Bridging knowledge divides: Examining the dynamic landscape of ICT integration in Pakistan's education sector

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ABSTRACT

This study delves into information technology's (ICT) effects on educational curriculum development, specifically focusing on the Pakistani context. The effects of information and communication technology (ICT) on various nations' educational curricula are global. Integrating ICT into the academic sector is crucial to advancing educational planning in today's technology-driven era. The research aims to scrutinize the utilization and influence of ICT in Pakistan's educational landscape. A straightforward sampling procedure systematically gathered data from 385 Lahore city respondents spanning five public universities. The outcomes elucidate a substantial positive correlation between the availability and utilization of ICT and the enhancement of students' knowledge and learning skills. The study accentuates the pivotal role of ICT in amplifying educational efficiency and underscores its significance in shaping policies within the education sector. The ramifications of the research extend to educators, policymakers, and stakeholders, emphasizing the imperative need to integrate ICT into educational practices to achieve optimal outcomes effectively. By acknowledging the affirmative impact of ICT on academic development, this study contributes valuable insights that can guide strategies for elevating educational quality and planning in the digital age, ensuring a more robust and technology-enabled educational system. This suggests that integrating ICT positively impacts educational effectiveness and is essential for informing policies within the education sector.

Keywords: *Educational planning, Education sector, Information and communication technology, Knowledge and learning skills, Policy formation, Student performance.*

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Highlights of this paper

- This paper scrutinises ICT integration in Pakistan's education across diverse settings.
- We are identifying critical factors like infrastructure and training that are crucial for successful ICT integration in education.
- We are examining how ICT enhances student outcomes and overall educational efficiency.

1. INTRODUCTION

This research examines the connection between Information and Communication Technology and the educational experiences of elementary school students in a setting where ICT has been effectively included in the curriculum. We obtain insights into particular learning experiences by including instructors in the study design, which is especially beneficial for this age group (Goodison, 2002). While the ICT curriculum advocates for the

With comprehensive utilisation of ICT in the learning and teaching process, educators prioritise cultivating technical ICT skills. The project aims to evaluate the possible effects of an institution-based ICT curriculum while changing the national ICT-related curriculum into an ICT plan integrated into the broader institutional policy (Tondeur, Braak, & Valcke, 2006). Many academic staff members and students seldom utilise computers for official academic purposes, despite significant attempts to position ICT as a critical component of university teaching and learning (Selwyn, 2007). Since newly trained teachers show a need for an additional understanding of ICT and related skills, the changing ICT scene raises issues regarding the value of systematic ICT characteristics in teacher education (Andersson Sven, 2006). The study investigates how shifts in ICT spending and academic achievement within Local Education Authorities (LEAs) relate. Contrary to prior research conclusions, evidence shows that ICT investment improves elementary school educational performance. This is similar to findings in the corporate sector, where ICT investment increases productivity (Machin, McNally, & Silva, 2007).

Though an extensive examination of their use is still in its infancy, PowerPoint and other visual technologies have become ubiquitous at institutions where they are seen as indispensable to teaching (Reedy, 2008). The success of teacher use of computer-mediated communication (CMC) hinges on clarifying the link between the possibilities of CMC and teacher practice. Language teachers are beginning to use CMC, though there is no evidence that these teachers are more technologically innovative. The challenge lies in integrating CMC for supportive tasks and teaching purposes (Braak, 2000). Teachers provide students with genuine assignments and affluent circumstances in solid learning environments. Open-ended ICT applications are more frequently used by teachers who establish effective learning environments, which increases the effectiveness of those settings. According to Tawalbeh (2001) when conducting computer literacy and awareness courses, the Jordanian Ministry of Education prioritises social and vocational factors. The study highlights the necessity of providing students with worthwhile computer-using experiences to sustain their interest in using ICT in higher education (Selwyn & Kate, 2000).

In order to investigate the combined effects of institutional and teacher characteristics on various forms of computer usage, the study uses a multilevel approach. To guarantee that ICT improves the learning experience of all students, including those with Special Educational Needs (SEN), it emphasises the significance of evaluating and creating resources and techniques (Tondeur, Valcke, & Van, 2008). According to Lai and Pratt (2004) a full-time ICT coordinator is necessary for effective integration into the institutional curriculum. ICT coordinators' expertise and enthusiasm are essential for organising and using ICT in educational settings. The research also delves into the development of ICT in education, particularly for students with visual impairments, arguing that ICT provides opportunities for fuller participation in education (Douglas, 2001). The importance of an effective and robust ICT policy for higher education is emphasised, acknowledging the challenges less developed countries face in implementing such policies. Information and Communication Technologies, or ICTs, have been introduced, and

they are seen to be a valuable tool for tackling issues in education. ICTs—including mobile networks, television, radio, and the internet—are essential in several industries, including entertainment, education, and health (Januszewski & Molenda, 2007).

