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**Original Research**

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# Quality Measurement of the Blended Learning Model in Higher Education: Scale Development and Validation

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## Abstract

**Objective:** This study aimed to develop and test a scale for measuring the quality of blended learning models in higher education.

**Methods:** This research adopts a sequential mixed-method approach to construct a new measurement scale. The first phase consisted of the inductive approach to identify the items, followed by exploratory factor analysis. The identified dimensions were tested for reliability and validity in the second phase.

**Results:** The Blended Learning Quality Assessment (BLQA) contains 4 dimensions: Technology Integration, Pedagogy and Curriculum, Physical Infrastructure, and Educator Proficiency. The scale is comprised of 26 items assessing the quality of blended learning programs in higher education. The reliability and validity of the scale were established by confirmatory factor analysis (AVE > 0.6, Cronbach's alpha > 0.85).

**Conclusions:** In the face of changing student expectations of quality, this study introduces a comprehensive measurement scale by which institutions of higher education may effectively assess their performance.

**Implications:** Results contribute to extant literature by proposing a comprehensive scale to measure the quality of an institution's blended learning model. The scale integrates digital aspects of pedagogy, delivery, and infrastructure and can be used to identify the dimensions contributing most to student satisfaction.

**Keywords**: *blended learning, higher education, scale development, service quality*

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## Introduction

In recent years, the rapid advancement of technology has transformed the educational landscape, with online platforms becoming increasingly prevalent. The COVID-19 pandemic, which made remote teaching techniques urgently necessary, expedited this shift. The educational model known as blended learning combines online components with more conventional methods of direct classroom teaching. Research regarding blended learning has gained significant prominence owing to its increasing relevance (Anthony et al., 2022; Bervell et al., 2021; Bhagat et al., 2021; Garrison & Vaughan, 2007; Müller et al., 2023; Wong et al., 2014).

It has been argued that, if developed and implemented well, blended learning can significantly transform higher education (Garrison & Vaughan, 2007). A combination of online education with face-to-face instruction results in a rigorous learning environment (Almahasees & Qassem, 2022). The quality and accessibility of information technology, combined with the quality of online course design, directly influence student satisfaction with e-learning outcomes (Nikou & Maslov, 2023). Nevertheless, switching to blended learning from the conventional face-to-face mode poses challenges, including adaptation to the online environment, lack of interaction and motivation, and potential deficiency of internet access. Ensuring the effective adoption of blended learning and its subsequent impact on students requires implementers to understand its associated quality dimensions. The quality level of educational services is determined by how monitoring and evaluation are conducted and by how subsequent changes are implemented (Becket & Brookes, 2006). The quality dimensions include criteria such as instructional design, technological integration, learner engagement, and overall effectiveness.

The objective of the study was to explore the quality dimensions of blended learning in higher education and develop a measurement scale by which to assess it. A sequential mixed-method approach was adopted to construct the new measurement scale, the Blended Learning Quality Assessment (BQLA). The first phase consisted of an inductive approach to identify the items; it was followed by a second phase that included exploratory and confirmatory factor analyses. The participants were undergraduate and postgraduate students from two private universities in India.

## Theoretical Underpinning and Literature Review

We first discuss constructivist learning theory, the theoretical underpinning of the study, and then provide a literature review. The literature review examines various quality measurement scales used in higher education, followed by a review of scales developed and used specifically in the context of blended and online learning in higher education. Blended learning in the Indian context is briefly reviewed.

### Constructivist Learning Theory

Constructivist learning theory prioritizes problem-oriented learning and encourages collaboration in the learning process (Boghossian, 2006). It emphasizes the learner's active engagement and construction of knowledge and can provide insights into how well a blended learning model facilitates student-driven learning experiences (Chuang, 2021). The theory's focus on collaboration and social interaction aligns with the typically collaborative nature of blended learning environments. Constructivist learning theory enriches the theoretical underpinnings of the study by offering a lens through which to evaluate the learner-centered aspects and collaborative dynamics normally found in blended learning, thereby contributing to the development of a comprehensive quality measurement scale.

### Quality Measurement in Higher Education

Students come to any classroom with varied expectations (Harvey & Williams, 2010). The educational institution is expected to disseminate knowledge to students and develop their critical thinking capabilities

and other relevant skill sets (Pithers & Soden, 2000). Desirable student learning outcomes are often shaped by input from prospective employers.

Various measurement scales have been developed in different contexts to ascertain the quality of education. SERVQUAL (Parasuraman et al., 1988), for example, has been extensively used to assess quality and service related to education delivery in the education sector (Ip et al., 2017; Leonnard, 2018; Liu et al., 2021). SERVQUAL captures the expectations for and perceptions of service quality in five dimensions: reliability, assurance, tangibility, empathy, and responsiveness. Ip et al. (2017) built a service quality measurement instrument for teaching evaluation based on SERVQUAL. Researchers found that the service dimensions of reliability, assurance, and responsiveness significantly impact student satisfaction with teachers' performance. Similarly, Liu et al. (2021) conducted a study on online teaching quality based on the SERVQUAL model. They highlighted the gaps between service perception and expectation using the five dimensions of SERVQUAL.

In addition to using established service quality models like SERVQUAL, researchers have developed quality measurement scales explicitly tailored for the higher education sector. Parnell and Carraher (2003) developed the Management Education by Internet Readiness Scale (MEBIR) to assess the readiness of learners for internet-mediated management education. The four dimensions of the MEBIR scale are technological mastery, flexibility of course delivery, anticipated quality of the course, and self-management orientation. Also to measure service quality in the higher education sector, Abdullah (2006) conceptualized and developed the Higher Education Performance Scale (HEdPERF). This scale includes 41 items, categorized under six factors that include non-academic aspects, academic aspects, reputation, access, program issues, and understanding. Concurrently, Mahapatra and Khan (2007) developed EduQual, based on the SERVQUAL model. This 28-item scale has five dimensions: learning outcomes, responsiveness, physical facilities, personal development, and academics. Based on HEdPERF, Yildiz and Kara (2009) developed the Physical Education and Sports Sciences Performance scale (PESPERF), specifically to measure the service quality of higher education institution departments offering physical education and sports sciences.

