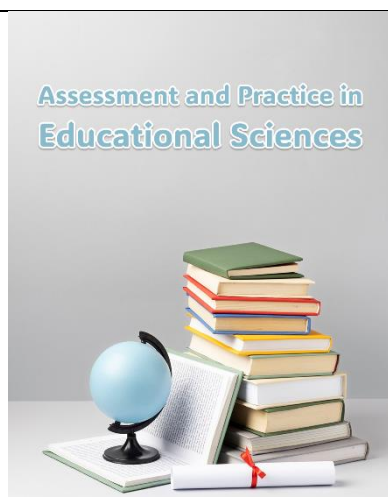




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Development and Validation of an Online Teaching Effectiveness Questionnaire for Online Instructors

ABSTRACT

Given the lack of measurement tools for assessing the level of online teaching effectiveness among online instructors, the present study aimed to validate the Online Teaching Effectiveness Questionnaire for online instructors. The current study was conducted using an analytical instrument-development approach. For this purpose, 345 online instructors who had studied virtually were selected through available random sampling and responded to the Online Teaching Effectiveness Questionnaire. The validity of the instrument was then assessed using content validity, exploratory factor analysis, and confirmatory factor analysis, and its reliability was evaluated using Cronbach's alpha and test-retest reliability. The results of the factor analyses showed that the factorial structure of the instrument had an acceptable fit with the data and that all goodness-of-fit indices supported the model. Moreover, the reliability analysis indicated that both Cronbach's alpha coefficients and the test-retest reliability coefficients were all above 0.80, demonstrating appropriate internal and external consistency. Therefore, this questionnaire appears to be a suitable instrument for measuring the level of online teaching effectiveness among online instructors.

Keywords: Online Teaching Effectiveness Questionnaire, Validation, Online Instructors

Introduction

The rapid expansion of digital education over the past decade has fundamentally reshaped teaching and learning structures in higher education institutions worldwide. As online learning environments have evolved from supplementary instructional modes into mainstream educational systems, the importance of evaluating and enhancing teaching effectiveness in virtual settings has become a critical scholarly and practical concern (1). The global transformation accelerated by the COVID-19

pandemic highlighted both the promise and the limitations of digital instruction, emphasizing the need for pedagogical frameworks capable of supporting meaningful learning, sustaining student engagement, and ensuring instructional quality. Within this landscape, defining and measuring the effectiveness of online teaching is essential for institutional decision-making, instructional design, and continuous improvement of digital learning practices. At the same time, the diversification of online teaching modalities—including synchronous, asynchronous, blended, and fully virtual programs—has contributed to the complexity of evaluating instructors' performance in digital environments (2, 3), thus making the development of valid and reliable measurement instruments an academic necessity.

A growing body of literature has underscored how learner engagement, system usability, digital interaction, and pedagogical design collectively influence teaching effectiveness in online environments. For instance, the success of an e-learning system depends not only on technological infrastructure but also on instructors' pedagogical responsiveness and students' behavioral and cognitive engagement, as emphasized in empirical studies on e-learning success models (4). At the same time, expanding access to online courses through global MOOC platforms has created new opportunities for participation and flexible learning pathways, yet research indicates that the pedagogical effectiveness of learners in such contexts requires careful examination of interaction quality, instructional support, and motivation (5). Furthermore, the psychometric validation of instruments that measure students' readiness or instructors' competencies in online education contexts has become an important methodological priority, illustrating the need for culturally adapted, theoretically grounded scales that reflect the characteristics of diverse digital learning environments (6).

Online learning environments impose a unique set of cognitive and behavioral demands on learners, many of which directly relate to instructors' ability to design clear instructional structures and support self-regulated learning. For example, procrastination—one of the most pervasive behavioral barriers in online learning—has been shown to predict poor self-regulated learning and reduced learning effectiveness, particularly during extended periods of virtual instruction such as the pandemic lockdowns (7). Similarly, research highlights that instructors' digital teaching strategies and motivational beliefs shape how students perceive and engage with online lessons, thereby influencing students' learning behaviors and academic performance in digital contexts (8). These findings collectively suggest that the psychological, motivational, and pedagogical dimensions of online teaching should be integrated within any framework designed to evaluate teaching effectiveness in digital environments.

