Enhancing Vocational Training with ICT Integration: A Study in Sindh, Pakistan

Atta Hussain Lakho
M.Phil. Education Scholar at BBSUL, Karachi.
Email: lakhoatta@gmail.com

Dr. Khadim Hussain Dahri
Assistant Professor, Department of Education, BBSUL, Karachi.

Fida Hussain Mahesar
Assistant Professor, Pak Studies, Superior Science College Khairpur Mirs.

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Abstract

This research paper investigates the impact of Information and Communication Technology (ICT) integration into vocational training, specifically focusing on ICT-integrated curriculum content, materials, and teaching strategies. The study draws on the theoretical foundations of Complex Adaptive Blended Learning Systems (CABLES) and the SAMR blended learning model. Data was collected through self-administered questionnaires from students in technical colleges across various cities in Sindh, Pakistan, utilizing Partial Least Squares - Structural Equation Modeling (PLS-SEM) for analysis. The quantitative research approach is chosen for this study, the study seeks to provide a robust understanding of students' perceptions in technical colleges in Sindh province regarding the impact of ICT-integrated curriculum content on their satisfaction in vocational training. Purposive sampling, a non-probability sampling method, was employed. A sample size of 416 responses was collected based on the recommended sample-to-item ratio, ensuring robust data for analysis. Findings indicate that ICT-integrated curriculum material positively influences student learning and satisfaction in vocational training. Additionally, ICT-integrated teaching methods enhance student learning and satisfaction. The study also highlights the mediating role of curriculum content in improving student satisfaction. Despite some limitations, this research contributes to the field of vocational education and emphasizes the importance of updating course materials with ICT integration.

Keywords: ICT-integrated curriculum, vocational training, Sindh, Pakistan, PLS-SEM.

1.Introduction

This study investigates the existing body of literature related to the research topic. It seeks to identify relevant academic works that pertain to the subject matter, summarizing key findings and methodological challenges in line with the knowledge gap outlined. This section

is compiled from readily accessible and up-to-date sources, suitable for peer evaluation. It initiates with an overview and essential information regarding vocational training in the context of Pakistan. It also explores the significance and scope of blended learning within Pakistan. The theoretical underpinning of this study encompasses a comprehensive examination of the Complex Adaptive Blended Learning System (CABLES) and the SAMR model of blended learning. Furthermore, the chapter sheds light on the notions of students' satisfaction, learning, and ICT-integrated curriculum content, ICT-integrated curriculum material, and ICT-integrated teaching strategies to prepare the reader for the development of hypotheses. A graphical representation of the study framework is also incorporated, culminating in a summary.

Vocational Training in Pakistan: Vocational training primarily emphasizes the development of technical skills for specific careers or trades, offering practical knowledge in contrast to the theoretical information imparted by traditional formal education systems (Rahman & Bockarie, 2022). Empowering learners to make informed choices regarding their professional growth, vocational training presents a myriad of options. It encompasses educational curricula that equip individuals for careers such as technicians, artisans, tradespersons, or other specialized professions (Jinshan et al., 2022). Such training can be delivered through classroom instruction, hands-on training, or a combination of both (Jinshan et al., 2022). In Pakistan, many secondary vocational students opt for Diploma programs, which typically span 2 to 3 years, covering technical fields like engineering and technology or business and economics programs (Ahmed et al., 2022a; Rehman & Farzaneh, 2022). Examinations are frequently administered by the Board of Technical Education of Sindh (SBTE).

2. Literature Review

Blended Learning in Pakistan: Blended learning, also known as digitally enhanced education, mixed-mode instruction, or technology-mediated learning, amalgamates online educational resources and opportunities for digital engagement with conventional classroom teaching methods (Siddiq & Hussain, 2022). In blended learning, physical presence is required for both instructors and students, although students may have some autonomy over when, where, and at what pace they engage (Fida et al., 2022). While students typically attend traditional classrooms with a teacher present, in-person classroom activities are augmented with computer-mediated content and delivery. Blended learning is also applied in training and professional development settings (Soomro et al., 2022). Pakistan has been striving to implement blended learning, particularly in the wake of the COVID-19 pandemic (Iqbal et al., 2022b). This approach allows students in Pakistan to engage in learning through both traditional classroom settings and online platforms (Ahmed et al., 2022b).