Kumar and Dash (2014) argued that HEdPERF, EduQual, and the modified SERVQUAL do not focus on course delivery and are more confined to entity-level dimensions. Hence, they developed INSTAQUAL, an instrument that measures the service quality in management institutions, based on five dimensions, including academics, career and industry interface, competence, physical facilities, and leisure. Arguing the lack of a holistic approach in existing scales, Teeroovengadum et al. (2016) proposed a hierarchical measurement scale (HESQUAL) comprised of 53 items arranged in five primary dimensions: administrative quality, physical environment quality, core educational quality, support facilities quality, and transformative quality. The increasing range of services associated with education has also led to the development of SMARTQUAL—a dashboard of indicators (Adot et al., 2023) that includes 56 key performance indicators to assess the quality performance of higher education institutions.

## Blended Learning Scales in Higher Education

The use of technology in delivering educational services gained unprecedented significance during the COVID-19 pandemic. The disruption of education due to the pandemic resulted in heavy investments in technology to support teaching and learning processes, as part of systems necessary to maintain academic operations (Azorín, 2020; Zhao & Watterston, 2021).

Blended learning approaches have been shown to enhance learning and teaching activities, facilitate self-paced learning, and offer students individual learning paths (Castro, 2019; Zhang & Zhu, 2020); these approaches foster a dynamic educational environment. The perceived quality of the face-to-face component in the blended experience has been shown to have a direct influence on student motivation (Kassab et al., 2015). Müller et al. (2023) examined the effectiveness and design factors (content delivery, performance assessment, and interaction) of blended learning courses. Results established that overall course effectiveness is comparable to courses in traditional face-to-face programs, but that course structure, interaction, learning tasks, and timely feedback warrant more attention in the design of blended learning courses. These results

align with the findings of Zhang and Chen (2022), who also highlighted that different blended learning modes (designed based on varying degrees of offline-online interaction and technology usage) can satisfy student learning demands.

Recognizing the significance of the blended learning model, contemporary scales have been developed to assess and measure its effectiveness and impact. Table 1 lists several scales developed to study teachers or students in the context of blended learning and e-learning in higher education. A comparative analysis shows that these scales focus on assessing acceptance (Bervell et al., 2021), measuring course experience (Bhagat et al., 2021; Ginns & Ellis, 2007, 2009), evaluating competence (Matosas-López et al., 2019; Tzafilkou et al., 2022), and measuring self-efficacy and readiness (Ghazali et al., 2021; Hung et al., 2010; Tezer et al., 2018). The examination of the scope of these studies underscores the absence of a contemporary scale dedicated to assessing the quality of the blended learning model.

**Table 1.** *Measurement Scales Related to Blended and E-Learning*

| Scale | Scope | Target group | Reference |
|---|---|---|---|
| e-Learning Experience Questionnaire | Studies relationship between student perceptions of the e-learning environment and approaches to study and student grades | Undergraduates | Ginns and Ellis (2007) |
| | 5 items related to e-learning added to existing validated teaching evaluation instrument, the SCEQ (Student Course Experience Questionnaire) | Undergraduates | Ginns and Ellis (2009) |
| Online Learning Readiness Scale (OLRS) | Multidimensional instrument assessing college students' online learning readiness | Online undergraduates | Hung et al. (2010) |
| Online Authentic Learning Self-Efficacy Scale (OALSS) | Instrument determining online authentic learning self-efficacy of prospective teachers | Prospective university teachers | Tezer et al. (2018) |
| Behavioural Anchored Rating Scale (BARS) methodology-based instrument | Assessment instrument including behavioral scales to evaluate university teachers in blended learning modalities | Higher education teachers | Matosas-López et al. (2019) |
| Massive Open Online Course (MOOC) efficacy scale | MOOC self-efficacy scale for students in higher education institutions. MOOC self-efficacy conceived as information searching, making queries, MOOC learning, and MOOC usability. | Higher education students | Ghazali et al. (2021) |
| Blended Learning Acceptance Scale (BLAS) | Measures acceptance of blended learning in distance higher education | Tutors in a distance education program | Bervell et al. (2021) |
| Students Blended Learning Course Experience Scale (BLCES) | Measures blended learning course experience | Undergraduate students in Malaysia | Bhagat et al. (2021) |
| Students' Digital Competence Scale (SDiCoS) | Measures online learning and collaboration skills, use of social media, mobile devices, safety, and data protection | Higher Education Students | Tzafilkou et al. (2022) |

### Blended Learning in the Indian Context

Learning through self-study or distance mode was initiated in India in the 1960s (Koruga et al., 2023). However, face-to-face learning has been the primary mode of education at all levels. Following the challenges of the pandemic, more research is being dedicated to perceptions and adoption of the blended learning model in the country (Bordoloi et al., 2021; Kasat et al., 2019; Virani et al., 2023). Bordoloi et al. (2021) emphasized that teachers and learners prefer a blended learning model to entirely online or entirely face-to-face classrooms. Virani et al. (2023) and Kasat et al. (2019) discussed perceptions and ways to adopt blended learning through massive open online courses (MOOCs) and flipped classrooms, which operate with the underlying assumption that direct instruction mode may not be the best use of class time. They found that social influence, perceived ease of use, and content quality positively impact educator attitudes and intentions to adopt MOOCS. Kasat et al. (2019) conducted a longitudinal study of postgraduate students and compared the impact of flipped classrooms and traditional teaching approaches on various student engagement parameters. They established that flipped classroom methodology promotes increased student engagement. The review of extant literature underscores that recent studies in the Indian context have focused on understanding the preference and impact of the blended learning model.