The question of instructional effectiveness becomes even more important when considering the variety of pedagogical models used in contemporary e-learning. For example, many studies have documented the role of engagement, interaction quality, and digital presence in enhancing student outcomes in online environments. During the pandemic, the Interaction Model of online learning demonstrated that learning effectiveness depends significantly on the interplay of behavioral, emotional, and cognitive engagement (9). In public universities in several developing-country contexts, institutional capabilities—such as availability of digital resources, instructional support, and faculty training—have also been identified as determinants of whether e-learning initiatives succeed or fail (10). Parallel research on blended learning models has found that hybrid instructional designs that integrate face-to-face and digital modalities can substantially enhance performance and reading proficiency when they are implemented with clear structure and instructor guidance (11). These insights reinforce the notion that instructors' online teaching effectiveness must be conceptualized within broader pedagogical and institutional ecosystems, not merely as a function of individual teaching performance.

The digital transformation of higher education has brought about substantial challenges for instructors, who must navigate new technological tools while maintaining high-quality educational experiences. A comprehensive review of these challenges illustrates that faculty members must not only adapt their pedagogical strategies but also develop competencies in digital

communication, online assessment, and virtual classroom management (1). The complexity of these challenges is magnified in contexts where resources, institutional readiness, or digital infrastructure remain uneven—such as in religious colleges, where instructors must continuously strengthen pedagogical competencies to meet the expectations of online learners (12). Similarly, the degree of learning effectiveness in online higher education is influenced by project-based learning, flipped classrooms, and collaborative digital activities, which require instructors to facilitate active, interactive learning experiences rather than relying solely on lecture-based methods (13). These findings indicate that teaching effectiveness in online environments is multi-dimensional and deeply interdependent with instructors' digital pedagogical skills.

Recent scholarship has continued to expand understanding of digital learning by examining the psychological consequences of prolonged online study. For example, learning burnout—an emerging concern in digital educational research—has been found to vary between online and offline environments, with significant implications for how educators design instructional activities and support student engagement (14). The design of digital learning environments themselves plays a crucial role as well; advanced collaborative virtual learning environments provide structured frameworks for the creation of digital educational materials that support higher-order cognitive engagement and student collaboration (15). Similarly, research emphasizes that educational equity must be considered when designing virtual education models, with qualitative studies revealing that disparities in access to digital tools and instructional support can limit the effectiveness of online teaching in school systems (16). These perspectives reinforce the importance of developing rigorous evaluation tools that account for the diversity of learners' needs and the constraints of different educational contexts.

From a broader educational systems perspective, the acceptance and adoption of e-learning technologies depend on individual, social, and organizational factors that influence user behavior. The Technology Acceptance Model (TAM) and its extensions have been widely used to explain variations in e-learning acceptance, highlighting the effects of perceived usefulness, ease of use, and instructor support on student engagement (17). Research also indicates that the effectiveness of e-learning is shaped by institutional strategies, learner motivation, and integrated instructional design models. For example, the adoption of blended e-learning design models has been shown to significantly improve academic performance among university students in teacher education programs (18). These studies demonstrate that the evaluation of instructors' online teaching effectiveness must consider both learner perspectives and institutional dynamics.

Given these considerations, examining the effectiveness of instructors' online teaching requires careful methodological attention and robust theoretical grounding. Existing instruments vary widely in scope and psychometric rigor, and many lack validation across diverse higher education contexts. Since online teaching effectiveness is influenced by factors such as interaction quality, learner support, assessment methods, cognitive presence, and digital content design—as documented across multiple empirical studies—it is essential to develop and validate a comprehensive scale that reflects these dimensions within the context of contemporary digital education systems. Such an instrument can provide reliable metrics for research, evaluation, and policy-making purposes in higher education. Therefore, the aim of this study is to develop and validate a comprehensive questionnaire to measure the effectiveness of online teaching among university instructors.

Methods and Materials

The present study is an instrument-development research conducted using an analytical approach. This psychometric study was carried out in 2022 with the aim of validating the Online Teaching Effectiveness Scale for online instructors in universities across the country.

The design of the present study is applied in terms of purpose, and in terms of data collection, it is a quantitative study based on a correlational approach using path analysis. The statistical population included all faculty members of Payame Noor

University who, based on self-report, had participated in one or more online courses and e-learning programs during the 2020–2021 academic year. Moreover, Table 1 presents the demographic characteristics of the statistical population categorized by academic rank.