The revolutionary potential of ICTs in educational delivery modalities is highlighted by Toffler (1991) assertion regarding the 21st-century illiterate (Toffler, 1991). The International Labour Organization's emphasis on "Basic Education for All," "Core Work Skills for All," and "Lifelong Learning for All" aligns with the role of ICTs in meeting the necessities of a global economy (Tinio, 2003). ICTs are influential tools for advancing education, promoting strength, and enhancing educational relevance. However, the actual benefits of ICTs are not automatic, necessitating a comprehensive approach that addresses various factors, including technology provision, effective pedagogy, institutional readiness, teacher competency, curriculum alignment, and long-term funding (Tinio, 2003).

Despite the potential benefits, the integration of ICTs faces challenges in both developed and developing countries, with Pakistan encountering hurdles in ICT literacy, a lack of unified government policies, outdated teaching methods, and school infrastructure limitations, especially in rural areas. Overcoming these challenges requires focusing on capacity-building in areas like teacher professional development, technical support, specialist development, and content creation.

2. RESEARCH PROBLEM STATEMENT

The study looks at the significant barriers to Information and Communication Technology (ICT) integration in Pakistan's educational system, considering the framework of "Bridging Knowledge Divides: Examining the Dynamic Landscape of ICT Integration." Despite the global recognition of ICT's transformative potential in education, a gap exists in understanding Pakistan's specific dynamics and obstacles. This study seeks to identify and analyse the factors hindering the seamless incorporation of ICT into the educational framework, exploring issues such as ICT literacy disparities, the absence of unified government policies, outdated teaching methodologies, and infrastructural limitations, especially in rural areas. The overarching problem statement centres on bridging the knowledge divide within the Pakistani education sector by comprehensively examining the barriers that impede effective ICT integration. By delving into these challenges, the research aims to provide actionable insights for policymakers, educators, and stakeholders to foster a more inclusive and technologically adept educational landscape in Pakistan.

3. SIGNIFICANCE OF THE STUDY

This research is important since it investigates the ever-changing field of ICT integration in Pakistan's education system, with a particular emphasis on closing knowledge gaps. To effectively shape educational policy, it is essential to comprehend how ICT affects learning.

Experiences of primary school students within a well-integrated curriculum. The study intends to shed light on how teachers build technical ICT abilities and integrate ICT into the teaching and learning process by looking at teachers' roles in these areas. The results will offer insightful information on the possibilities of an ICT curriculum based in schools, coordinating national requirements with real-world application. The study also discusses the difficulties that less developed nations like Pakistan have in maximising the advantages of ICT in education, offering crucial foundational information for stakeholders, educators, and policymakers working toward an inclusive and technologically advanced educational environment.

4. RESEARCH OBJECTIVES

The research goals of the study are as follows:

- To examine the state of ICT integration in Pakistan's education sector and determine the amount and efficacy of technology use in instruction.
- To investigate what makes ICT integration in education successful and evaluate how it affects student performance and overall educational effectiveness in Pakistan.

5. RESEARCH QUESTIONS

Research Question 1: How much ICT is currently integrated into Pakistan's educational system, and what impact does it have on methods of instruction and learning?

Research Question 2: In the context of Pakistan, what factors affect the effective integration of ICT into educational practices, and how do these aspects affect student results and overall educational efficiency?

6. CONCEPTUAL FRAMEWORK

6.1. Mathematical Model in Econometrics

The researchers will investigate how the following factors affect ICT use and influence Pakistan's educational landscape: accessibility of ICT, Utilization of ICT, Familiarity with ICT and Efficacy of ICT. The remaining factors will remain unchanged.