## Purpose of the Study and Research Questions

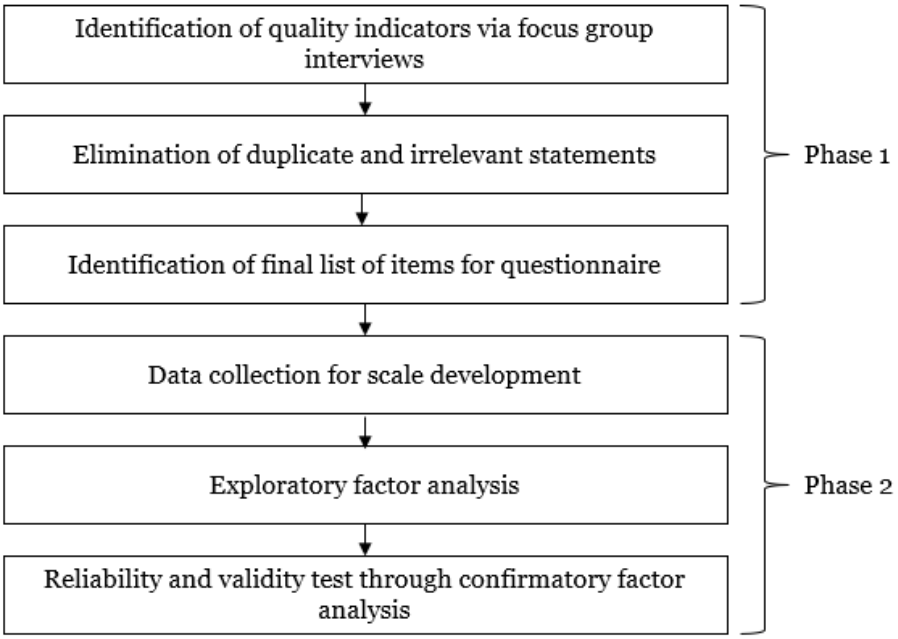
Existing service quality scales, including EduQual (Mahapatra & Khan, 2007), HEdPERF (Abdullah, 2006), and MEBIR (Parnell & Carraher, 2005), do not measure quality in the context of blended learning in higher education institutions. Blended learning is a relatively new model for many institutions, so in order to increase its efficacy, we must identify dimensions of quality measurement from the perspective of students. Recognizing this gap in the research, we adopted an exploratory approach, in order to ascertain student preferences and expectations regarding quality dimensions characteristic of blended learning and, using this information, to develop a quality measurement scale. Thus, the primary research question is to determine specific quality dimensions that define blended learning. To answer this question, we constructed a reliable, valid, and contemporary scale to measure the quality dimensions of the blended learning model in higher education.

## Methodology

### Research Design

A sequential mixed-method approach was used in the study. The scale development process consists of three fundamental parts: theoretical analysis, item generation, and psychometric analysis (Morgado et al., 2018). The scale development process followed herein adopted these three sequential steps, broadly divided into two phases (Figure 1). Item generation, followed by content validity, was completed in the first phase. Items pertaining to service dimensions of blended learning were developed through an inductive approach. In the second phase, exploratory factor analysis was conducted for dimension reduction, followed by confirmatory factor analysis to test the reliability and validity of the instrument and determine the psychometric aspect. The study was reviewed and approved by the ethics review boards of the participating universities. Informed consent of the participants in both phases was obtained before the study.

**Figure 1.** *Scale Development Process*




## Context and Research Setting

The survey was administered in two private universities in India. Both universities (referred to here as University A and University B) offer undergraduate and postgraduate courses in management, engineering, science, and humanities. Both universities are present at three locations in the country and have been operating for more than two decades. During the 2022–2023 academic year, University A had a population of more than 30,000 students, while University B was somewhat larger, with a population of more than 40,000. These institutions were selected for study because they adopted a blended learning approach to teaching and learning. They continued to expand the model even after the universities were reopened post-COVID. Here, we refer to the blended learning model as face-to-face interactions that are supported by the flexibility of online interactions and technology integration in the course delivery and evaluation processes.

Both universities have similar blended learning models. Students and research scholars have remote access to e-libraries and institutional digital repositories. Course content (session plans and teaching materials), attendance, assignments, evaluation, and feedback have been shifted online via a centralized learning management system to ensure accessibility and transparency in processes. The course design has been changed to integrate self-learning, wherein students take suggested courses from platforms like Coursera and SWAYAM (a platform managed by the Ministry of Human Resource Development, India, for Online Courses). Though the proportion of online and face-to-face components in teaching depends on the course structure, educators are encouraged and trained to integrate technology in teaching.

## Phase 1: Item Generation

### Participants

During Phase 1, six focus group interviews were conducted with undergraduate and postgraduate students studying under a blended learning model. To ensure participants had enough experience to provide valid input, students studying in the blended learning model and completing at least a year in their existing courses were selected for the study. The details of the focus group participants are presented in Table 2 below.