Table 1. Categorization of Elements of the Statistical Population

Demographic Variable	Frequency	Percentage
Age		
30–40 years	179	51.14
41–60 years	151	43.14
61 years and above	20	5.71
Gender		
Female	190	54.28
Male	160	45.71

For studies involving model construction, the following rule of thumb has been suggested for determining sample size: a minimum of 5 participants per estimated parameter, a preferable ratio of 10:1, and an optimal ratio of 15:1 (Kline, 2011). Since the present study included 24 observed parameters, the ratio of approximately 15:1 was used, and 350 participants were selected through convenience sampling (considering the possibility of participant attrition, incomplete questionnaires, and outliers). During data analysis, after removing incomplete questionnaires and outliers, a total of 341 questionnaires were included in the analysis.

The statistical population included all faculty members of Payame Noor University who, based on self-report, had participated in one or more online courses and e-learning programs during the 2020–2021 academic year.

To ensure the accurate and appropriate process of distributing, completing, and collecting the final questionnaire, a one-day training workshop was held to provide necessary instructions to provincial coordinators. Afterward, the questionnaires were distributed nationwide by these coordinators and collected after completion. The questionnaires were administered virtually and distributed to respondents via email and applications such as WhatsApp, Telegram, and iGap. No further explanation was provided to respondents, as the necessary instructions were stated at the beginning of the questionnaire. Additionally, no time limit was imposed for completing the questionnaire. After removing incomplete or unanswered questionnaires, a total of 345 questionnaires were subjected to statistical analysis, and the data were analyzed using SPSS version 24 and AMOS version 24.

Since there is no single standard method for constructing and evaluating models such as online teaching satisfaction among instructors, the present study used the Online Teaching Satisfaction Model proposed by Bolliger and Waslik (2009) to assess the validity of the questionnaire measuring satisfaction with online teaching among instructors.

To determine the consistency and homogeneity of each factor of the questionnaire, Cronbach's alpha was used because the questionnaire did not contain right or wrong answers, and respondents rated their satisfaction level on a five-point Likert scale. Before calculating the final reliability coefficient, it was decided to develop a small conceptual model with the least number of indicators; thus, three indicators were retained for each factor, and other indicators with low discrimination power (less than 0.25) were removed. In other words, the goal was to shorten the final model—and thus the final questionnaire—as much as possible while preserving its reliability and validity, since some online instructors may lack sufficient motivation, patience, or time to complete long questionnaires (Russell, Peplau, & Ferguson, 1978). Therefore, reducing the length of the questionnaire while maintaining acceptable reliability enhances its efficiency. Consequently, from the 15 designed indicators across all factors, two indicators—"satisfaction with staff behavior" and "student participation level"—were removed and excluded due

to low homogeneity with other indicators. After removing indicators that did not influence the “online teaching satisfaction” level, the internal consistency coefficient of each factor was calculated.

The validity of the data collection instrument was assessed using quantitative content validity methods, including the Content Validity Ratio (CVR) and the Content Validity Index (CVI). For construct validity, exploratory factor analysis was performed using Bartlett’s test of sphericity, eigenvalues, and varimax rotation. Varimax rotation was used to simplify and clarify the extracted factor structure. With this method, items with high correlations loaded onto the same factor, with 0.40 considered the minimum acceptable factor loading. For further instrument validation, confirmatory factor analysis was applied, and the model fit indices—including Chi-square (χ^2), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Goodness of Fit Index (GFI), and Adjusted Goodness of Fit Index (AGFI)—were evaluated.

Findings and Results

In this section, the set of indicators in the “Online Teaching Effectiveness Model for Instructors,” which exhibited appropriate homogeneity (all factors together containing 42 indicators), were analyzed to determine the overall internal consistency coefficient. The total reliability coefficient of the questionnaire was 0.88, and the mean discrimination index of all 42 indicators was 0.57 with a standard deviation of 0.10.