The Econometric Equation is as follows:

Utilization and Influence of $ICT = \alpha + \beta 1\,(Accessibility\ of\ ICT) + \beta 2\,(Utilization\ of\ ICT) + \beta 3\,(Familiarity\ with\ ICT) + \beta 4\,(Efficacy\ of\ ICT)$

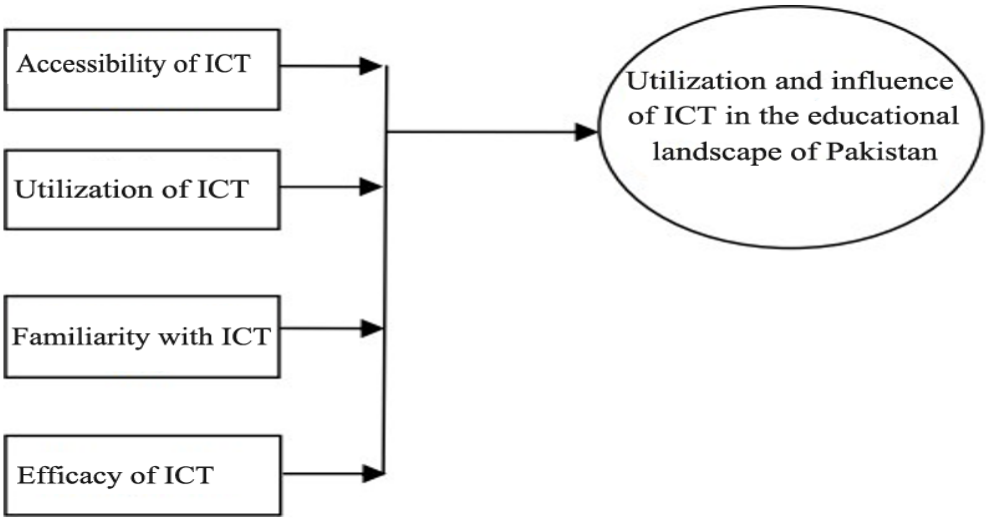

Figure 1. Conceptual framework.

Figure 1 illustrates the following factors that affect ICT use and influence Pakistan's educational landscape: Accessibility of ICT, Utilization of ICT, Familiarity with ICT and Efficacy of ICT. The hypothesis is that these factors impact the utilization and influence of ICT in the education sector.

Hypothesis:

H_0: Accessibility of ICT, Utilization of ICT, Familiarity with ICT and Efficacy of ICT does not impact the association between Utilization and Influence of ICT in the education sector.

H_1: Accessibility of ICT, Utilization of ICT, Familiarity with ICT and Efficacy of ICT do impact the association of Utilization and Influence of ICT in the education sector.

7. LITERATURE REVIEW

Integrating Information and Communication Technology (ICT) in the education sector has garnered significant global focus as a transformative force capable of bridging knowledge divides and reshaping traditional learning paradigms. This literature review explores existing scholarship and research to thoroughly grasp the changes that ICT integration has brought to the education sector. By examining key themes, challenges, and success factors, this review seeks to lay the groundwork for a nuanced analysis of the current state of ICT integration, focusing on its implications for educational outcomes.

Scholars have approached the study of ICT integration in education from various theoretical perspectives. The Technological Pedagogical Content Knowledge (TPACK) framework, proposed by Mishra and Koehler (2006) has been instrumental in conceptualising the interplay between technology, pedagogy, and content expertise (Mishra & Koehler, 2006). Additionally, the Diffusion of Innovations theory (Rogers, 2003) provides insights into adopting and disseminating technological innovations in educational settings. These frameworks contribute a theoretical lens through which the complexities of ICT integration can be analysed (Rogers, 2003).

Internationally, the trend towards ICT integration in education is evident. Research by UNESCO (2019) highlights the growing emphasis on digital skills as a prerequisite for participation in the knowledge economy. Countries like Finland and Singapore have successfully integrated ICT into their education systems, offering valuable insights into practical strategies and best practices (Ministry of Education, 2020). Masterplan for ICT in the Ministry of Education (2020) comparative analyses of global initiatives illuminate the diverse approaches and outcomes associated with ICT integration in education (Sang, Valcke, Braak, & Tondeur, 2010).

ICT integration continues to present ongoing problems despite its potential benefits. Infrastructure issues frequently impede widespread adoption, especially in developing nations (Selwyn, 2010). Critical elements impacting the effectiveness of ICT efforts include teacher preparation and training (Ertmer, Ottenbreit-Leftwich, & Tondeur, 2015). Furthermore, worries about the technological divide and unequal access to it emphasise the necessity of inclusive measures that consider socioeconomic disparities (Warschauer, 2003).

