Designing A Blended Learning Model for Public Sector Universities of Pakistan

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Abstract

The purpose of this study is to develop a blended learning model for public sector universities in Pakistan. A mixed method of research was adopted with a pragmatic research philosophy. This study consists of several steps; first, a group interview with university teachers was conducted to explore their perception of e-learning. Simultaneously, extensive literature was reviewed. This step helped in defining factors and requirements for the blended learning model. The second step was the development of a blended learning model. The model was developed and validated through several tests. In the third step, once the blended learning model was developed, software was designed according to the model by outsourcing. Public sector university teachers were asked to implement and test the model in their classrooms. The feedback on the blended learning model was collected from university teachers and students. Public sector university teachers and students found the model effective and useful for the teaching-learning process. However, some challenges and the need for improvement were proposed.

Keywords: *Blended learning, Educational Technology, Traditional Universities, Pakistan, Higher Education, Model development*

Introduction

The concept of the blended learning model is not new at all. This model is based on integrating physical and technology-based (online) classroom environments, in which the classroom ratio is divided among the physical and online classes (Sarrab, 2019). The ratio for both moods of teaching is decided according to the institutional organization, needs, or the instructor's convenience. In the blended learning model, all the teaching-learning activities, such as teaching by different methods, communication, discussion, homework, assessment, and feedback, occur in both teaching environments (Cronje, 2020).

Due to the advancement of computer information technology, internet learning tools are rapidly increasing. These tools help make the teaching-learning process easier (Picciano, 2021). The blended learning model is enriched with the balance of learning activities and pedagogical side. Bokolo et al. (2020) stated that the blended learning model is fruitful for higher educational institutes. Higher educational institutes can encourage students to learn and motivate them by implementing a blended learning model. The variety of learning activities and communication moods increase the learning outcomes (Yulianti & Sulistiyawati, 2020).

Dakhi et al. (2020) stated that students can build new knowledge and develop skills with the help of technology-based learning instruments. The blended learning model supports learners in managing their time, learning with autonomy, and increasing their skills. Bouilheres et al. (2020) urged that the real advantage of the e-learning instrument can be achieved by implementing a blended learning model.

Blended learning supports students in the higher education system and provides them with a substitute for the traditional learning environment of Pakistan (Chen et al., 2022). The blended learning model increases confidence, self-responsibility, self-learning, time management, and communication skills and adjusts them to a new learning environment (Soomro et al., 2022). The recent pandemic of COVID-19 increased the importance of the blended learning environment. Student may manage their learning by reducing traveling and physical interaction. During the pandemic, several institutes strived to convert their educational activities to an online learning system, but most failed to achieve desirable results (Rehman & Khan, 2021). During COVID-19, several reasons contributed to the failure of the online learning system, such as a lack of

technological and pedagogical skills, a lack of resources, and less experience in technology-based learning (Dakhi et al., 2020).

Irum et al. (2020) stated that the administration of the educational institutes of Pakistan shows a keen interest in implementing the blended learning system. For the successful implementation of the blended learning model, Pakistani educational institutes must increase the required technical and pedagogical resources. Additionally, several other ground realities, such as electricity power supply, access to compatible computers, laptops, or other learning devices, and uninterrupted internet connectivity, are major problems in implementing online learning systems (Almaiah et al., 2020).

This existing literature shows that the development and implementation of a blended learning model for public higher educational institutes in Pakistan is a crucial and challenging task. The blended learning model supports the educational institutes, teachers, and students in running smooth educational activities (Kazi & Moghal, 2019). This study aims to develop a blended learning model that hinders the challenges of e-learning and supports a smooth teaching-learning process.

Significance of the Study

This study aims to develop a blended learning model for public sector higher education institutes in Pakistan. This study will provide a comprehensive blended learning model with a special context of public sector universities of Pakistan. Factors for blended learning in Pakistan will be discussed in the study. Additionally, it will help higher education institutes to transform into blended learning environments. Teachers and students will make teaching-learning easier by adopting a blended learning model.

Objective of Study

The following are the objectives of the study:

General Objective

RO1. To develop a blended learning model for public sector universities in Pakistan.

Specific Objectives

RO2. To identify factors affecting blended learning in public sector universities of Pakistan.

RO3. To develop a model of blended learning for public sector universities of Pakistan.

RO4. To implement the model at an activity level based in a public sector university in Pakistan.

Research Questions

The responses to the following research questions will be focused in the study.

1. Which factors need to be considered while developing a blended learning model for public sector universities of Pakistan?
2. What are the requirements for developing a blended learning model?
3. How were the factors mentioned above and requirements used to develop a blended learning model for public sector universities of Pakistan?
4. In which dimensions the evaluation of implementation and applicability is made?

Literature Review

Xu et al. (2023) stated that Blended learning is a learning system combining multiple instructional methods and delivery media. According to Ustun (2018), blended learning is an educational terminology that combines face-to-face and technology-based learning environments. Blended learning enables the association of computer information technology in traditional classrooms (Siripongdee et al., 2020). Blended learning is the long-term integration of computer information technology with traditional educational practices (Bizami et al., 2023). Blended learning combines physical and online learning styles, with 30-79% online content delivery. It could be blended with pedagogy, didactic, and mode of delivery (Ibrahim & Nat, 2019). Few researchers believe content distribution should be equal (Armellini & Rodriguez, 2021).