**Table 2.** *Details of Focus Group Discussions*

| Focus group discussion | No. of participants | Mode | Stream | University |
|---|---|---|---|---|
| 1 | 8 | In person | Management | University A |
| 2 | 10 | In person | Management | University B |
| 3 | 8 | In person | Engineering | University A |
| 4 | 12 | In person | Engineering | University B |
| 5 | 8 | Online | Science | Both A & B |
| 6 | 8 | Online | Humanities | Both A & B |

### Data Analysis and Preparation of Survey Instrument

In the first phase, 40 items were finalized, using data from the six focus group interviews in an inductive approach (Kapuscinski & Masters, 2010). Students were asked what they expected in terms of quality from their course and educational institution (details are provided in the Appendix). Focus group discussions were recorded, and the authors reviewed the data gathered after every meeting. Focus groups were stopped once no new items emerged. We analyzed the initial data pool for redundancy and clarity. Some items were discarded due to duplication, while a few were discarded due to not being in the scope of the study. For example, statements such as, "I feel I can do better in a blended learning environment," were removed, as they are not relevant under the study's scope (they measure student self-efficacy rather than quality of the model). Some items were rephrased; for example, "Lecturers should train and encourage the introverts to participate better, rather than encouraging the extroverts," was rephrased as the item "Supportive and student-friendly teachers." After this process, we asked five experts and five students to examine the items for clarity and ease of understanding to ensure content and face validity. Their suggestions helped replace some complicated and/or ambiguous wording. Finally, 40 items were developed and used in the second phase of the study. The items were presented (not in any particular order) as statements in the questionnaire and were measured on a 5-point Likert scale (from 1 = Strongly disagree to 5 = Strongly agree).

### Phase 2: Data Collection

A questionnaire was designed for the survey consisting of two parts. Part A of the questionnaire included demographics (age, gender) and educational details (course enrolled, year of the study). Part B included the 40 items identified in Phase 1. The questionnaire was administered to the respondents in person between November, 2022, and January, 2023.

## Data Analysis

### Preliminary Analyses

Data were checked for suitability for factor analysis using the Kaiser-Meyer-Olkin (KMO) test. A KMO value of more than 0.6 shows that the sample size is adequate for factor analysis (Tabachnick & Fidell, 2019).

### Exploratory Factor Analysis

Exploratory factor analysis (EFA) using the principal components method with varimax rotation (Costello & Osborne, 2019) was conducted using SPSS V23. Items were retained if their factor loadings were greater than .50 and communality greater than .5. Factors with an eigenvalue greater than 1 were considered. Items were eliminated from factors if their cross-loading was .40 or more (Hair et al., 2006).

### Confirmatory Factor Analysis

The results from EFA were further tested using confirmatory factor analysis (CFA) with the same data sample. Model fit indices for the measurement model include incremental fit index (IFI), Tucker Lewis index (TLI), and comparative fit index (CFI), all of which should be more than .90 (Kline, 2005). The root mean square residual (RMSR) and standard root mean square residual (SRMR) should be less than 0.05 (Byrne, 2014).

The root mean square of error approximation (RMSEA) should be less than 0.07 (Steiger, 2007). Additionally, the relative chi-square to degrees of freedom ratio should be less than 3.0, and the *p*-value should be between 0.01 and 0.05 for an acceptable fit (Schermelleh-Engel et al., 2003).

Scale reliability was assessed using Cronbach's alpha to check the internal consistency of the items; values of more than .70 are considered satisfactory (Taber, 2018). Convergent validity shows the similarity of items within a construct and was assessed using average variance extracted (AVE). The value of AVE should be more than 0.5 (Fornell & Larcker, 1981). Finally, discriminant validity shows how the items of a construct are not similar to another construct. To establish discriminant validity, the average variance extracted (AVE) estimates were compared to the corresponding squared inter-construct correlation (SIC) estimates. A scale is considered to achieve discriminant validity when all AVE estimates are larger than corresponding SIC estimates (Fornell & Larcker, 1981).

## Results

### Demographic Profile

Of the 600 students approached, 232 willingly participated in the study and gave responses to all questions, indicating a response rate of 38.6 %. Others did not want to participate in the study or did not respond to all questions appropriately. The mean age of the respondents is 21.1 years (*SD* = 2.5). Most students (*N* =144, 62%) were in undergraduate programs, representing engineering (*N* = 38), law (*N* = 12), commerce (*N* = 28), business administration (*N* = 34), science (*N* = 12), and humanities (*N* = 20). All postgraduate students were in management programs. Most respondents were male (62%). The gender parity index in higher education in India for 2021–2022 is 1.01 as reported in the All India Survey On Higher Education, 2021–2022 (Government of India, 2023). More male students participated in the survey than would be expected, given the population.

### Preliminary Analyses

A KMO value of .960 established the adequacy of the sample for factor analysis.

### Exploratory Factor Analysis

Four factors, including 29 items, accounted for a cumulative variance of 70.05%. Of the 11 items removed, eight were because of excessive cross-loading. Three items were eliminated due to low communality (<0.5); hence, 29 items were retained in scale for the next stage. Factor 1, Technology Integration, consists of ten items. The items address the integration of technology in the learning process, use of digital resources, dissemination of information, designing courses, and existing infrastructure. Item loadings ranged between .53 to .71, and the factor explains 24.81% of the variance. Factor 2, Pedagogy and Curriculum, consists of ten items and explains 19.70% of the variance. The item loadings ranged between 0.76 to 0.89. These items address curriculum design based on industry needs, focus on hands-on student training, and use of advanced teaching methods. Factor 3, Physical Infrastructure, explains 13.39% of the variance and consists of five items. These items address the availability and accessibility of resources such as the library and learning ambiance. The factor loadings ranged between 0.67 and 0.88. Finally, Factor 4, Educator Proficiency, explains 12.15% of the variance in the items and consists of 4 items. These items include teacher qualifications, industry exposure, and efficiency in course content delivery. All items in Factor 4 have loadings of greater than 0.85.

### Confirmatory Factor Analysis

Confirmatory factor analysis resulted in the removal of three items to achieve a desirable fit, yielding a 26-item scale. One item each was removed from Factors 1, 2, and 3 due to low standardized regression weights. Model fit indices establish a good fit of the measurement model: IFI = 0.94, TLI = 0.93, and CFI = 0.94; RMR = 0.04, SRMR = 0.04, and RMSEA = 0.062; relative chi-square ($x^2/df$) is 1.92; and *p* = 03. Indices suggest a model that fits the data well.

