors' adoption of online learning and teaching strategies and approaches post-pandemic.

Appendix A

Exploratory Factor Analysis of online Teaching Self-Efficacy Construct.

Items	Factor Loadings				Original Construct
	Factor 1	Factor 2	Factor 3	Factor 4	
1. Design online course	0.812				Course design self-efficacy
2. Create online course introduction and learning methods/strategies	0.789				Course design self-efficacy
3. Identify effective online course teaching method/strategy	0.672				Course design self-efficacy
4. Organize units and lessons within the online course	0.733				Course design self-efficacy
Factor 1 Reliability	0.901				
5. Use different types of online teaching strategies		0.565			Online teaching self-efficacy
6. Communicate with students synchronously and asynchronously		0.536			Online teaching self-efficacy
7. Deal with online teaching issues and challenges		0.644			Online teaching self-efficacy
8. Redesign of learning activities to online learning activities		0.693			Online teaching self-efficacy
9. Design of online learning activities to improve students' online interaction.		0.721			Online teaching self-efficacy
10. Share and post online learning activities properly.		0.831			Online teaching self-efficacy
11. Manage online learning activities when teaching online.		0.77			Online teaching self-efficacy
Factor 2 Reliability	0.913				
12. Create educational videos to support students online learning (e.g., lecture recording)			0.703		Online teaching tools self-efficacy

Items	Factor Loadings				Original Construct
	Factor 1	Factor 2	Factor 3	Factor 4	
13. Use easy and free online tools that may support my remote teaching			0.681		Online teaching tools self-efficacy
14. Learn new online teaching tools independently			0.516		Online teaching tools self-efficacy
15. Deal with online teaching technical issues and challenges			0.564		Online teaching tools self-efficacy
Factor 3 Reliability	0.783				
16. Design online assessment and evaluation				0.636	Online evaluation and assessment self-efficacy
17. Manage online exams and quizzes				0.787	Online evaluation and assessment self-efficacy
18. Provide effective feedback remotely				0.716	Online evaluation and assessment self-efficacy
Factor 4 Reliability	0.839				

Appendix B

Exploratory Factor Analysis of Perceived Benefits of Online Learning for Emergencies Construct.

Items	Loadings	Original Construct
1. Rescued the learning process during the pandemic	0.697	Perceived benefits of online learning for emergencies
2. Transformed the learning process to be student-centered learning process	0.702	Perceived benefits of online learning for emergencies
3. Helped to improve overall education quality in my institute.	0.781	Perceived benefits of online learning for emergencies
4. I learned online teaching skills and competencies	0.741	Perceived benefits of online learning for emergencies
5. It was an opportunity to learn instructional technology skills and competencies	0.722	Perceived benefits of online learning for emergencies
6. It was an easy transition to online learning during the pandemic	0.692	Perceived benefits of online learning for emergencies
Factor Reliability	0.812	

Appendix C

Exploratory factor analysis of instructors' intentions for the future implementation of online teaching technologies and strategies beyond the pandemic period construct.

Items	Loadings	Original Construct
1. Encouraged me to think about building my online course even after the pandemic ends and students return to campus.	0.90	Instructors' intentions for the future implementation of online teaching technologies and strategies

Items	Loadings	Original Construct
2. Encouraged me to think about implementing online learning strategies to design better blended learning environments.	0.93	Instructors' intentions for the future implementation of online teaching technologies and strategies
Factor Reliability	0.860	

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Declarations

Competing Interest The author has no competing interests to declare that are relevant to the content of this article.

Ethics approval IRB was obtained.

Consent Participation in this study was voluntary and IRB was obtained.

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