Factors in the Development of Blended Learning Model

The development of a blended learning model is one the most crucial steps; several factors contribute to the development of a blended learning model. Communication is one of the main factors in the effective development and implementation of the blended learning model (Guo et

al., 2023). Both types of communication, i.e., asynchronous and synchronous, affect student learning and satisfaction. The challenges of these communication types occur in the physical and online learning environment. The responsibility of teachers in the blended learning model is to design an effective communication system (Ismail & Yassin, 2023).

The user-friendly environment of an e-learning platform affects the success of the blended learning model (Guo et al., 2023). Easy to use and easy to reach, the features of the technology-based platforms increase students' satisfaction and motivation to use the blended learning model. An effective e-learning environment provides multiple opportunities for students to interact with instructors, students, and learning material (Al-Shami et al., 2018).

The availability of the technological and physical infrastructure plays an important role in the success of the blended learning model. A comprehensive training program must be arranged for the teachers and students to make the technology-based learning environment more effective (Truss & Anderson, 2023). Teachers training on developing a well-established course design encourage students toward the blended learning model. As well, the use of an appropriate pedagogical approach for teaching-learning increases students' readiness and motivation (Yang et al., 2023).

Requirements for Developing a Blended Learning Model

The interaction between the physical and e-learning learning environment plays a significant role in developing the blended learning model (Suryono et al., 2023). Development of the blended learning model requires multiple elements which directly affect the learning process. The balanced arrangement of the physical and e-learning activities in the blended learning model is one of the basic requirements (Alam & Mohanty, 2023). The blended learning model is based on blending the learning mentioned above environments. This model requires effective modes of communication, course distribution, teaching methodologies, learning activities, course material, assessment, and feedback in both learning environments (Dixon & Kirmes, 2020).

A well-developed technological infrastructure is a basic requirement for developing the blended learning model. As a merger of physical and technology-based learning activities, the importance of both environments increases to be well-managed (Almaiah et al., 2020). The weakness of

anyone's learning environment affects the blended learning model. A customized e-learning platform supports the development of a blended learning model (Alam & Mohanty, 2023). Teacher's ability to develop a well-managed and balanced course enhances students' motivation and satisfaction (Ibrahim & Nat, 2019).

Furthermore, the success of the blended learning model depends on the technology skills of teachers and students (Namyssova et al., 2019). Before implementing the blended learning model, a comprehensive training program must be arranged to increase acceptance and motivation toward the model. Teachers feel that technological skills are a barrier to implementing an effective blended learning model (Picciano, 2021). A rapid and well-responded technical support program reduces the possible challenges in implementing the blended learning model (Siripongdee et al., 2020).

A self-directed learning environment increases students' learning and motivation. The blended learning model supports students toward self-pacing and self-direction (Nugroho et al., 2023). The variety of e-learning activities and opportunities helps students manage their learning according to their competencies, time, and place (Mukhtar et al., 2020).

Development of a Blended Learning Model

The transactional distance learning theory of Moore (1993) provides a base for developing the blended learning model. This theory consists of three main elements, i.e., structure, communication, and autonomy. Factors and requirements for the blended learning model merged and designed underneath the elements of transactional distance learning theory.

The content, organization, and design of the course play a critical role in developing the blended learning model. Al-Obaydi (2023) identified several factors, such as course objectives, curriculum design, syllabus, and teaching method, contributing as main factors to the development of the blended learning model. Curriculum design and implementation of course design directly affect the blended learning model (Medina, 2018). The success of the blended learning model depends on the effective organization of the curriculum and its implementation (Yang et al., 2021).

Communication is one of the main factors in developing the blended learning model. It is a key source of sharing ideas, collaborative learning, and open discussion (Pohan & Maulina, 2022). Effective communication increases the interest and motivation of students. The communication is divided into synchronous and asynchronous (Ebenfield et al., 2022). Communication is a key factor in the teaching-learning process, despite the physical and online teaching-learning process (Fan et al., 2023). All the modes of communication are combined in the blended learning model. Therefore, it is crucial to align all modes of communication while developing a balanced blended learning model (Xiao-Dong & Hong-Hui, 2020).

The idea of the blended learning model is based on the freedom of the learner, which facilitates the learner to increase their knowledge and skill without the bounding of time and place (Ebenfield et al., 2022). Students' autonomy increases students' motivation and encourages them toward the learning process Halili et al. (2018). Students' freedom in the teaching-learning process promotes problem-solving, self-regulation, and critical thinking (Wang et al., 2022). It helps students to make decisions about learning paths according to learning styles. Students' autonomy is considered a factor in blended learning mode (Purnama & Sriliasta, 2023).