Table 3 includes the scale items, their factor loadings, average variance extracted, and Cronbach's alpha for identified factors. Cronbach's alpha values are more than 0.8 for all constructs, demonstrating internal consistency and reliability of the factors. AVE for all constructs is greater than 0.6, and construct reliability is more than 0.8, thus establishing convergent validity. In terms of discriminant validity, the correlation matrix between the factors is shown in Table 4. The average variance extracted (AVE) estimates are higher in the case of each construct from the corresponding squared inter-construct correlation, thus establishing the distinctness of factors from one another.

**Table 3.** *Scale Items, Factors Loadings, Average Variance Extracted (AVE), and Cronbach's Alpha of the Blended Learning Quality Assessment (BLQA)*

| Factors | Scale items | Factor loadings | AVE | Cronbach's alpha |
|---|---|---|---|---|
| Technology Integration (F1) | 1. Use of the latest technology for communication with students | 0.831 | 0.713 | 0.958 |
| | 2. Use of appropriate technology for content delivery | 0.809 | | |
| | 3. Appropriate communication system to provide information to stakeholders | 0.826 | | |
| | 4. Use of technology to improve the learning process | 0.866 | | |
| | 5. Availability of adequate communication facility | 0.799 | | |
| | 6. Training provided to students for efficiently using technical resources. | 0.795 | | |
| | 7. Access to digital resources for self-paced learning | 0.867 | | |
| | 8. Use of technology for improved learning and support of the learning environment | 0.874 | | |
| | 9. Use of blended learning modules to improve student performance | 0.924 | | |
| Pedagogy and Curriculum (F2) | 10. The teaching process involves student participation. | 0.848 | 0.710 | 0.960 |
| | 11. Academic curriculum is designed as per the requirements of the future need. | 0.826 | | |
| | 12. Academic curriculum integrates sufficient practical training. | 0.812 | | |
| | 13. Students' feedback is considered by management. | 0.820 | | |
| | 14. Provides scope for experiential learning for the enhanced learning experience | 0.895 | | |
| | 15. Students' participation is encouraged in academic decisions. | 0.864 | | |

| | | | | |
|---|---|---|---|---|
| | 16. Use of advanced teaching methods and pedagogies | 0.877 | | |
| | 17. Development of soft skills through training | 0.873 | | |
| | 18. Quality of seminars and conferences | 0.765 | | |
| Physical Infrastructure (F3) | 19. Updated library and related learning resources | 0.824 | 0.656 | 0.864 |
| | 20. Healthy and high-quality food in the hostels | 0.665 | | |
| | 21. Appropriate ambiance for learning | 0.859 | | |
| | 22. Infrastructure facilities to facilitate students' learning | 0.875 | | |
| Educator Proficiency (F4) | 23. Qualified teachers | 0.905 | 0.806 | 0.940 |
| | 24. Supportive and student-friendly teachers | 0.929 | | |
| | 25. Efficiency of teachers in delivering course content | 0.909 | | |
| | 26. Teachers with adequate industry exposure | 0.846 | | |

**Table 4.** *Correlation Matrix*

| | F1 | F2 | F3 | F4 |
|---|---|---|---|---|
| F1 | 1 | 0.706 | 0.673 | 0.692 |
| F2 | | 1 | 0.646 | 0.618 |
| F3 | | | 1 | 0.528 |
| F4 | | | | 1 |

## Discussion

The purpose of the study was to develop and validate the Blended Learning Quality Assessment for higher education institutions. The new scale is comprised of dimensions—technology integration, pedagogy and curriculum, physical infrastructure, and educator proficiency—that integrate aspects of technology into education management. Results highlight preferences for high-quality digital infrastructure and technology integration into processes. The focus on technology during and after the pandemic (Zhao & Watterston, 2021) resonates with the study's findings. The items in the technology integration factor demonstrate that students not only expect access to digital resources but also require appropriate training to use them well. This factor is novel, as earlier studies have not emphasized technology integration as a distinct factor.

The items in the pedagogy factor make evident that using the latest technology for communication, content delivery, learning process improvement, access, and training has become a significant service dimension. The discussions under this factor also indicated that the participation of students in designing and delivering pedagogy is desired. The courses must be updated regularly per industry needs, as the pace of change in the external environment is relatively frequent, and students need to be up to date with it. These findings are

consistent with Bhagat et al. (2021), who emphasized the importance of course design and learning experience in measuring the blended learning course experience.

The physical infrastructure factor consists of items related to the ambiance and updated library, highlighting the need to recognize and improve contemporary aspects of physical infrastructure. Students also require teachers with skill and industry exposure (the educator proficiency factor) as being at the threshold of working life; they want significant adept guidance. This finding is consistent with those of Matosas-López et al. (2019), which highlighted the importance of communication between teachers and students and the importance of teachers' competency.

A significant omission in this scale is the redundancy of administrative services, a dimension used in several scales (e.g., Abdullah, 2006; Tsinidou et al., 2010). The role of non-teaching staff in student satisfaction has been significantly reduced, due to the establishment of digital communication channels with students. These findings highlight students' changing perspectives on quality, and the proposed measurement scale enables institutions to address it.

In relation to prior research, our findings align with the broader trends identified by Zhao and Watterston (2021), indicating that higher education institutions are incorporating technology into their operational and strategic decisions, a trend reinforced by the preferences highlighted in this study. However, a noteworthy departure from some existing scales is the exclusion of administrative services as a separate dimension, reflecting the diminishing role of non-teaching staff in student satisfaction due to the establishment of digital communication channels.

## Implications of the Study

Measuring quality management processes helps institutions identify where they excel and where they can improve. The BLQA scale complements other quality measurement instruments to attain total quality management within the system. Blended learning is no longer a choice or a separate arm for educational institutions, but the sound foundation on which education and learning must be redesigned. This new paradigm requires multidimensional quality assessment to measure and monitor it. The theoretical and practical implications of the study are as follows.