2.1 Blended Learning and Vocational Training Programs in Pakistan

In 2018, the "Prime Minister's Youth Skill Development Program" (PMYSDP) was initiated with the aim of enhancing the quality of "technical and vocational education and training" (TVET) in Pakistan (Rehman & Farzaneh, 2022). The program introduced training courses that are aligned with global technological advancements to bolster the employment

prospects of young Pakistanis (Ahmed et al., 2022a). The program aspires to equip young individuals with high-tech and market-driven skills that match international standards (Bashir et al., 2022). The initiative encompasses a variety of measures designed to overhaul the nation's overall TVET system, including national and international accreditation of TVET institutions, the establishment of 75 High-Tech Skills centers/labs, and the introduction of the "National Employment Exchange Tool" (NEXT) featuring a national employment site and training in traditional apprenticeships and technological skills (NAVTTC, 2022). In response to the global pandemic, the government of Pakistan has also recognized the need to implement adaptable teaching strategies, such as blended learning, to ensure that students can learn in both traditional classrooms and online settings (Cheema et al., 2022).

2.1.2 Complex Adaptive Blended Learning System (CABLES)

CABLES is a widely accepted and adaptable model in the field of education, spanning from primary schools to higher education, placing a strong emphasis on students and their active interaction within a rapidly evolving educational landscape (Cummings, 2022). In this model, students' roles and responsibilities evolve in tandem with emerging technologies and systems, fostering their transition from passive to active learners (Boukhalfa et al., 2022). Instructors, too, undergo transformation as they become more proficient and innovative in their use of technology, influencing and being influenced by the students (Shohel et al., 2022). The model encompasses six distinct components, each with its own sub-system: students, teachers, technology, content, learner support, and organizations.

2.2.2 SAMR Model of Blended Learning

The SAMR (Substitution, Augmentation, Modification, and Redefinition) model is an influential framework for evaluating the use of technology in educational activities (Hashim & Hamidon, 2022). It provides a four-part continuum for assessing the rigor and depth of technology integration in the classroom. At the substitution level, technology replaces traditional tools, such as using digital devices for tasks previously done with pen and paper. The augmentation level enhances these tasks with technological benefits. Modification entails a shift in the role of technology, fostering more interactive and engaging learning experiences. Redefinition represents the highest level, where technology enables entirely new educational activities. The SAMR model provides insight into how technology can be used to transform learning experiences, rather than merely substituting or augmenting traditional methods.

2.2.3 Student Satisfaction and Learning Outcomes in Blended Learning

Student satisfaction is a crucial factor in evaluating the effectiveness of any educational approach. In blended learning, students' satisfaction with the learning experience can significantly impact their motivation and overall learning outcomes (Yoon et al., 2022). A high level of satisfaction with a blended learning course is often associated with positive learning experiences, while dissatisfaction can hinder the effectiveness of the approach (Karp, 2022). Learning outcomes encompass the knowledge, skills, and abilities students gain as a result of their education (Herrington & Oliver, 2022). Measuring learning outcomes is essential for assessing the success of any educational program, including blended learning. In the context of vocational training in Pakistan, it is vital to investigate how blended learning influences

student satisfaction and learning outcomes.

2.2.4 Information and Communication Technology (ICT)-Integrated Curriculum Content, Material, and Teaching Strategies

The integration of Information and Communication Technology (ICT) into educational settings has transformed the teaching and learning process, enabling access to a wealth of information and resources (Raza et al., 2022). ICT-integrated curriculum content refers to the incorporation of digital resources and tools into the curriculum to enhance learning experiences (Islam et al., 2022). ICT-integrated curriculum material includes digital textbooks, multimedia presentations, and online resources that supplement traditional learning materials. ICT-integrated teaching strategies encompass innovative methods of instruction that leverage technology to engage and educate students. In the context of blended learning, the effective integration of ICT into curriculum content, material, and teaching strategies can greatly impact the quality of education and learning outcomes.