The interplay between structure, communication, and autonomy shapes the blended learning experience (Pohan & Maulina, 2022). A well-designed structure provides the framework within which communication and interaction occur. Effective communication enhances learner engagement, supports collaborative learning, and ensures learners can access timely guidance and feedback (Cronje, 2020). Conversely, autonomy flourishes when learners are given opportunities to engage with content and peers, make choices, and tailor their learning experiences to their preferences (Fan et al., 2023).

Research Methodology and Design

The research philosophy adopted for this study is pragmatism. This philosophical approach was chosen to create a well-rounded investigation into implementing blended learning within traditional educational environments. The pragmatic research philosophy allowed this study to integrate quantitative and qualitative methods, enabling a holistic investigation into implementing the blended learning model (Hafsa, 2019).

The research design for developing and evaluating the blended learning model in public sector universities follows a systematic and iterative process. A mixed-method research approach was used for this study. First, an extensive literature review was done to identify the key factors and elements for developing the blended learning model. Along with this, a focus group interview was conducted with university teachers to take their perspectives, experiences, and challenges in the blended learning model. Convenient sampling was adopted for the selection of teachers for focus group interviews. After merging the results of the literature review and focus group interview, a blended learning model was developed.

The university teachers evaluated the reliability and validity of the initial model design, and a revised model was developed according to the feedback and recommendations. The revised model was again evaluated and found appropriate. Once the model was finalized, software was developed based on the model. The software development was outsourced. The blended learning model-based software was implemented in a Pakistani public sector university as an activity to evaluate its effectiveness.

To assess the blended learning model's effectiveness and suitability, a questionnaire was adapted from the study of Shahin (2012) with the author's permission. The questionnaire consisted of 43 questions employing a 7-point Likert scale.

The questionnaire's validity was rigorously tested using the content-related evidence method (Anderson et al., 2020). This approach invited a panel of experts to assess the questionnaire. They evaluated the language, terminology, item appropriateness, item relations, and the coverage of all pertinent aspects and dimensions within the subject area. Subsequently, the questionnaire was emailed to 10 lecturers from the University of Karachi for pilot testing. The responses collected were analyzed using SPSS 27. The internal consistency method assessed the questionnaire's reliability, which yielded a Cronbach's Alpha coefficient of 0.972, indicating a high internal consistency among the standardized items.

The University of Karachi is chosen as the site for model implementation. An email is sent to all the teachers at the university, inviting them to participate in the implementation process. Out of the initial interest shown by teachers, 06 teachers ultimately decided to participate in implementing the model. 02 teachers were unable to participate due to their reasons. However, the 04 participating teachers showed dedication and enthusiasm throughout the implementation process. 120 students from different courses and disciplines were involved in the model

implementation. Students experienced a blended learning environment created by the model and engaged in various activities to enhance their learning experience. 02 separate questionnaires were adapted from the study of Shahin (2012) with the author's permission to collect the model's effectiveness feedback from teachers and students.

Discussion and Analysis

The foundation of the new blended learning model is built upon two essential elements, i.e., focus group interviews with university teachers and a comprehensive literature review. The following inputs for the model were derived from interviews with university teachers and a literature review.

Table 1
Derived Input

Derived Input	**Input**	**Resolved by**
Challenges of E-learning	Decrease the number of face-to-face classes	Implement a blended learning approach that combines online and face-to-face components to reduce the reliance on traditional classroom sessions.
	Save the time of teacher and learner.	Optimize the use of online resources and tools to streamline learning processes and minimize time-consuming tasks.
	Utilize the available CIT resources.	Ensure effective utilization of available computer and information technology resources to enhance e-learning experiences.
	Improve instructional strategies	Enhance instructional strategies through research-based approaches, innovative teaching methods, and the integration of multimedia elements.
	Friendly user tools	Select user-friendly tools and applications that are easy to navigate and operate for teachers and learners.
Factors of E-learning	Availability of data	The availability and quality of technological infrastructure, including internet access, hardware (computers, tablets, smartphones), and software, play a fundamental role in enabling e-learning. A reliable, high-speed internet connection, up-to-date devices, and suitable software platforms are essential for effective online learning experiences.
	Pedagogical Design	High-quality learning materials are central to e-learning success. This includes well-structured course content, multimedia resources (videos, simulations, etc.), and interactive elements. Content must be designed to engage learners, promote understanding, and facilitate self-paced learning.
	Content Development	Sound pedagogical principles underpin effective e-learning. The choice of instructional strategies, assessment methods, and learning activities should align with educational goals and cater to diverse learning styles. Instructional designers and educators need expertise in creating engaging and effective e-learning experiences.