The literature reveals a multitude of opportunities associated with ICT integration in education. Increased access to information and educational resources (Albirini, 2006) personalised learning experiences (Means, Toyama, Murphy, Bakia, & Jones, 2010) and the development of critical 21st-century skills (Voogt, Fisser, Pareja Roblin, Tondeur, & van Braak, 2013) are identified as key benefits. The potential for ICT to address educational inequalities and enhance student engagement underscores its transformative potential (UNESCO, 2020).

Studies examining the impact of ICT on educational outcomes offer varying perspectives. While some research suggests positive correlations between ICT adoption and improved student performance (Tamim, Bernard, Borokhovski, Abrami, & Schmid, 2011) others highlight the nuanced nature of this relationship, emphasising the importance of pedagogical approaches and contextual factors (Hattie, 2009). Understanding the complex interplay between ICT use and learning outcomes is crucial for informed decision-making in educational policy (Hattie, 2009).

As technology evolves, the literature suggests emerging trends in ICT integration. The rise of artificial intelligence (AI) in education (Holmes, 2019) the potential of virtual reality (VR) for immersive learning experiences (Dalgarno & Lee, 2010) and the importance of digital citizenship education (Ribble, 2015) are identified

as areas warranting further exploration. Understanding these evolving trends is crucial for anticipating the future landscape of ICT integration in education.

Various research techniques have been used to investigate ICT integration in education, such as mixed-methods approaches, qualitative case studies, and quantitative surveys. Methodological issues are covered in the literature, including the necessity of thorough effect evaluations and the significance of recording a range of viewpoints. A basis for critically assessing the reliability of research findings is established by acknowledging the variation in methods.

The literature review highlights the multifaceted character of ICT integration in the educational field. The assessment notes that although ICT can be revolutionary, removing obstacles, taking advantage of possibilities, and implementing evidence-based practices are crucial. A thorough examination of the changing environment of ICT integration in education is made possible by synthesising theoretical frameworks, global trends, opportunities, difficulties, and case studies. This highlights the necessity of continuing research and making well-informed policy decisions. This information base is essential for educators, legislators, and academics navigating the dynamic junction of technology and education.

An increasing body of research on using information and communication technology (ICT) in educational settings—especially in Pakistan—indicates that using technology to improve learning outcomes is becoming increasingly popular. Numerous studies emphasise the importance of addressing knowledge divides through effective ICT implementation. Tondeur, Braak, and Valcke (2010) advocate for institutional-based ICT curricula to align national standards with practical implementation. This aligns with the current research focus on evaluating the impact of such curricula in the Pakistani education system. The dynamic landscape of ICT integration in Pakistan's education sector is a focal point for research, aligning with the study's overarching theme of "Bridging Knowledge Divides." Across numerous countries, the profound impact of information technology on educational curriculum development is evident, emphasising the need for effective integration strategies (Machin et al., 2007). The positive effect of ICT on students, which result in improved performance through the development of knowledge and learning skills, serve as a testament to its transformative influence in education (Selwyn, 2022).

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This literature review delves into critical factors influencing ICT integration in the educational landscape. Examining how ICT enhances student outcomes and overall educational efficiency aligns with the study's objectives, shedding light on the multifaceted nature of ICT integration (Tondeur et al., 2010). The study aligns with the literature addressing the necessity for capacity-building, teacher professional development, and content creation to overcome these challenges (Selwyn, 2022).

Over the last two decades, Information and Communication Technologies (ICTs) have gained increased significance and relevance. Global knowledge and information have expanded as a result of the internet's availability of enormous information repositories, ICT sector developments, and increased organisational and corporate flexibility (McAndrew, 2002). Selwyn (2007) clarified the difficulties encountered in postsecondary education by highlighting the necessity for educators to easily acquire technical ICT competencies and incorporate technology into the teaching and learning process. Machin et al. (2007) examine the interplay between ICT investment and academic performance in educational institutions, offering a valuable framework for comprehending the possible advantages in a local setting.

Reedy (2008) highlights the pervasive use of visual technologies like PowerPoint in universities and the perceived educational appropriateness, echoing the current study's interest in assessing the effectiveness of these tools. Furthermore, research by Smeets (2005) and Tearle (2003) highlights the need for solid learning environments and teacher responsibilities in incorporating open-ended ICT applications; this aligns with the current study's objective of examining these dynamics in Pakistani education. The literature also acknowledges challenges faced by developing countries like Pakistan, as outlined by Ather and Qamar, citing resource constraints and inconsistent policies. This aligns with the study's goal of identifying the obstacles to successful ICT integration in Pakistan's educational system.