2.2.4 Conceptual Framework

The conceptual framework for this study is illustrated in Figure 2.1. It depicts the relationship between independent variables, dependent variables, and moderators. The independent variables consist of Complex Adaptive Blended Learning System (CABLES) and the SAMR model of blended learning, which are expected to influence student satisfaction and learning outcomes. Student satisfaction and learning outcomes are the dependent variables. Moderators in the framework include ICT-integrated curriculum content, material, and teaching strategies, which are expected to moderate the relationship between independent variables and dependent variables.

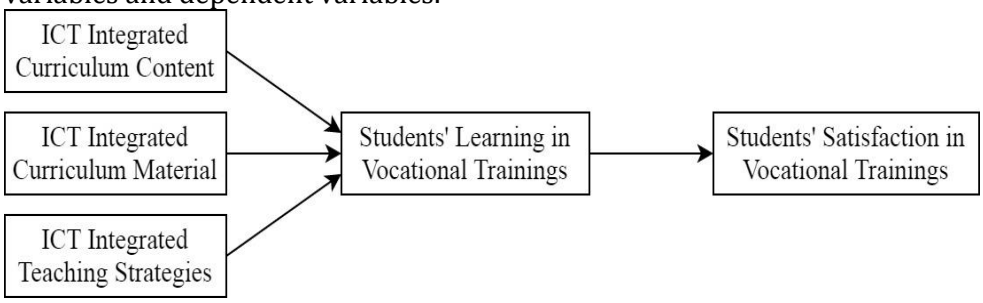

Figure: Conceptual Framework

3. Methodology

Research Design: The quantitative research approach is chosen for this study, emphasizing precise measurements and statistical analysis of data collected through surveys, polls, and questionnaires. By focusing on quantitative data analysis, the study seeks to provide a robust understanding of students' perceptions in technical colleges in Sindh province regarding the impact of ICT-integrated curriculum content on their satisfaction in vocational training. The accessible population is composed of students in technical colleges in Sindh province, including Karachi, Hyderabad, Sukkur, Larkana, and Nawab shah. A sample size of 416 responses was collected based on the recommended sample-to-item ratio, ensuring robust

data for analysis. Purposive sampling, a non-probability sampling method, was employed, allowing the researcher to efficiently gather data from relevant respondents.

Data Collection Tool/Instrumentation: A Likert scale was employed for data collection, allowing respondents to express their agreement or disagreement with specific statements. The choice of the 5-point Likert scale was guided by its simplicity and efficiency in obtaining responses.

4. Data Collection Technique/Strategy

Table 4.1: Demographic Profile (n=416)

		Frequency	Percent
Gender	Male	206	49.5
	Female	210	50.5
Age Group	14 to 16 years	138	33.2
	17 to 19 years	143	34.4
	20 years and above	135	32.5
Location	Karachi	90	21.6
	Hyderabad	77	18.5
	Sukkur	79	19.0
	Larkana	101	24.3
	Nawabshah	69	16.6

The data was collected from 416 respondents. This group consisted of 206 males (49.5%) and 210 females (50.5%). Additionally, 138 participants (33.2%) were in the age group of 14 to 16 years, 143 participants (34.4%) were between 17 to 19 years, and 135 participants (32.5%) were 20 years of age or above. Furthermore, participants were located in various regions, with 90 respondents (21.6%) from Karachi, 77 (18.5%) from Hyderabad, 79 (19%) from Sukkur, 101 (24.3%) from Larkana, and 69 (16.6%) from Nawabshah.

Table 4.2 : Measurement Model

	Loadings	Prob.	Alpha	CR	AVE
CC1 <- Curriculum Content	0.643	0.000			
CC2 <- Curriculum Content	0.942	0.000	0.746	0.853	0.664
CC3 <- Curriculum Content	0.830	0.000			
CM1 <- Curriculum Material	0.704	0.000			
CM2 <- Curriculum Material	0.778	0.000	0.854	0.896	0.685
CM3 <- Curriculum Material	0.879	0.000			
CM4 <- Curriculum Material	0.930	0.000			
SL1 <- Students' Learning	0.752	0.000			
SL2 <- Students' Learning	0.874	0.000	0.903	0.928	0.721
SL3 <- Students' Learning	0.795	0.000			