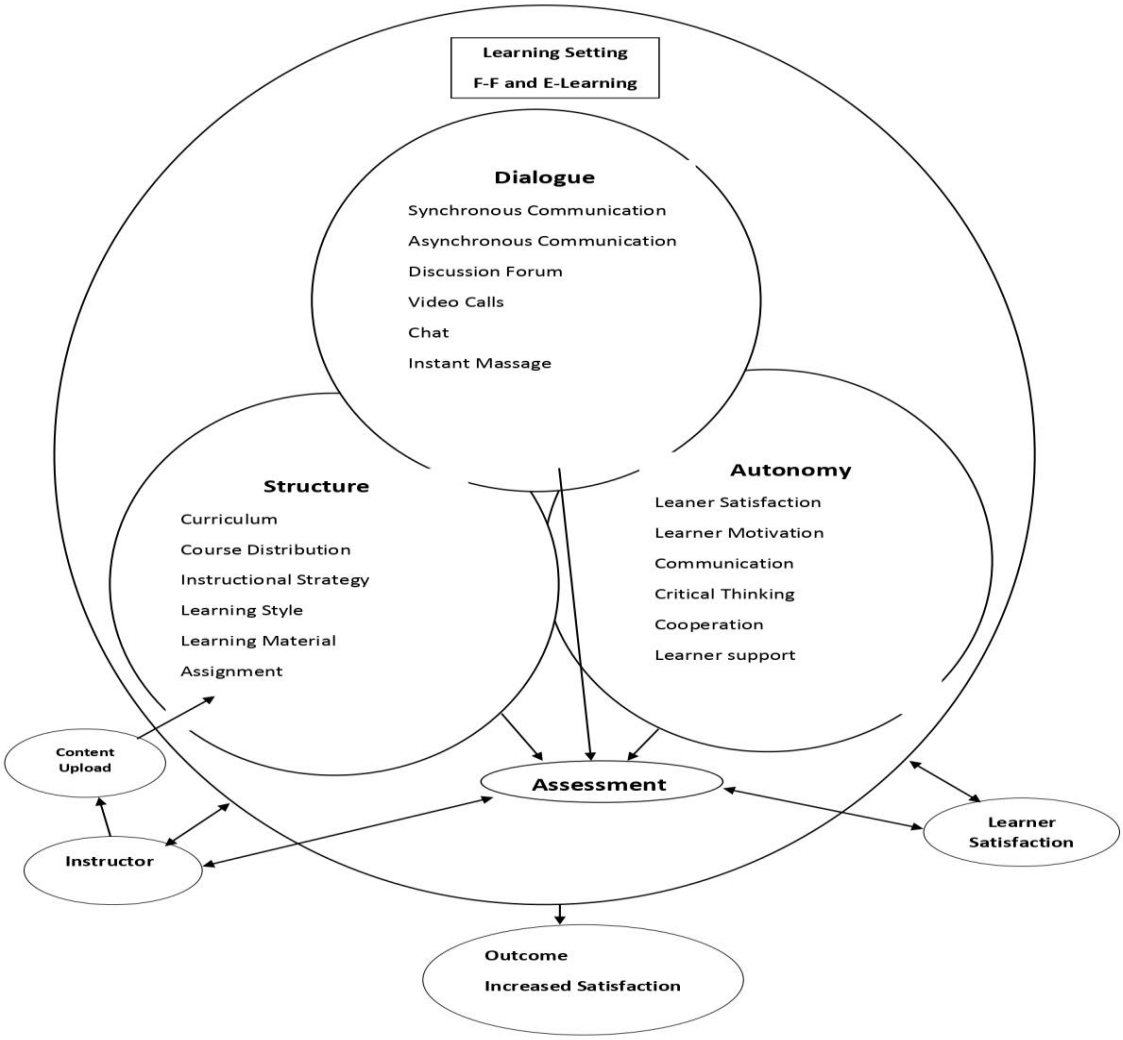
	Learner Engagement	Motivating and sustaining learner engagement is a critical factor. E-learning should incorporate interactive elements, discussion forums, quizzes, and peer-to-peer collaboration to keep learners actively involved. Gamification and social learning features can enhance engagement.
	Instructor Support and Training	Instructors need training and ongoing support to teach in an online environment effectively. They must be proficient in using e-learning tools, facilitating discussions, providing timely feedback, and managing online classrooms.
Qualities of E-learning	User-friendly	Develop an e-learning model that prioritizes user-friendliness, intuitive design, and ease of navigation for teachers and learners.
	Easy layout	Design an e-learning platform with a simple and organized layout to facilitate easy access to course materials and resources.
	Attractive learning environment	Create an engaging and visually appealing online learning environment that motivates and captivates learners.
	Easy to create a new classroom	Provide an easy-to-use interface for teachers to create and set up virtual classrooms quickly.
	Easy to communicate	Offer seamless communication tools and features that facilitate effective interaction between teachers and learners.
	Video conferences without time limitations	Ensure the availability of video conferencing tools that allow uninterrupted communication without time constraints.
Concept of Blended Learning	Pedagogical considerations	Incorporate pedagogical principles and instructional design strategies to ensure effective learning experiences in both online and face-to-face components.
	Technological infrastructure	Establish a robust technological infrastructure that supports the delivery and accessibility of blended learning materials and resources.
	Teacher training and support	Provide comprehensive training and support for teachers to develop their skills in designing and delivering blended learning courses.
	Learner readiness and support	Offer guidance and support to learners to enhance their readiness and ability to navigate and engage in blended learning environments.
	Time management	Implement strategies and tools to assist learners in managing their time effectively and staying organized throughout the blended learning process.
	Evaluation and assessment	Develop appropriate evaluation and assessment methods to measure learning outcomes and provide feedback to learners in blended learning settings.
	Continuous improvement	Continuously assess and improve the blended learning model based on feedback, data analysis, and emerging best practices in the field.
	Providing timely feedback	Ensure timely and constructive feedback is provided to learners to support their learning progress and development.
Instructional Strategies	Learning objectives	Align instructional strategies with clear and measurable learning objectives to guide the design and delivery of learning activities.
	Active learning	Engage learners through active learning strategies such as discussions, group work, problem-solving, and hands-on activities.
	Personalization and differentiation	Adopt instructional approaches that allow for personalized and differentiated learning experiences to meet individual learner needs.