With particular relevance to Pakistan, the literature review identifies a corpus of research that offers insightful information on the potential and difficulties related to ICT integration in education. The existing studies lay a foundation for the current research endeavour, emphasising the need for a nuanced understanding of the dynamics at play to bridge knowledge divides effectively.

8. RESEARCH METHODOLOGY

In order to thoroughly examine the changing landscape of ICT integration in Pakistan's education sector and its effect on bridging knowledge divides, this study uses a mixed-methods approach. The study starts with a quantitative phase in which data from 385 respondents from five public universities in Lahore city is gathered using a simple sampling technique. A structured questionnaire gathers pertinent data regarding the volume and efficacy of ICT use in teaching and learning procedures. After that, statistical methods are used to examine the quantitative data to obtain numerical insights into the state of ICT integration today and how it affects student outcomes and overall educational efficiency. After the quantitative stage, focus groups and in-depth interviews with educators, legislators, and other stakeholders are used to add a qualitative dimension. This qualitative phase aims to provide a nuanced understanding of the factors influencing the successful implementation of ICT in educational practices and the challenges faced. Integrating quantitative and qualitative findings enhances the study's robustness, offering a holistic view of ICT integration in Pakistan's education sector. The triangulation of methods ensures a comprehensive exploration of the research questions, contributing valuable insights to educators, policymakers, and stakeholders in shaping the future of ICT in education.

In order to analyse the use and impact of ICT in education, we look at four independent variables: ICT accessibility, ICT use, ICT familiarity, and ICT efficacy.

8.1. Accessibility of ICT

The first criterion applied in evaluating ICT use and impact in the education sector is ICT accessibility. This variable makes it possible to investigate the type of ICT accessibility found in Pakistan's educational systems. Respondent feedback was assessed using a five-point Likert scale, addressing inquiries related to:

- The presence of a well-equipped IT lab in the university or college.
- Consistent availability of the internet whenever the computer lab is used.
- The presence of multimedia resources during lectures.
- The existence of a digital library in computer labs.

8.2. Utilisation of ICT

The utilisation of ICT is the second component used to examine how ICT is used and how it affects Pakistani education. This variable helps to explain how students may use the newest technologies in their academic pursuits. A five-point Likert scale was used to evaluate participant comments, with particular attention paid to questions about:

- Incorporation of the latest ICT technology in universities or colleges.
- Adoption of multimedia devices instead of traditional whiteboards or blackboards.
- Utilise the internet for assignments and projects rather than rely on books or the library.
- Use of wireless communication within the university or college.

8.3. Familiarity with ICT

ICT literacy is the third element used to evaluate the use and impact of ICT in Pakistan's educational sectors. This variable makes it possible to examine the students' comprehension of ICT and how it helps them in the classroom. A five-point Likert scale was used to evaluate the respondents' answers to questions about:

- Information Technology (IT) in education equips students with the skills to operate various devices.
- IT in the education sector imparts knowledge that proves beneficial at the professional level.
- IT aids in generating productive knowledge for students about their studies.

8.4. Efficacy of ICT

The final and fourth independent variable utilised to assess ICT use and influence in Pakistani education sectors is its effectiveness. This variable allows one to evaluate the efficiency of ICT in Pakistan's educational system. Respondent opinions were evaluated using a five-point Likert scale on the following topics:

- IT enables students to improve their learning skills.
- It imparts extensive knowledge to students through the internet.
- The use of digital projectors aids students in enhancing their learning experience.
- IT can be used to improve local, regional, and national educational efficiency.

8.5. Utilisation and Influence of ICT in the Education Sector

This dependent variable explains how pupils use of the newest information and communication technology (ICT) in their curriculum impacts Pakistan's educational system. A five-point Likert scale was employed to assess the respondents' responses to inquiries concerning:

- Utilising IT for improved educational planning.
- Achieving better results is due to the integration of IT by students.
- Enhancing the knowledge skills of students through IT.
- Positive effects brought about by IT in Pakistan's education sector.

- Efficient utilisation of IT in Pakistan's education sector.