1. The scale addresses the application of digital technology in curriculum, pedagogy, communication, and infrastructure and offers a comprehensive tool by which to assess the performance level of blended learning programs.
2. The measurement scores can be used to identify the dimensions contributing most to student satisfaction, in order to focus on and improve the areas of concern. These scores can also identify segments of students with different quality preferences, which will help institutions plan and strategize provision of services in relation to target groups.
3. With the firm establishment of blended learning, student expectations of quality are not limited to course structure and delivery but extend to physical infrastructure. As there are more face-to-face interactions in a blended learning model than in open and distance learning models, satisfaction in the infrastructure dimension becomes increasingly important.

The COVID-19 pandemic led to a paradigm shift in service expectations, wherein digital integration in infrastructure and pedagogy, as well as industry exposure in the curriculum, have all become prominent aspects of quality. There is a strong inclination among students and faculty to continue using technologies for teaching and learning processes and for student progress monitoring that were adopted during the pandemic. The study results are relevant to the prevailing scenario of higher education institutions. Narrowing the gap between delivery and expectation can improve trust and brand building for the institution. Institutions have been

investing in upgrading technology, including computer simulations and artificial intelligence, to offer students optimal learning opportunities. Investment in and establishment of blended learning programs, enhanced by continuous monitoring and improvement, are essential to providing students with the best possible learning experience. This scale will help policymakers and institutions of higher education attain this objective.

### Limitations

Limitations should be acknowledged. Respondents were selected from two universities only; thus, the study is limited in its generalizability due to the small sample size.

Also, the same sample has been used to conduct both EFA and CFA, which limits the scale's reliability. Further analysis needs to be done on different EFA and CFA samples to ensure the scale's reliability. Additionally, the scale can be further tested on a larger sample size in different educational settings. A comparative analysis of results from public and private educational institutions can be done for a better understanding of student expectations that may differ among private and public institutions.

## Conclusion

This study delved into assessing quality management processes in the context of blended learning, focusing on dimensions such as technology integration, pedagogy and curriculum, physical infrastructure, and educator proficiency. The findings contribute valuable insights into evolving student preferences and expectations in the rapidly changing landscape of higher education. The proposed measurement scale, the BLQA, encapsulates digital issues across curriculum, pedagogy, communication, and infrastructure, providing a comprehensive tool by which institutions can gauge their performance in blended learning. It is evident from the study that, in the wake of the pandemic and the subsequent integration of technology into higher education, quality expectations have expanded. The significance of physical infrastructure, including ambiance and updated libraries, has become apparent in blended learning, where face-to-face interactions play a pivotal role.

## References

Abdullah, F. (2006). The development of HEdPERF: A new measuring instrument of service quality for the higher education sector. *International Journal of Consumer Studies*, *30*(6), 569–581. https://doi.org/10.1111/j.1470-6431.2005.00480.x

Adot, E., Akhmedova, A., Alvelos, H., Barbosa-Pereira, S., Berbegal-Mirabent, J., Cardoso, S., Domingues, P., Franceschini, F., Gil-Doménech, D., Machado, R., Maisano, D. A., Marimon, F., Mas-Machuca, M., Mastrogiacomo, L., Melo, A. I., Miguéis, V., Rosa, M. J., Sampaio, P., Torrents, D., & Xambre, A. R. (2023). SMART-QUAL: A dashboard for quality measurement in higher education institutions. *International Journal of Quality & Reliability Management*, *40*(6), 1518–1539. https://doi.org/10.1108/IJQRM-06-2022-0167

Almahasees, Z., & Qassem, M. (2022). Faculty perception of teaching translation courses online during Covid-19. *PSU Research Review*, *6*(3), 205–219. https://doi.org/10.1108/PRR-12-2020-0044

Anthony, B., Kamaludin, A., Romli, A., Raffei, A. F. M., Eh Phon, D. N. A. L., Abdullah, A., & Ming, G. L. (2022). Blended learning adoption and implementation in higher education: A theoretical and systematic review. *Technology, Knowledge and Learning*, *27*(2), 531–578. https://doi.org/10.1007/s10758-020-09477-z

Azorín, C. (2020). Beyond COVID-19 supernova: Is another education coming? *Journal of Professional Capital and Community*, *5*(3/4), 381–390. https://doi.org/10.1108/JPCC-05-2020-0019

Becket, N., & Brookes, M. (2006). Evaluating quality management in university departments. *Quality Assurance in Education*, *14*(2), 123–142. https://doi.org/10.1108/09684880610662015

Bervell, B., Umar, I. N., Kumar, J. A., Asante Somuah, B., & Arkorful, V. (2021). Blended Learning Acceptance Scale (BLAS) in distance higher education: Toward an initial development and validation. *SAGE Open*, *11*(3). https://doi.org/10.1177/21582440211040073

Bhagat, K. K., Cheng, C.-H., Koneru, I., Fook, F. S., & Chang, C.-Y. (2021). Students' Blended Learning Course Experience Scale (BLCES): Development and validation. *Interactive Learning Environments*, *31*(6), 3971–3981. https://doi.org/10.1080/10494820.2021.1946566

Boghossian, P. (2006). Behaviorism, constructivism, and Socratic pedagogy. *Educational Philosophy and Theory*, *38*(6), 713–722. https://doi.org/10.1111/j.1469-5812.2006.00226.x

Bordoloi, R., Das, P., & Das, K. (2021). Perception towards online/blended learning at the time of Covid-19 pandemic: An academic analytics in the Indian context. *Asian Association of Open Universities Journal*, *16*(1), 41–60. https://doi.org/10.1108/AAOUJ-09-2020-0079

Byrne, B. M. (2014). *Structural equation modeling with LISREL, PRELIS, and SIMPLIS: Basic concepts, applications, and programming*. Psychology Press.