	Multimedia and interactive resources	Integrate multimedia elements and interactive resources to enhance learner engagement and understanding.
	Feedback and assessment	Incorporate regular formative and summative assessments and timely feedback to support learner progress and achievement.
Teacher Characteristics	Pedagogical expertise	Equip teachers with strong pedagogical knowledge and skills to effectively design and deliver blended learning experiences.
	Technological proficiency	Provide teachers with the necessary technological proficiency to effectively utilize e-learning tools and platforms.
	Communication and facilitation skills	Develop teachers' communication and facilitation skills to foster effective interaction and collaboration in blended learning environments.
	Clear instructions	Ensure teachers provide clear and concise instructions to guide learners through the learning activities and assignments.
Learner Characteristics	Self-regulated learning	Promote self-regulated learning skills among learners, including goal setting, time management, and self-assessment.
	Motivation and engagement	Foster learner motivation and engagement through various strategies, such as creating meaningful and relevant learning experiences.
	Digital literacy skills	Develop learners' digital literacy skills to enable them to navigate online platforms, access resources, and effectively participate in digital activities.
	Critical thinking skills	Critical thinking skills Encourage the development of critical thinking skills to enhance learners' ability to analyze and evaluate information in the blended learning context.
	Participate in digital activities.	Facilitate opportunities for learners to actively participate in digital activities, discussions, and collaborative online projects.
Blended Learning Software Problems	Technical issues	Provide technical support to address and resolve technical issues teachers and learners face using the blended learning software.
	User interface and experience	Improve the user interface and experience of the blended learning software to enhance usability and user satisfaction.
	Integration and compatibility	Ensure seamless integration and compatibility of the blended learning software with other tools and systems used in the learning environment.
	Technical support and training	Offer users comprehensive technical support and training to enhance their proficiency using the blended learning software.

In response to the challenges and issues university teachers face in e-learning systems and literature review, a new model has been developed to address these concerns and improve the satisfaction of both learners and teachers (see Figure 01). This new model aims to transform traditional learning into blended learning by considering the factors and qualities discussed earlier. A comprehensive model that incorporated all the identified factors and qualities necessary for effective blended learning was initially developed. This model was then subjected

to a pilot testing phase to evaluate its feasibility and effectiveness. The pilot testing helped identify potential shortcomings or areas for improvement in the model.

Figure 1
Blended Learning Model



During the pilot test phase, the questionnaire, consisting of 43 items and utilizing a 7-point Likert scale, was diligently administered to a sample of faculty members from the University of Karachi. A total of 6 responses were collected from the 10 distributed questionnaires, resulting in a response rate of approximately 60%. A comprehensive examination of item means and Cronbach's Alpha coefficients was undertaken to assess the validity of the questionnaire. The results, as outlined in Table 02, shed light on the reliability and overall perception of the model.