SL4 <- Students' Learning	0.897	0.000			
SL5 <- Students' Learning	0.915	0.000			
SS1 <- Students' Satisfaction	0.919	0.000			
SS2 <- Students' Satisfaction	0.903	0.000	0.915	0.940	0.799
SS3 <- Students' Satisfaction	0.943	0.000			
SS4 <- Students' Satisfaction	0.803	0.000			
TS1 <- Teaching Strategies	0.937	0.000			
TS2 <- Teaching Strategies	0.949	0.000	0.966	0.975	0.907
TS3 <- Teaching Strategies	0.973	0.000			
TS4 <- Teaching Strategies	0.951	0.000			

According to the guidelines of Hair et al. (2017), for substantial internal consistency based on inter-item correlation, Cronbach's alpha should exceed 70%, while the composite reliability (CR) should exceed 80% to indicate strong composite internal consistency of constructs. Additionally, indicator reliabilities should surpass 0.70 for significant reliability, and the average variance extracted (AVE) should be above 0.50 to demonstrate substantial correlation between indicators and their latent constructs (Hair et al., 2011b).

The table above reveals that CC1 had the lowest indicator reliability at 0.643, and curriculum content had the lowest alpha coefficient of 0.746, CR coefficient of 0.853, and AVE coefficient of 0.664. However, all other constructs displayed high values for composite reliability, AVE coefficients, alpha coefficients, and indicator reliabilities. Thus, the measurement model has yielded substantial results.

Table 4.3: Cross loadings

	CC	**CM**	**TS**	**SL**	**SS**
CC1	**0.643**	0.007	0.173	0.030	0.208
CC2	**0.942**	-0.286	0.487	0.382	0.482
CC3	**0.830**	-0.013	0.252	0.163	0.325
CM1	-0.093	**0.704**	-0.372	-0.311	-0.173
CM2	-0.148	**0.778**	-0.411	-0.405	-0.207
CM3	-0.134	**0.879**	-0.334	-0.332	-0.291
CM4	-0.159	**0.930**	-0.525	-0.443	-0.416
SL1	0.261	-0.341	0.317	**0.752**	0.210
SL2	0.277	-0.352	0.407	**0.874**	0.256
SL3	0.082	-0.352	0.319	**0.795**	0.227
SL4	0.271	-0.455	0.541	**0.897**	0.397
SL5	0.283	-0.393	0.527	**0.915**	0.361
SS1	0.321	-0.451	0.844	0.385	**0.919**
SS2	0.330	-0.267	0.692	0.298	**0.903**

SS3	0.435	-0.245	0.836	0.338	**0.943**
SS4	0.534	-0.310	0.598	0.249	**0.803**
TS1	0.383	-0.472	**0.937**	0.463	0.715
TS2	0.339	-0.489	**0.949**	0.532	0.859
TS3	0.392	-0.502	**0.973**	0.536	0.791
TS4	0.454	-0.451	**0.951**	0.443	0.826

Hair et al. (2013) suggest that the indicator reliability of latent constructs should be greater than that of other constructs. In the table, all indicators exhibit higher loadings in their respective constructs compared to their cross-loadings in other constructs. This indicates that the variance among indicators is more substantial within certain constructs than others.

Table 4 4: Direct-Effect Analysis

	Estimate	S.D.	t-Stats	Prob.	Decision
CC -> SS	0.115	0.032	3.580	0.000	Supported
CM -> SS	0.081	0.025	3.214	0.001	Supported
TS -> SS	0.835	0.026	32.274	0.000	Supported
SS -> SL	0.360	0.036	10.108	0.000	Supported

CC = ICT-Integrated Curriculum Content; CM = ICT-Integrated Curriculum Material; TS = ICT-Integrated Teaching Strategies; SS = Students' Satisfaction; SL = Students' Learning

The table indicates that curriculum content ($\beta = 0.115$; $p < 0.05$) positively influences students' satisfaction, supporting the hypothesis. Furthermore, curriculum material ($\beta = 0.081$; $p < 0.05$) positively but significantly impacts students' satisfaction, also supporting the hypothesis. Teaching strategies ($\beta = 0.835$; $p < 0.05$) positively affect students' satisfaction, supporting the hypothesis. Lastly, students' satisfaction ($\beta = 0.360$; $p < 0.05$) significantly and positively influences students' learning.