Table 2. Results of Principal Component Factor Analysis of the PTQ with Oblimin Rotation (N = 350)

Factor	Item	Factor Loading
Learner–Instructor Interaction	Item 1	0.81
	Item 2	0.75
	Item 3	0.79
	Item 4	0.74
	Item 5	0.79
	Item 6	0.88
	Item 7	0.81
	Item 8	0.83
Teaching–Learning Strategies	Item 9	0.79
	Item 10	0.82
	Item 11	0.69
	Item 12	0.67
Cognitive and Social Presence	Item 13	0.80
	Item 14	0.78
	Item 15	0.86
	Item 16	0.84
	Item 17	0.84
	Item 18	0.79
	Item 19	0.88
	Item 20	0.90
Interaction Among Instructors	Item 21	0.67
	Item 22	0.85
	Item 23	0.80
	Item 24	0.83
	Item 25	0.88
	Item 26	0.79
	Item 27	0.76
	Item 28	0.73
	Item 29	0.81
Assessment and Feedback Provision	Item 30	0.69
	Item 31	0.80
	Item 32	0.84
	Item 33	0.76
	Item 34	0.70
	Item 35	0.77

Educational Content	Item 36	0.83
	Item 37	0.80
	Item 38	0.93
	Item 39	0.76
	Item 40	0.77
	Item 41	0.79
	Item 42	0.76

As Table 2 indicates, the lowest factor loadings belong to Items 12 and 21 (0.67), while Item 38 has the highest loading. Additionally, confirmatory factor analysis demonstrated that the scale had a favorable model fit ($p < .0001$, $\chi^2 = 425.15$, $CMIN/DF = 4.39$, $CFI = 0.95$, $GFI = 0.93$, $TLI = 0.90$, $NFI = 0.94$, $PNFI = 0.79$, $RMSEA = 0.07$).