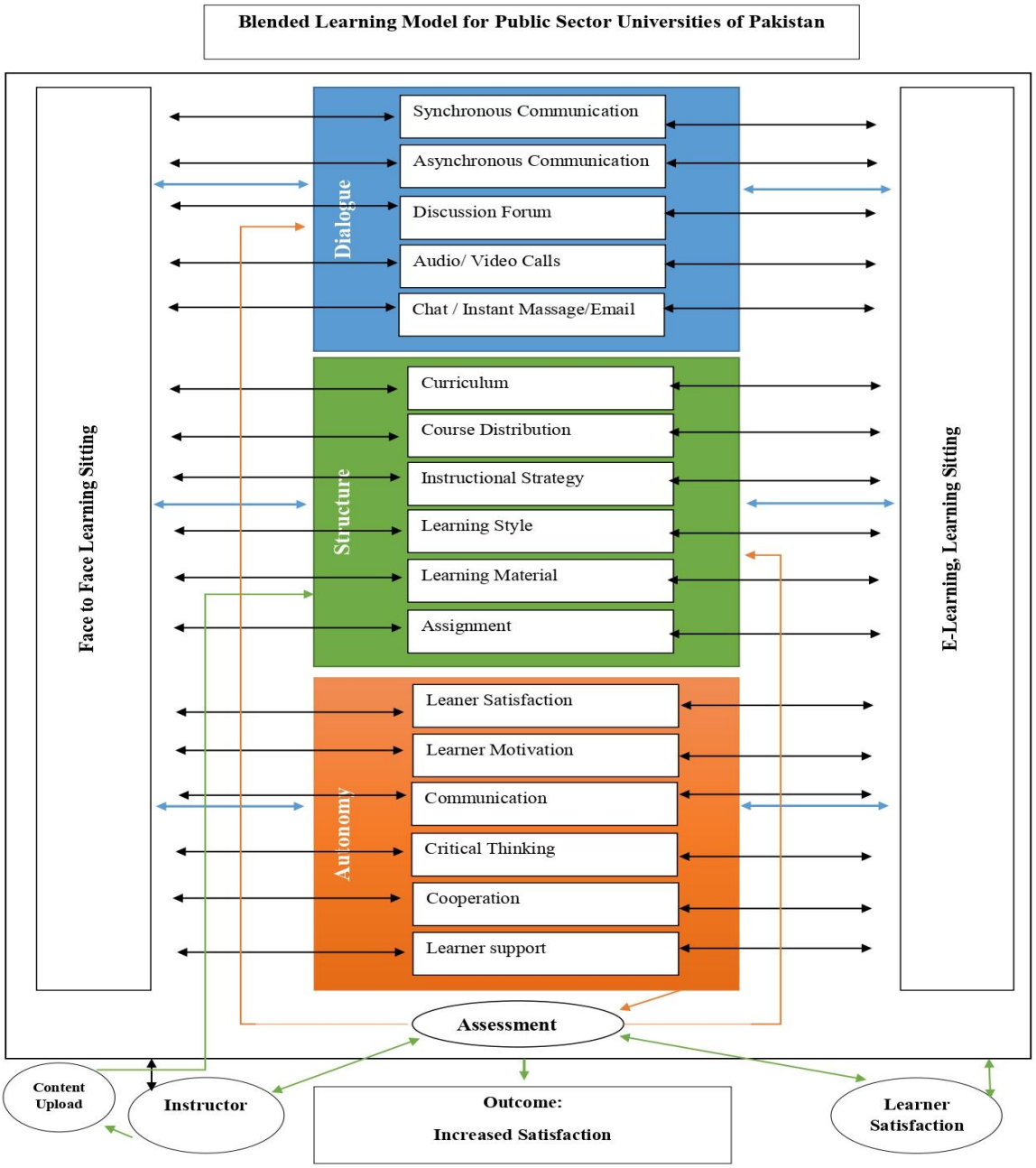
Table 2
Reliability of Model

Item	Mean	Cronbach's Alpha if Item Deleted
1. The Model is:		
Understandable	4.21	.888
Clear	4.00	.888
Complete	3.43	.881
Comprehensive	3.88	.880
Self-Explained	3.81	.888
2. The Graphical Representation is		
Understandable	4.21	.888
Clear	3.88	.888
Complete	3.83	.888
Comprehensive	4.00	.888
Match Textual Explanation	4.43	.888
3. The Textual Explanation of the Model is		
Understandable	4.21	.888
Clear	4.58	.888
Complete	3.83	.888
Comprehensive	3.88	.888
The Components are		
Understandable	4.50	.888
Necessary	4.21	.888
Relevant	4.08	.888
Sufficient	4.38	.888
The Relationship between Components is		
Understandable	3.38	.888
Clear	3.88	.888
Meaningful	3.81	.888
The Graphical Representation of Components is		
Understandable	4.08	.888
Clear	4.00	.888
Suitable	3.83	.888
The Learning Setting Component is		
Necessary	3.88	.888
In the Right Place	4.50	.888

The Dialogue component is		
Necessary	3.88	.888
All subcomponents are relevant	4.21	.868
The Structure Component is		
Necessary	4.00	.868
All subcomponents are relevant	4.36	.868
The Autonomy Component is		
Necessary	4.21	.868
All subcomponents are relevant	4.28	.868
The Content Upload Component is		
Necessary	4.00	.868
In the Right Place	4.43	.868
The Instructor Component is		
Necessary	4.21	.868
The Right Place	4.58	.868
The Learner Satisfaction Component is		
Necessary	4.14	.868
In the Right Place	4.08	.868
The Assessment Component is		
Necessary	3.83	.868
In the Right Place	4.21	.868
The Outcome Component is		
Understandable	3.81	.868
Clear	4.43	.868
Reasonable	4.14	.868

The suggestions and feedback of evaluators were incorporated, and the model was revised accordingly. Both learning sitting, i.e., face-to-face and e-learning, were placed separately on the left and right sides of the model, respectively. The model design was reshaped to make it easier to understand and interlink all the model components. The revised model is shown in Figure 02.

Figure 2
Revised Blended Learning Model



Before converting the revised model into software form and implementing it, it was again evaluated by public-sector university faculty members. The questionnaire was distributed among teaching faculty of public sector higher educational institutes via email and hand. The questionnaire was distributed among 50 faculty members of public sector higher educational institutes; 30 faculty members evaluated the model and gave feedback. The reliability scores

varied across different groups of questions, but overall, the revised model received positive feedback. Respondents generally found the model, its graphical representation, textual explanation, components, relationships, and outcome favorable and acceptable.