5. Discussion

The findings of this study have unveiled a series of critical relationships among the key components of the educational process and the overall learning experience. These relationships offer valuable insights into the dynamics of curriculum content (CC), curriculum material (CM), teaching strategies (TS), students' satisfaction (SS), and students' learning (SL). In the following discussion, we delve into these relationships and their implications in the context of contemporary education.

Curriculum Content (CC) and Students' Satisfaction (SS)

The study has established a significant positive relationship between curriculum content (CC) and students' satisfaction (SS). This result aligns with prior research by Ayanbode et al. (2022) and underscores the crucial role of CC in shaping the learning experience. CC, encompassing all learning planned and guided by educational institutions, plays a pivotal role in enhancing student learning and satisfaction. Furthermore, the design and structure of the

CC influence student motivation and their overall experience, consistent with the observations of Fleacă et al. (2023).

Stein et al. (2023) emphasizes the importance of well-structured CC for knowledge transfer and student engagement. Engaged students often exhibit higher levels of satisfaction when they actively participate in content-oriented interactions. Additionally, they engage directly with course materials, which further enriches the learning experience. The integration of Information and Communication Technology (ICT) into the curriculum content can potentially boost students' ICT competencies, suggesting that modern education should place a greater emphasis on creating an integrative learning environment that fosters such skills.

Curriculum Material (CM) and Students' Satisfaction (SS)

The study has also revealed a significant positive association between curriculum material (CM) and students' satisfaction (SS). This outcome mirrors the findings of Maleelai and Chaichuay (2022) and underscores the pivotal role of CM in delivering the curriculum and enhancing student learning. CM encompasses various resources like textbooks, lesson plans, and study materials, which are crucial for students' understanding and satisfaction. To meet the needs and satisfaction of students, CM often utilizes pedagogical and technological support.

In today's educational landscape, the integration of ICT into CM is transforming traditional teaching methods. To adapt to this change, CM should shift its focus from mere topic coverage to providing an integrated learning experience, potentially bolstering students' ICT competencies, as highlighted by MULIYANA (2022). Effective CM should be technically sound, well-organized, and provide opportunities for students to practice, evaluate their progress, and collaborate with peers—a crucial component for effective learning.

Teaching Strategies (TS) and Students' Satisfaction (SS)

Teaching strategies (TS) were found to significantly and positively influence students' satisfaction (SS). This observation resonates with the work of Okorie (2022) and underscores the importance of well-planned instructional methods. TS involves outlining the planned activities, desired outcomes, and strategies for achieving those objectives. Effective TS can enhance student engagement and adaptability within the learning environment.

The integration of ICT in educational settings has significantly improved teaching effectiveness, with teachers employing various ICT tools such as multimedia and digital communication applications (e.g., Google Meet, WeChat, Zoom, and WhatsApp) to enhance the learning process (Raza et al., 2023). Effective TS can lead to higher student satisfaction when activities are appropriately chosen to facilitate comprehension and learning. Elsayed Farid Amr et al. (2023) highlight that ICT-integrated TS have become essential for web-based instruction, as ICT skills and knowledge are crucial to achieving better student outcomes and satisfaction. The implementation of ICT in TS offers a versatile and effective method for improving educational results and enhancing SS.

Students' Satisfaction (SS) and Students' Learning (SL)

The study establishes a significant positive relationship between students' satisfaction (SS) and students' learning (SL), in line with the findings of Butt et al. (2023). The academic

success of students depends on specific aspects of the learning environment, particularly small-group work and problem-solving activities. SS refers to students' subjective assessments of how effectively a learning environment supports their academic performance.

Teachers should strive to provide effective learning environments with a variety of learning activities and opportunities that have been proven to support the accomplishment of desired learning outcomes, as supported by Huang et al. (2023). A flexible learning environment that accommodates students' preferred learning styles and pacing can significantly contribute to student engagement and overall satisfaction, as proposed by TONG and Li (2023).

6. Conclusion

In sum, the findings of this study underscore the multifaceted relationships among curriculum content, curriculum material, teaching strategies, students' satisfaction, and students' learning. They highlight the significance of integrating ICT into these components and emphasize the critical role of students' satisfaction in translating these influences into improved learning outcomes. These insights are pertinent for educators, curriculum designers, and policymakers aiming to enhance the quality of education in an increasingly technology-driven world.

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