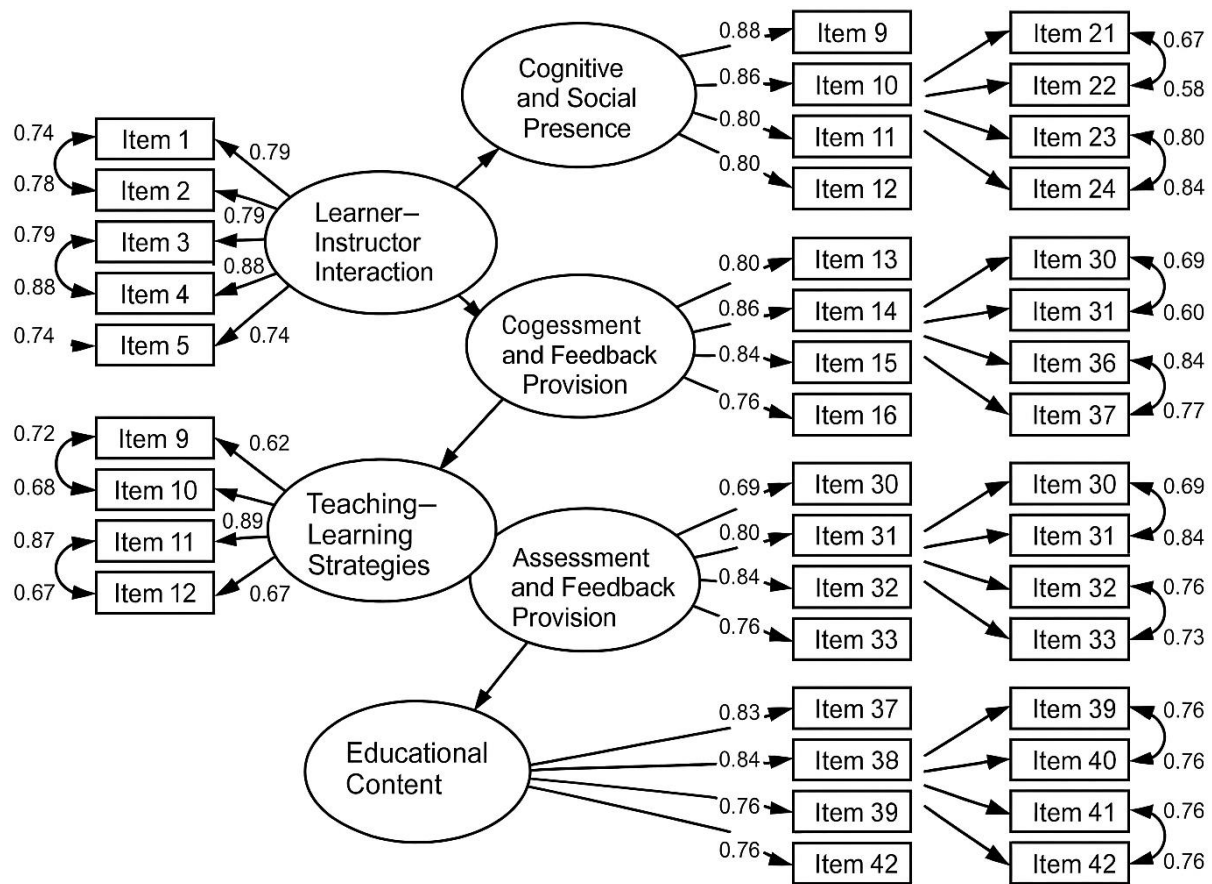


Figure 1. CFA Model

Table 3. Goodness-of-Fit Statistics for the “Online Teaching Effectiveness Questionnaire for Instructors”

Index	Value
Minimum Fit Function Chi-Square	8.546
Root Mean Square Residual (RMR)	0.08
Standardized RMR	0.08
Goodness of Fit Index (GFI)	0.89
Adjusted Goodness of Fit Index (AGFI)	0.87
Normed Fit Index (NFI)	0.91
Non-Normed Fit Index (NNFI)	0.93
Incremental Fit Index (IFI)	0.94
Comparative Fit Index (CFI)	0.94
Parsimony Normed Fit Index (PNFI)	0.91
Root Mean Square Error of Approximation (RMSEA)	0.052

The following section describes these indices and interprets the results obtained in this study:

1. **Chi-square Goodness-of-Fit Index:** The chi-square value tests the null hypothesis that the model fits the population data. A significant chi-square indicates poor model fit, while smaller chi-square values reflect better fit. This index is influenced by sample size such that larger samples tend to produce statistically significant chi-square values, which may lead to model rejection, whereas smaller samples may cause poor-fitting models to appear acceptable. Thus, when the sample size ranges between 65 and 300, the chi-square value is considered a reasonable indicator of fit; however, for larger samples, the chi-square is almost always significant, which contradicts the recommendation for large sample sizes in confirmatory factor analysis (Hooman, 2001; Hooman, 2008). Therefore, it is recommended that the chi-square index be used only as a guideline and that actual discrepancies between implied and observed correlations be examined (Kline, 2001). In the present study, the chi-square index calculated by AMOS was 8.546.
2. **Root Mean Square Residual (RMR):** This index is the square root of the mean squared differences between implied and observed correlations. There is no specific cutoff value for this index, which ranges between 0 and 1; thus, it should be kept as small as possible (Kline, 1994). In this study, the RMR was 0.08.
3. **Standardized Root Mean Square Residual (SRMR):** This index is more interpretable when standardized because it provides a common metric for evaluating residuals. SRMR represents the average difference between predicted and observed variances and covariances based on standardized residuals. A value of zero indicates perfect model fit; however, achieving zero is rare in practice, so the SRMR should be as close to zero as possible. In this study, the SRMR was 0.08.
4. **Goodness of Fit Index (GFI):** This index represents the ratio of the sum of squared differences to observed variances. It can be considered analogous to the squared multiple correlation coefficient in multivariate regression (Hooman, 2001). It ranges between 0 and 1, and values closer to 1 indicate better model fit (Kline, 2001). In the present study, the GFI was 0.89.
5. **Adjusted Goodness of Fit Index (AGFI):** Similar to GFI, this index ranges from 0 to 1. Higher values indicate superior model fit (Hooman, 2008). In this study, AGFI was 0.87.
6. **Normed Fit Index (NFI):** Values between 0.90 and 0.95 are considered acceptable, and values above 0.95 are excellent. One limitation of this index is its sensitivity to the number of model parameters—adding more parameters increases its value. In this study, the NFI was 0.91.
7. **Non-Normed Fit Index (NNFI/TLI):** This index is interpreted similarly to NFI. Values between 0.90 and 0.95 are acceptable. In this study, the NNFI was 0.94.
8. **Incremental Fit Index (IFI):** This index is similar to NNFI. In the present study, the IFI was 0.94.
9. **Comparative Fit Index (CFI):** This index compares the target model with a null model in which the latent variables are assumed to be uncorrelated. In the present study, the CFI was 0.94.
10. **Parsimony Normed Fit Index (PNFI):** Similar to IFI and CFI, this index should also be close to 1 for acceptable model fit. In this study, PNFI was 0.91.
11. **Root Mean Square Error of Approximation (RMSEA):** Values below 0.05 indicate good fit, and values up to 0.08 indicate reasonable approximation errors. Values of 0.10 or higher reflect poor fit. A cutoff of ≤ 0.06 is generally considered acceptable. RMSEA is less sensitive to sample size and therefore often preferred. In this study, the RMSEA was 0.052.