8.6. Sampling

In order to better understand how ICT is used and its effect on Pakistan's educational system, researchers performed a study. To do this, a range of samples was provided using convenient sampling, a non-probability sampling technique. A nominal scale examines the overall number of males and females. Surveys were employed to collect data for the research. The questionnaire's items were arranged using an interval scale with five Likert values from strongly disagree to strongly agree.

Table 1. Gender.

Category	Numbers
Male	250
Female	135
Total	385

Table 1 presents data on the distribution of individuals in different categories. There are 250 males, 135 females, and 385 individuals.The researchers used a questionnaire to collect data to survey LahoreCity.Fourhundred fifty questionnaireswereresentoutinthisendeavour,and385werereturned.Theresearchers usedthe following formula to gettheresponse rate:

Questionnaire Responded *

100Total Questionnaires

385 * 100 =85.55%

450

Hence, theResponserateis85.55%.

Table 2. Descriptive statistics.

Variables	Mean	Standard deviation	Sample size
Utilisation& influence of ICT	4.028	0.839	385
Accessibility of ICT	3.000	0.997	385
Utilisation of ICT	3.069	0.988	385
Familiarity with ICT	3.944	0.794	385
Efficacy of ICT	3.878	0.861	385

Table 2 displays variables and their mean values, standard deviations, and sample sizes. For the variable "Utilization & influence of ICT," the mean is 4.028, the standard deviation is 0.839, and the sample size is 385. Similarly, for "Accessibility of ICT," the mean is 3.000, the standard deviation is 0.997, and the sample size is 385. The variables "Utilization of ICT," "Familiarity with ICT," and "Efficacy of ICT" have mean values of 3.069, 3.944, and 3.878, standard deviations of 0.988, 0.794, and 0.861, respectively, with a consistent sample size of 385 for each variable.

9. DATA EXAMINATION AND EXPLANATION

This table demonstrates that 385 students make up the overall response of the sampling (mean) from various Pakistani higher education institutions. After gathering data from these pupils, the researchers determined that the dependent variable for the use and effect of ICT is 4.0280. Respondents differ by 0.83953 from the mean for this variable, and the values fall between 3.18847 and 4.86753. This demonstrates that students' responses range from

strongly disagreeing to undecided. Both concur that using ICT enhances knowledge and skills and helps produce better outcomes for Pakistan's educational system. They also concur that ICT is effectively employed in Pakistan's school system and improves educational planning.

The respondents differ by 0.99734 from the mean in the independent variable of accessibility of ICT, which is 3.00. The results indicate that the range of student replies was virtually agree to disagree. The range falls between 2.00266 and 3.99734. The findings indicate that students need more confidence in the presence of a fully functional IT lab, internet connectivity in the computer lab, the usage of multimedia in lectures, and the computer lab's digital library.

The percentage of respondents who use ICT as an independent variable is 3.0699; hence, there is a 0.98831 deviation from the mean. The results, which vary from 2.08169 to 4.05811, demonstrate that students' responses range from disagree to agree. This finding suggests that students must be more confident about using multimedia devices and the newest lecture technologies. They are also still determining how wireless connectivity works in their institutions and how they use the internet for projects and assignments.

The respondents differ by 0.79478 from their mean in the independent variable of familiarity with ICT, which is 3.9441. The range of the results, which reveal that students' responses range from doubtful to almost strongly agree, is 3.14932 to 4.73888. According to this conclusion, practically all students concur that ICT offers information for using various gadgets and aids in producing helpful knowledge relevant to their academic work. They also concur that using ICT in education yields knowledge beneficial in the workplace.

ICT efficacy as an independent variable is 3.8788, and respondents differ by 0.86176 from the mean. The results indicate that students' responses vary from unsure to almost strongly agree, ranging from 3.01704 to 4.74056. According to this finding, virtually all students agree that ICT helps them study better, that using digital projectors facilitates better learning, and that ICT offers a wealth of knowledge through the internet. It implies that ICT may be applied to improve national, regional, and local educational effectiveness.

10. DISCUSSION

Research Question 1: How much ICT is currently integrated into Pakistan's educational system, and what impact does it have on methods of instruction and learning?

The level of ICT integration in Pakistan's educational system is a good indicator of how frequently technology is used in a range of educational settings. Institutions use ICT to improve teaching strategies and give students dynamic learning experiences, from online resources to intelligent classrooms. In order to ensure that students are proficient with digital tools and can use them successfully in their academic endeavours, the integration attempts to close the technology gap.