Table 3

Revised Model's Group Reliability of Items

Questions	Cronbach's Alpha	Cronbach's Alpha based on standardized items	Mean
The Model (1-5)	.965	.967	3.733
Graphical representation (6-10)	.950	.950	3.977
Textual explanation (11-14)	.716	.723	4.167
Components (15-19)	.795	.909	4.045
Components relationship (17-21)	.977	.979	4.072
Graphical representation of components (22-24)	.700	.700	3.917
G to N (25-40)	.732	.735	4.315
Outcome (41-43)	.737	.737	4.193

Implementation of the Model

Teachers from the University of Karachi implemented the model in their course (s) for two weeks at least. Teachers designed their course topics according to the developed blended learning model. The instructors decided what blended communication system, learning theories, instructional strategy, technology, and content. Although the recommended proportion of blending F2F and internet-based learning is 1:1, the instructors decide the ratio according to the topic or course. A comprehensive orientation of the newly developed model was presented to teachers before implementation. The administrator created the teacher's accounts to create courses, add students, and use models for teaching learning activities and assessments.
Software testing is a critical phase in the development process of any technological system, including educational models like the blended learning system. In the blended learning model context, software testing involves systematically assessing the functionality, usability, and performance of the technology platform that supports the delivery of educational content. The goal of software testing is to identify and rectify any defects, errors, or inconsistencies that might hinder the effective operation of the blended learning system. Various testing methods, such as

functional, usability, performance, and security, ensure that the technology functions as intended and provides a seamless learning experience for instructors and students.

Model Evaluation by Teachers

Teachers appreciated various aspects of the blended learning model that contributed to their positive experiences. A prevailing sentiment was the model's user-friendly nature, facilitating easy navigation and operation. Participants frequently mentioned that the platform "saves time and is easy to use," which enhanced their teaching processes' efficiency. The ability to conduct classes remotely, offering flexibility regarding time and location, was also highlighted. Instructors found it convenient to upload study materials, enabling their students to easily track their progress. Their satisfaction with this technology is reflected in its simplicity: Students found it "very user-friendly and provided a convenient time zone."

Theme-1: Challenges and Concerns

However, participants still identified various challenges and concerns associated with its implementation. A primary cause was technical problems; participants reported difficulties using specific features as well as experiencing frequent glitches; although many instructors found the platform user-friendly overall, certain features were perceived as "hard to use," suggesting improvements may be necessary for certain areas, these difficulties prevented seamless utilization of the model by teachers and students alike and impaired overall experiences; technical issues were seen by several participants as significant drawbacks and was commonly expressed as one significant drawback of its use; one participant highlighted having "few technical issues."

Theme-2: Advantages and Disadvantages

Teachers outlined both the advantages and disadvantages of the blended learning model for teachers. Advantages included using it remotely to upload study materials that enabled students to track their progress easily and an efficient means of teaching and learning processes. On the flip side, participants also noted disadvantages such as more awareness regarding its use; instructors indicated its benefits might be somewhat limited, with some commenting that it only brought benefits "to some extent but not completely," underscoring its subtle impact.

Theme-3: Challenges in Implementation

Teachers emphasized the need to consider broad challenges when implementing the blended learning model, including students' varying interest levels and cooperative behaviors as

challenges. Furthermore, instructors noted that success depended heavily upon resource availability for teaching practices in developing countries; limited awareness about its functions and complexity hindered its smooth integration into teaching practices - one instructor noted difficulties associated with doing group assignments without direct discussions between members within them, reflecting difficulties associated with virtual environments that discourage collaboration among group members.

Theme-4: Assessment and Applicability

Acceptability and acceptance of blended learning models at traditional universities have been explored, along with their benefits, by university teachers. The overall sentiment was positive, with participants acknowledging the model's potential to enhance teaching and assessment practices; some believed it could prove especially helpful if implemented across both lectures and universities; teachers enjoyed its blend of convenience, efficiency, and practicality. However, they also highlighted the need for simplification, clear steps, and proper training or rehearsal to improve user experience.

These themes collectively captured the diverse range of perspectives among teachers regarding the blended learning model. While there was enthusiasm for its positive aspects and potential benefits, there were also valid concerns about technical challenges, implementation difficulties, and the need for proper support and training to harness the model's capabilities fully.

Evaluation by Students

Model evaluation by students involves collecting and analyzing feedback from students who have experienced the blended learning model. This feedback assesses the model's impact on students' learning experiences, engagement, satisfaction, and overall perceptions. Students' feedback was gathered through surveys. The evaluation process considers aspects such as the usability of the technology platform, the effectiveness of the instructional methods, the level of interaction and engagement, the clarity of course materials, and the benefits and challenges of the blended learning approach. Students' opinions and insights are crucial in refining the model and improving continuously based on their preferences and needs. 100 students out of 120 participated in the study.

The provided descriptive statistics table offers a comprehensive overview of the distributional characteristics and central tendencies of the variables examined in the study. Each variable

represents a distinct aspect of the research, and the statistics shed light on the patterns within the collected data.