Discussion and Conclusion

The purpose of the present study was to develop and validate a comprehensive questionnaire measuring online teaching effectiveness among university instructors. The findings demonstrated that the instrument possessed strong psychometric properties, including high internal consistency, satisfactory discrimination indices, and a robust factorial structure confirmed through both exploratory and confirmatory analyses. The six-factor model—learner–instructor interaction, teaching–learning strategies, cognitive and social presence, instructor–instructor interaction, assessment and feedback provision, and educational content—showed strong loadings across all items, reflecting the multidimensional nature of teaching effectiveness in online environments. These results align with contemporary theoretical models of digital pedagogy and with empirical studies in the field of e-learning, which emphasize the importance of interaction quality, structured learning strategies, human presence in virtual environments, and timely assessment practices in determining instructional effectiveness.

The prominence of learner–instructor interaction in the factorial structure is consistent with previous findings underscoring that communication and interaction are among the strongest predictors of online learning engagement and success. For example, studies on Massive Open Online Courses have emphasized how the quality of instructor–learner interaction has a direct effect on learners’ motivation, participation, and perceived course effectiveness (5). Similarly, research conducted in university e-learning settings highlights that effective interaction between instructors and students plays a key role in shaping learners’ readiness for online learning and their adherence to digital learning expectations (19). During the COVID-19 pandemic, when online instruction became the default mode, interaction emerged as a significant factor determining whether students remained engaged in self-directed learning tasks, as procrastination and lack of instructor presence contributed to online learning ineffectiveness (7). The strong performance of the learner–instructor interaction factor in the present study therefore reinforces the centrality of active, responsive communication in online teaching environments.

The second major dimension identified in the model—teaching–learning strategies—also aligns closely with the broader literature on online educational effectiveness. Studies on the effectiveness of blended and online learning consistently emphasize that instructors’ ability to use structured teaching strategies, scaffolded learning processes, and clear instructional design principles contributes significantly to learning outcomes. For example, blended learning models have been shown to improve academic performance among university students when instructors effectively integrate digital materials with structured learning pathways (18). Likewise, research on reading proficiency in blended environments demonstrates that clear instructional design and active learning strategies enhance comprehension and engagement (11). These findings correspond with the strong loadings observed for teaching–learning strategy items in the present study, suggesting that consistent pedagogical planning and varied instructional approaches remain essential determinants of effective online teaching.

Cognitive and social presence emerged as another key factor in the validated model, reflecting the importance of human-centered design in online learning. Social presence, in particular, has been shown to foster a sense of belonging and meaningful connection among online learners, which in turn enhances motivation and reduces emotional barriers such as anxiety or disengagement. The literature on virtual learning environments supports this view; for example, research on collaborative digital learning emphasizes the necessity of designing environments that encourage interaction, shared problem-solving, and emotional connection among learners (15). Similarly, studies investigating learning burnout reveal that absence of cognitive and social presence in online settings contributes to emotional exhaustion, reduced motivation, and weaker learning outcomes (14). The strong factor loadings observed for cognitive and social presence in the present instrument therefore reflect established theoretical frameworks such as the Community of Inquiry model, which posits that social and cognitive presence are essential components of meaningful online learning.

The factor related to instructor–instructor interaction also performed strongly and underscores the collaborative dimension of online teaching, which is often overlooked in traditional evaluations focused solely on teacher–student relationships. Research conducted in higher education institutions suggests that instructors’ collaboration, peer support, and team cohesion are crucial determinants of online learning effectiveness, particularly when instructors must adapt teaching methods rapidly under pressure—as seen during the pandemic (13). Institutional capabilities, including opportunities for instructor collaboration and professional development, have also been identified as enabling factors for successful e-learning implementation, especially in resource-constrained contexts such as public universities in developing countries (10). This aligns with the strong loadings observed in the present model, which indicate that collaborative professional culture and instructor networks contribute to enhancing teaching effectiveness in online environments.