Castro, R. (2019). Blended learning in higher education: Trends and capabilities. *Education and Information Technologies*, *24*(4), 2523–2546. https://doi.org/10.1007/s10639-019-09886-3

Chuang, S. (2021). The applications of constructivist learning theory and social learning theory on adult continuous development. *Performance Improvement*, *60*(3), 6–14. https://doi.org/10.1002/pfi.21963

Costello, A. B., & Osborne, J. (2019). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research, and Evaluation*, *10*, Article 7. https://doi.org/10.7275/JYJ1-4868

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Garrison, D. R., & Vaughan, N. D. (2007). *Blended learning in higher education: Framework, principles, and guidelines*. Jossey-Bass. https://doi.org/10.1002/9781118269558

Ghazali, N., Nordin, M. S., & Ahmad, T. B. T. (2021). Development and validation of Student's MOOC-efficacy Scale: Exploratory factor analysis. *Asian Journal of University Education*, *17*(4), 327–339. https://doi.org/10.24191/ajue.v17i4.16182

Ginns, P., & Ellis, R. (2007). Quality in blended learning: Exploring the relationships between on-line and face-to-face teaching and learning. *The Internet and Higher Education*, *10*(1), 53–64. https://doi.org/10.1016/j.iheduc.2006.10.003

Ginns, P., & Ellis, R. A. (2009). Evaluating the quality of e-learning at the degree level in the student experience of blended learning. *British Journal of Educational Technology*, *40*(4), 652–663. https://doi.org/10.1111/j.1467-8535.2008.00861.x

Government of India. (2023). All India Survey on Higher Education 2021–22. https://aishe.gov.in/aishe/viewDocument.action?documentId=353

Hair, J. F., Black, B., Babin, B., Anderson, R., & Tatham, R. (Eds.). (2006). *Multivariate data analysis* (6th ed). Pearson Prentice Hall.

Harvey, L., & Williams, J. (2010). Fifteen years of *Quality in Higher Education* (part 2). *Quality in Higher Education*, *16*(2), 81–113. https://doi.org/10.1080/13538322.2010.485722

Hung, M.-L., Chou, C., Chen, C.-H., & Own, Z.-Y. (2010). Learner readiness for online learning: Scale development and student perceptions. *Computers and Education*, *55*(3), 1080–1090. https://doi.org/10.1016/j.compedu.2010.05.004

Ip, R. K. F., Iong, S. I. F., Wu, M. X. Y., & Wang, S. S. Y. (2017, December 14–18). *A preliminary study on teaching quality assessment from the perspective of "students as customers."* 2017 IEEE 6th International Conference on Teaching, Assessment, and Learning for Engineering, Hong Kong, China. https://doi.org/10.1109/TALE.2017.8252376

Kapuscinski, A. N., & Masters, K. S. (2010). The current status of measures of spirituality: A critical review of scale development. *Psychology of Religion and Spirituality*, *2*(4), 191–205. https://doi.org/10.1037/a0020498

Kasat, K., Shaikh, N., Chandrachud, M., & Saini, J. R. (2019, November 11–13). *Impact of flipped classroom on engagement of post-graduate students under the faculty of social sciences*. 12th Annual Conference of Education, Research and Innovation, Seville, Spain. https://doi.org/10.21125/iceri.2019.1803

Kassab, S. E., Al-Shafei, A., Salem, A.-H., & Otoom, S. (2015). Relationships between the quality of blended learning experience, self-regulated learning, and academic achievement of medical students: A path analysis. *Advances in Medical Education and Practice, 6*, 27–34. https://doi.org/10.2147/AMEP.S75830

Kline, R. B. (2005). *Principles and practice of structural equation modeling* (2nd ed). Guilford.

Koruga, N., Nainwal, R., & Ayisi-Addo, A. K. (2023). Teachers' perspectives in higher education on using educational technology during the COVID-19 pandemic: Observations for Ghana, India, and Serbia. *Higher Learning Research Communications*, *13*(1), 93–108. https://doi.org/10.18870/hlrc.v13i1.1349

Kumar, S., & Dash, M. K. (2014). The INSTAQUAL scale: An instrument for measuring service quality of management institutions. *International Journal of Services, Economics and Management*, *6*(4), 377–394. https://doi.org/10.1504/IJSEM.2014.068279

Leonnard, L. (2018). The performance of SERVQUAL to measure service quality in a private university. *Journal on Efficiency and Responsibility in Education and Science*, *11*(1), 16–21. https://doi.org/10.7160/eriesj.2018.110103

Liu, L., Liu, X., & Xu, F. (2021, January 18–20). *The study of quality evaluation model for the real-time interactive online teaching*. 10th International Conference on Educational and Information Technology, Chengdu, China. https://doi.org/10.1109/ICEIT51700.2021.9375621

Mahapatra, S. S., & Khan, M. S. (2007). A framework for analyzing quality in education settings. *European Journal of Engineering Education*, *32*(2), 205–217. https://doi.org/10.1080/03043790601118606

Matosas-López, L., Aguado-Franco, J. C., & Gómez-Galán, J. (2019). Constructing an instrument with behavioral scales to assess teaching quality in blended learning modalities. *Journal of New Approaches in Educational Research*, *8*(2), 142. https://doi.org/10.7821/naer.2019.7.410

Morgado, F. F. R., Meireles, J. F. F., Neves, C. M., Amaral, A. C. S., & Ferreira, M. E. C. (2018). Scale development: Ten main limitations and recommendations to improve future research practices. *Psicologia: Reflexão e Crítica*, *30*, Article 3. https://doi.org/10.1186/s41155-016-0057-1

Müller, C., Mildenberger, T., & Steingruber, D. (2023). Learning effectiveness of a flexible learning study programme in a blended learning design: Why are some courses more effective than others? *International Journal of Educational Technology in Higher Education*, *20*, Article 10. https://doi.org/10.1186/s41239-022-00379-x

Nikou, S., & Maslov, I. (2023). Finnish university students' satisfaction with e-learning outcomes during the COVID-19 pandemic. *International Journal of Educational Management*, *37*(1), 1–21. https://doi.org/10.1108/IJEM-04-2022-0166

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988). SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. *Journal of Retailing*, *64*(1), 12–40.