Research Question 2: In the context of Pakistan, what factors affect the effective integration of ICT into educational practices, and how do these aspects affect student results and overall educational efficiency?

Infrastructure development, teacher preparation, and curriculum alignment are some factors that impact Pakistan's capacity to use ICT in teaching practices effectively. To guarantee the smooth incorporation of ICT tools, adequate technology infrastructure must be combined with thorough training programs for educators. Moreover, curriculum alignment with technology improvements contributes to developing a comprehensive learning environment. These factors have a significant impact on student outcomes because they lead to improvements in digital literacy, critical thinking, and general education efficiency.

11. CONCLUSION

The key finding of this study emphasises the crucial significance of ICT accessibility and utilisation in improving students' educational performance. This highlights the beneficial role of ICT availability in education, which assists pupils in honing their learning skills. Furthermore, cutting-edge ICT technologies benefit students, particularly in the enhanced preparation of assignments and projects. The findings also demonstrate that ICT is an effective tool for assisting students in developing meaningful information for their academics. Our findings imply that increased ICT availability and usage in the education sector is associated with higher student efficiency. Students agree that ICT promotes comprehensive information acquisition via the internet and digital libraries, hence contributing to improving education.

12. FUTURE RESEARCH

Future study efforts on ICT integration in Pakistan's education sector should examine the changing dynamics of technological breakthroughs and their impact on education.

Educational methods. Investigating the changing role of ICT in pedagogy, teacher training, and curriculum creation could provide valuable insights into improving students' educational experiences. Examining the problems and opportunities of future technologies, such as artificial intelligence and virtual reality, would be critical for changing educational systems. Furthermore, investigating the long-term consequences of persistent ICT integration on student results and educational institutions' overall efficacy could help inform education policy decisions. Future research may also explore the impact of socioeconomic factors on access to and utilisation of ICT tools in various educational contexts, developing a holistic understanding.

REFERENCES

Albirini, A. (2006). Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers. *Computers & Education*, *47*(4), 373-398. https://doi.org/10.1016/j.compedu.2004.10.013

Andersson Sven, B. (2006). Newly qualified teachers' learning related to information and communication technology use: A Swedish perspective. *British Journal of Educational Technology*, *37*(5), 665-682. https://doi.org/10.1111/j.1467-8535.2006.00563.x

Braak, J. (2000). Integrating computer-mediated communication in language teaching: Challenges and possibilities. In M. Warschauer & D. Norris (Eds.), Language learning and new technologies: Case studies and principles. In (pp. 101-116): Cambridge University Press.

Dalgarno, B., & Lee, M. J. (2010). What are the learning affordances of 3-D virtual environments? *British Journal of Educational Technology*, *41*(1), 10-32. https://doi.org/10.1111/j.1467-8535.2009.01038.x

Douglas, G. (2001). ICT, education, and visual impairment. *British Journal of Educational Technology*, *32*(3), 353–364. https://doi.org/10.1111/1467-8535.00204

Ertmer, P. A., Ottenbreit-Leftwich, A. T., & Tondeur, J. (2015). Teachers' beliefs and uses of technology to support 21st-century teaching and learning. *International Journal of Educational Technology in Higher Education*, *12*(1), 25-41.

Goodison, T. A. (2002). Learning with ICT at primary level: Pupils' perceptions. *Journal of Computer Assisted Learning*, *18*, 282–295. https://doi.org/10.1046/j.0266-4909.2002.00240.x

Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement.* London & New York: Routledge.

Holmes, B. (2019). Artificial intelligence in education. *British Journal of Educational Technology*, *50*(4), 1829-1832.

Januszewski, A., & Molenda, M. (2007). *Educational technology: A definition with commentary* (2nd ed.). New York: Routledge.

Lai, K.-W., & Pratt, K. (2004). Information and communication technology (ICT) in secondary schools: The role of the computer coordinator. *British Journal of Educational Technology, 35*(4), 461–475. https://doi.org/10.1111/j.0007-1013.2004.00404.x

Machin, S., McNally, S., & Silva, O. (2007). New technology in schools: Is there a payoff? *The Economic Journal, 117*(522), 1145–1167. https://doi.org/10.1111/j.1468-0297.2007.02070.x

McAndrew, P. (2002). Handbook on information technologies for education and training: Edited by H.H. Adelsberger, B. Collis, and J.M. Pawloski. In (pp. 715): Springer-Verlag.

Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). *Evaluating evidence-based practices in online learning: A meta-analysis and review of online learning studies*. Washington DC: US Department of Education, Office of Planning, Evaluation, and Policy Development.

Ministry of Education, S. (2020). *Masterplan for ICT in education*. Retrieved from https://www.moe.gov.sg

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record, 108*(6), 1017-1054.

Reedy, A. (2008). Visual technologies in the classroom: Towards effective practice. *Journal of Educational Multimedia and Hypermedia, 17*(2), 185–196.

Ribble, M. (2015). *Digital citizenship in schools: Nine elements all students should know*. Washington, DC: International Society for Technology in Education.

Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press.

Sang, G., Valcke, M., Braak, J. V., & Tondeur, J. (2010). Student teachers' thinking processes and ICT integration: Predictors of prospective teaching behaviours with educational technology. *Computers & Education 54*(1), 103–112. https://doi.org/10.1016/j.compedu.2009.07.010

Selwyn, N. (2007). The use of computer technology in university teaching and learning: A critical perspective. *Journal of Computer Assisted Learning, 23*(2), 83–94. https://doi.org/10.1111/j.1365-2729.2006.00204.x

Selwyn, N. (2010). *Schools and schooling in the digital age: A critical analysis*. Abingdon: Routledge.

Selwyn, N. (2022). The future of AI and education: Some cautionary notes. *European Journal of Education, 57*(4), 620-631. https://doi.org/10.1111/ejed.12532

Selwyn, N., & Kate, B. (2000). Primary school children's use of ICT. *British Journal of Educational Technology, 31*(4), 321–332. https://doi.org/10.1111/1467-8535.00165

Smeets, E. (2005). Does ICT contribute to powerful learning environments in primary education? *Computers & Education, 44*(3), 343-355. https://doi.org/10.1016/j.compedu.2004.04.003

Tamim, R. M., Bernard, R. M., Borokhovski, E., Abrami, P. C., & Schmid, R. F. (2011). What forty years of research says about the impact of technology on learning: A second-order meta-analysis and validation study. *Review of Educational Research, 81*(1), 4-28. https://doi.org/10.3102/0034654310393361

Tawalbeh, M. (2001). The policy and management of information technology in Jordanian schools. *British Journal of Educational Technology, 32*(2), 133-140. https://doi.org/10.1111/1467-8535.00184

Tearle, P. (2003). ICT implementation: What makes the difference? *British Journal of Educational Technology, 34*(5), 567-583. https://doi.org/10.1046/j.0007-1013.2003.00351.x

Tinio, L. V. (2003). *ICT in education*. New York: UNDP-APDIP.

Toffler, A. (1991). *Powershift: knowledge, wealth, and violence at the edge of the 21st century Bantam books: Nonfiction*. Retrieved from http://www.oss.net/dynamaster/file_archive/040321/cd603a2279fc57351f313ac4e194d5c9/O

Tondeur, J., Braak, J., & Valcke, M. (2006). Curricula and the use of ICT in education: Two worlds apart? *British Journal of Educational Technology, 37*(6), 949-961. https://doi.org/10.1111/j.1467-8535.2006.00680.x

Tondeur, J., Braak, J., & Valcke, M. (2010). Bridging the digital divide: ICT curricula as a tool for institutional development. In M. Warschauer & S. Fotos (Eds.), Technology and education: Breaking new ground. In (pp. 187-204): Routledge.

Tondeur, J., Valcke, M., & Van, B. J. (2008). A multidimensional approach to determinants of computer use in primary education: Teacher and school characteristics. *Journal of Computer Assisted Learning*, *24*(6), 494-506. https://doi.org/10.1111/j.1365-2729.2008.00285.x

UNESCO. (2019). *I'd blush if I could: Closing gender divides in digital skills through education*. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000367304

UNESCO. (2020). *Education for sustainable development goals: Learning objectives*. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000247444

Voogt, J., Fisser, P., Pareja Roblin, N., Tondeur, J., & van Braak, J. (2013). Technological pedagogical content knowledge–a review of the literature. *Journal of Computer Assisted Learning*, *29*(2), 109-121.

Warschauer, M. (2003). *Technology and social inclusion: Rethinking the digital divide.* Cambridge, MA: MIT Press.