Assessment and feedback provision emerged as another vital dimension, and this too is supported by existing literature. Effective assessment practices in online learning require timely feedback, transparent evaluation criteria, and authentic assessment tasks that promote critical thinking. The success of e-learning systems depends significantly on instructors’ ability to provide meaningful assessment and feedback, as evidenced by empirical findings demonstrating that feedback processes are integral to system success and learner satisfaction (4). Additionally, qualitative studies highlight that pedagogical competence—including assessment design—is a core component of effective online teaching in specialized institutions such as religious colleges (12). The strong contribution of assessment and feedback items in the present study suggests that these competencies represent fundamental dimensions of instructor effectiveness in virtual environments.

The educational content factor also exhibited high reliability and strong loadings, reflecting the critical role of content quality and design in digital teaching. Studies during the COVID-19 pandemic have shown that well-designed digital educational materials increase engagement and facilitate learning, particularly when materials incorporate interactive elements and align with students’ learning needs (9). In addition, digital transformation research emphasizes that content design and integration of digital tools represent some of the most significant challenges facing higher education institutions today (1). Moreover, models of virtual education designed with attention to educational equity emphasize the need for accessible, adaptable content that responds to diverse learner needs (16). The validation of the educational content factor in the present study demonstrates its significance within a multidimensional conceptualization of online teaching effectiveness.

Taken together, the results indicate that online teaching effectiveness is a comprehensive construct encompassing interaction, pedagogy, presence, collaboration, assessment, and content quality. This multidimensionality is consistent with studies that conceptualize online learning effectiveness as the outcome of interactions among pedagogical, technological, and psychological factors. For instance, e-learning acceptance research has shown that effective online teaching depends on student perceptions of usefulness, ease of use, and support—all of which align with the structural factors identified in the present model (17). Additionally, research on online learning readiness highlights that teaching effectiveness contributes to how students perceive fairness, procedural clarity, and overall satisfaction in digital environments (19). These convergent findings support the validity and conceptual robustness of the instrument developed and validated in the present study.

By providing a valid and reliable tool that synthesizes insights from multiple domains of e-learning research, the present study contributes to the field by offering a comprehensive scale that captures diverse aspects of online teaching effectiveness. This instrument can assist institutions in monitoring instructional quality, designing professional development programs, and conducting research on pedagogical innovation in digital environments. Furthermore, it can serve as a diagnostic tool that helps instructors reflect on their teaching practices and enhance their effectiveness in virtual classrooms.

This study, despite its strengths, has several limitations that should be acknowledged. First, the sample was limited to instructors in a single national higher education system, which may restrict the generalizability of the results to other countries

with different institutional cultures or technological infrastructures. Second, the questionnaire was administered online, which may introduce self-selection bias, particularly among instructors who are more comfortable navigating digital systems. Third, the study relied on self-reported data, which may be influenced by social desirability or subjective perceptions rather than objective measures of teaching performance. Fourth, the cross-sectional design of the study limits the ability to infer causal relationships between the identified factors and actual teaching outcomes. Finally, while the instrument demonstrated strong psychometric properties, further validation using diverse populations and longitudinal designs would strengthen confidence in its stability and applicability.

Future studies should consider validating the instrument across different educational systems and cultural contexts to examine its cross-cultural applicability. Longitudinal research could investigate whether the identified dimensions of teaching effectiveness predict long-term student outcomes such as academic achievement, retention, or digital literacy development. Mixed-methods research combining survey data with observational or performance-based assessments could enhance understanding of how instructors' actual behaviors align with their self-reported effectiveness. Additionally, future studies may explore the relationship between institutional factors—such as digital infrastructure, professional development opportunities, and organizational support—and instructors' teaching effectiveness scores. Expanding the instrument to include measures of technological self-efficacy or digital ethics could further enrich its relevance in rapidly evolving digital education landscapes.

Institutions can use the validated questionnaire as a foundation for designing targeted professional development programs that focus on enhancing interaction, pedagogical design, assessment practices, and content creation. Instructional designers can employ the instrument to evaluate course quality and identify areas for improvement in learning management systems and digital course materials. Administrators may incorporate the scale into performance evaluations or accreditation processes to ensure consistency and quality in online teaching. Additionally, the instrument can guide instructors in reflecting on their strengths and weaknesses, enabling them to adopt evidence-based strategies that enhance student engagement, presence, and learning outcomes in online environments.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adhered in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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