Parnell, J. A., & Carraher, S. (2003). The Management Education by Internet Readiness (MEBIR) scale: Developing a scale to assess personal readiness for internet-mediated management education. *Journal of Management Education*, *27*(4), 431–446. https://doi.org/10.1177/1052562903252506

Parnell, J. A., & Carraher, S. (2005). Validating the Management Education by Internet Readiness (MEBIR) scale with samples of American, Chinese, and Mexican students. *Journal of Education for Business*, *81*(1), 47–54. https://doi.org/10.3200/JOEB.81.1.47-54

Pithers, R. T., & Soden, R. (2000). Critical thinking in education: A review. *Educational Research*, *42*(3), 237–249. https://doi.org/10.1080/001318800440579

Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research, 8*(2), 23–74. https://doi.org/10.23668/PSYCHARCHIVES.12784

Steiger, J. H. (2007). Understanding the limitations of global fit assessment in structural equation modeling. *Personality and Individual Differences*, *42*(5), 893–898. https://doi.org/10.1016/j.paid.2006.09.017

Tabachnick, B. G., & Fidell, L. S. (2019). *Using multivariate statistics* (7th ed). Pearson.

Taber, K. S. (2018). The use of Cronbach's alpha when developing and reporting research instruments in science education. *Research in Science Education*, *48*(6), 1273–1296. https://doi.org/10.1007/s11165-016-9602-2

Teeroovengadum, V., Kamalanabhan, T. J., & Seebaluck, A. K. (2016). Measuring service quality in higher education: Development of a hierarchical model (HESQUAL). *Quality Assurance in Education*, *24*(2), 244–258. https://doi.org/10.1108/QAE-06-2014-0028

Tezer, M., Yildiz, E. P., & Uzunboylu, H. (2018). Online authentic learning self-efficacy: A scale development. *Quality & Quantity*, *52*(S1), 639–649. https://doi.org/10.1007/s11135-017-0641-1

Tsinidou, M., Gerogiannis, V., & Fitsilis, P. (2010). Evaluation of the factors that determine quality in higher education: An empirical study. *Quality Assurance in Education*, *18*(3), 227–244. https://doi.org/10.1108/09684881011058669

Tzafilkou, K., Perifanou, M., & Economides, A. A. (2022). Development and validation of Students' Digital Competence Scale (SDiCoS). *International Journal of Educational Technology in Higher Education*, *19*, Article 30. https://doi.org/10.1186/s41239-022-00330-0

Virani, S. R., Saini, J. R., & Sharma, S. (2023). Adoption of massive open online courses (MOOCs) for blended learning: The Indian educators' perspective. *Interactive Learning Environments*, *31*(2), 1060–1076. https://doi.org/10.1080/10494820.2020.1817760

Wong, L., Tatnall, A., & Burgess, S. (2014). A framework for investigating blended learning effectiveness. *Education + Training*, *56*(2/3), 233–251. https://doi.org/10.1108/ET-04-2013-0049

Yildiz, S. M., & Kara, A. (2009). The PESPERF scale: An instrument for measuring service quality in the school of physical education and sports sciences (PESS). *Quality Assurance in Education*, *17*(4), 393–415. https://doi.org/10.1108/09684880910992359

Zhang, W., & Zhu, C. (2020). Blended learning as a good practice in ESL courses compared to F2F learning and online learning. *International Journal of Mobile and Blended Learning*, *12*(1), 64–81. https://doi.org/10.4018/IJMBL.2020010105

Zhang, Y., & Chen, T. (2021). *Students' choosing willingness on different types of blended courses and its influencing factors* [Conference paper]. International Conference on Computer Application and Information Security, Wuhan, China. https://doi.org/10.1117/12.2637488

Zhao, Y., & Watterston, J. (2021). The changes we need: Education post COVID-19. *Journal of Educational Change*, *22*(1), 3–12. https://doi.org/10.1007/s10833-021-09417-3

# Appendix

**Focus Group Discussion on Quality Measurement of Blended Learning Models in Higher Education**

Focus Group Number: _____

University Name: _____

Stream: _____

Date: _____

Place: _____

Start Time: _____

End Time: _____

**Guide For Interviewer/Moderators**

**Activity 1:** Give participants a brief overview of the discussion's purpose.

**Activity 2:** Introduction of participants

**Activity 3:** Topic discussion (Use prompts/questions to enquire in detail.)

**Method:** Semi-structured

**Details of Participants**

| Participant No. | Name | Age | Gender (M/F) | Course enrolled | Batch (year) |
|---|---|---|---|---|---|
| **1** | | | | | |
| **2** | | | | | |
| *Continued* | | | | | |

**Questions for the Participants**

1. What do you understand about "blended learning"? How do you think it is different from the traditional mode?
2. Which course you are enrolled in?
3. How is the course structured? Give details about the number of classes, practical training (if included), teaching mode (how many classes are online/offline), and tools used.
4. How has your course experience been? What aspect do you think needs improvement, and why?
5. What areas do you think your institution and faculty should focus on to improve the quality of blended learning? (Include what worked well and what needs improvement as per your experience.)
6. If you have to measure the effectiveness of the blended learning model in your university, what parameters do you want to consider?

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