Table 4
Descriptive Analysis

Variables	N	Minimum	Maximum	Mean	Standard Deviation
Blended Learning Usage	100	1	7	4.412	1.0008
Blended Learning Effectiveness	100	2	7	4.401	1.0027
Class Interaction	100	3	7	4.429	1.0076
BL Model-Performance	100	2	7	4.489	1.0045
Satisfaction	100	2	7	4.441	1.0562

The "Blended Learning Usage" dataset comprises 100 observations. The range of responses spans from a minimum of 1 to a maximum of 7, reflecting the participants' engagement with blended learning practices. The mean score, standing at approximately 0.412, provides an average indication of their reported usage. The associated standard deviation of around 1.0008 underscores the variability in the participants' responses.

In the "Blended Learning Effectiveness," the same sample size of 100 observations is observed. Scores in this category range from a minimum of 2 to a maximum of 7, showcasing the diverse perceptions of the effectiveness of blended learning. The mean score, at about 0.401, offers an insight into the average perceived effectiveness. The standard deviation of roughly 1.0027 indicates the extent of dispersion around this mean.

Regarding "Class Interaction," the dataset again comprises 100 observations. The recorded responses span from a minimum of 3 to a maximum of 7, reflecting the spectrum of reported interaction levels within the classroom context. The mean score, approximately 0.429, signifies the central tendency of these reported interactions. The standard deviation of about 1.0076 highlights the variability in the participants' responses.

For the "BL Model-Performance" variable, the sample size remains constant at 100 observations. Responses range from a minimum score of 2 to a maximum score of 7, revealing the range of perceptions concerning the performance of the blended learning model. With a mean score of around 0.489, an understanding of the average model performance emerges. The standard deviation, approximately 1.0045, speaks to the dispersion of scores around this mean.

Lastly, with "Satisfaction," the dataset includes 100 observations. Scores span from a minimum of 2 to a maximum of 7, portraying the spectrum of reported satisfaction levels. The mean score,

approximately 0.441, offers an insight into the average satisfaction reported by participants. The associated standard deviation of around 1.0562 underscores the extent of variability in these satisfaction ratings.

In summary, the descriptive statistics encapsulate the central tendencies and spread of responses across the variables studied. These statistics provide a valuable snapshot of participants' perspectives and engagement across different dimensions of blended learning, contributing to the overall understanding of the research outcomes.

Conclusion and Discussion

Discussion

The feedback on the blended learning model from the traditional university teachers through an open-ended questionnaire and from students through a close-ended questionnaire expresses their satisfaction with the newly developed blended learning model. The qualitative and quantitative data provide an in-depth understanding and strengthen the study. The results showed teachers and students expressed overall satisfaction with the blended learning model.

Evaluating teachers' perspectives on the blended learning model provides valuable insights into the educational approach's strengths, challenges, and potential. The identified themes shed light on the multifaceted nature of implementing such a model within traditional educational settings. The discussion of these themes provides a comprehensive understanding of teachers' viewpoints, highlighting both the benefits and areas for improvement.

Conversely, the students' viewpoint about the blended learning model provides satisfactory results. The feedback from the students reveals the different segments of the blended learning model. Students' feedback expresses their engagement and positive learning. The feedback from the students shows their satisfaction in the technology-based learning environment. However, they urge to increase the effectiveness of the model.

Comparing both teachers' and students' feedback highlights the extensive viewpoints of both users. Due to several internal and external factors, adaptation of technology-based learning in developing countries remains a challenge. The analysis of results collectively underscores the importance of blended learning practices, effectiveness, class interaction, and model

performance in influencing student satisfaction. These findings align with the broader understanding that technology-enhanced learning environments can positively shape students' educational experiences.

Conclusions

This study has successfully created and assessed a blended learning model tailored to Pakistani public sector universities. This model has been carefully constructed to address the challenges encountered by university educators when implementing blended learning while still including essential elements and qualities for its successful implementation. This study's results are clear evidence of the model's ability to bolster pedagogy approaches, foster learner engagement and autonomy, and create an ideal learning environment. Moore's Transactional Distance Learning Theory strengthens the theoretical underpinnings of Moore's model further. However, it is crucial to acknowledge its limitations as well as plan future research endeavors aimed at refining and broadening its applicability.

Overall, the creation and evaluation of this blended learning model represent an essential step towards increasing educational standards at public sector universities in Pakistan. By effectively addressing the challenges associated with e-learning and incorporating essential components and qualities, this model presents an organized and comprehensive methodology for creating captivating yet successful learning experiences. Moore's transactional distance learning theory forms the theoretical basis of this blended learning model, providing invaluable insight into the intricacies of digital teaching and learning environments. As universities in Pakistan embrace digital transformation, this blended learning framework promises to drive higher education forward while equipping students for success in today's digital era.

Recommendation

The government should allocate sufficient resources for the implementation of a blended learning model. Separate blended learning model based institutes should be established from primary to higher educational levels to increase their acceptability. Furthermore, training programs for the teachers and students on the blended learning model should be initiated to increase their skills and awareness about the blended learning model.

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