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IMPACT OF BLENDED LEARNING TEACHING TECHNIQUE ON STUDENTS ACADEMIC ACHIEVEMENTS AT ELEMENTARY LEVEL

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ABSTRACT

The increasing demands on teachers have led to the strategic integration of information communication technology, suggesting that teachers' efficacy can be heightened through the judicious incorporation of technology into their teaching techniques. In light of this premise, this research aimed to assess the impact of blending learning teaching techniques on the academic achievements of 8th class science subject students in Gujranwala. The main objective was to compare achievement levels between blending learning and traditional methods. In this regard, the pre-test post-test control group design was utilized, with a sample of sixty students randomly selected. Data were collected through achievement test, revealing the blending learnings' superiority in enhancing the students' cognitive skills according to Bloom's taxonomy. This study examined the leading issues in contemporary situation wherein results provide significant information in reaching the decision of study and making some appropriate recommendations. This highlighted the potential benefits in a tailor-made format thereby incorporating blending learning in developments of education at different levels especially at the elementary level.

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INTRODUCTION

Blended learning, a mix of traditional face-to-face and online instruction, is increasingly adopted in education (Tong, Uyen & Ngan, 2022). The challenges in implementing e-learning are prominent in third-world countries like Pakistan due to issues such as power outages, computer illiteracy, and limited access to technological devices and the internet. Consequently, integration of Information and Communication Technology (ICT) in the country's education system is hindered. Furthermore,

insufficient staff and basic infrastructure in both rural and urban public schools indicate a lack of prioritization of education in government policies. These challenges have spurred local researchers to focus on studies about ICT integration in education or evaluating accessibility and availability of essential infrastructure for ICT integration in higher education. In this context, researcher aimed to investigate whether Blended Learning (BL) enhances the academic performance of students at elementary level, which serves as vital stage for further education. McCue (2014) highlighted that BL contributed to development of teachers' analytical and evaluative skills by engaging them with relevant lesson content.

In developing nations, the utilization of Information and Communication Technology (ICT) remains in its nascent stages primarily due to resource constraints (Barbour, Brown, Waters, Hoey, Kennedy & Trimm, 2011). Thus, recognizing the imperative to elevate educational standards to international benchmarks, Higher Education Commission (HEC) of Pakistan embarked on an ambitious journey to digitize the education system (Rahman, 2006). Subsequently, the government, particularly the provincial government of the Punjab, intensified its efforts to address these challenges, notably by focusing on appointment of Information Technology (IT) personnel and establishing IT laboratories in secondary schools across the province during the fiscal year 2010-15 (Kundi, Nawaz & Khan, 2010). In this linking, a significant stride was made between 2010 and 2017, as numerous high and higher secondary schools were outfitted with information technology labs, supplemented by the installation of interactive whiteboard smart screens in the various districts. To mitigate the impact of electricity outages, solar panels were integrated into these systems. The vision extended beyond mere infrastructure enhancement; efforts were made to revamp the curriculum, with Directorate of Curriculum & Teacher Education (DCTE) spearheading the transition from traditional blackboards to smart screens.

This strategic shift prompted DCTE to launch an extensive Blended Learning (BL) initiative, aimed at equipping primary school teachers with the necessary skills to effectively integrate ICT into the educational landscape (Ameen, 2018). Through these concerted endeavors, Pakistan endeavors to bridge digital divide and unlock transformative potential of technology in education. The efficacy of provincial government of Punjab's efforts in supporting public sector elementary school teachers within province prompts inquiry. As contrasting perspectives on effectiveness of blended learning in pedagogical approaches persist, more questions emerge than answers. Consequently, a decision was made to scrutinize whether a tangible correlation exists amid blended learning instruction and practices of elementary school teachers. Blended learning at the elementary level can significantly enhance students' academic achievements by providing personalized, engaging, and resource-rich learning experiences. With careful planning and support, blended learning can be a powerful tool in improving educational outcomes for students. This analytical effort aims to shed light on ongoing discourse surrounding elementary school education, serving as a valuable supplement to existing literature in the field.

Problem Statement

Implementing e-learning faces significant challenges in countries like Pakistan, including power outages, computer illiteracy, and limited access to technology and internet. The study investigates how blending learning techniques affect the academic achievements in elementary students. By

comparing them with traditional methods, it assesses cognitive skill development based on Bloom's taxonomy in order to produce new knowledge. The findings endorse integrating blending learning into the elementary education to maximize student academic success. The problem statement of this was "impact of blended learning teaching technique on the students' academic achievements' at elementary level".

Objectives of Study

1. To evaluate the 8th-class science students' academic achievement at elementary level under blended learning teaching techniques and traditional methods.
2. To investigate the impact of BL teaching techniques and traditional teaching on cognitive development in 8th-class science students using cognitive levels.

Hypothesis of Study

1. There is no significant difference in the academic achievement of 8th class science students between those undergoing blended learning teaching techniques and those taught using the traditional methods.
2. There is no significant difference in cognitive development of 8th class science students based on the instructional method, whether blended learning techniques or traditional teaching, as measured by cognitive levels.

Significance of Study

In developing countries like Pakistan, where e-learning faces the formidable obstacles like power outages and limited technological access, understanding how Blended Learning (BL) techniques impact the elementary education is paramount. Researching the impact of blended learning on elementary students' academic achievements was significant for several reasons. Firstly, it provided insights into effectiveness of integrating technology with traditional teaching methods, potentially refining learning outcomes for students. Secondly, it allows educators to tailor learning experiences to meet individual student needs, fostering a more personalized approach to education. Thirdly, it prepared students for steadily digitalized world by equipping them with vital technological skills from an early age.

Moreover, understanding the impact of blended learning helped in optimizing resource allocation within educational institutions, ensuring efficient use of technology and training resources. Besides, it supported the professional development of the teachers by identifying the effective strategies for integrating the technology into their teaching practices. Lastly, researching the effects of blended learning contributed to addressing the achievement gaps and promoting equity in education by providing diverse learners with equal access to effective learning tools and methods. Thus, at the elementary level, this technique can have significant impacts on students' academic achievements. Overall, this research had far-reaching implications for improving the educational practices and student outcomes.

LITERATURE REVIEW

The term "e-learning" emerged in the 1980s (Bersin, 2004) alongside the rise of online and distance learning, providing educational access to individuals unable to attend the traditional classrooms.

However, it's essential to recognize that e-learning encompasses more than just distance teaching (Moore et al., 2011). The integration of e-learning into traditional classroom settings has proven to be more productive than standalone e-learning platforms. E-learning tools enable practitioners & learners to access course content conveniently, even outside of school premises. Concurrently, face-to-face interactions in traditional classrooms offer learners opportunities to reinforce messages and engage directly with teachers and peers. Doom (2016); Gottlieb (2015); Lam (2015); Larsen (2012) have successfully executed e-learning within face-to-face classroom environments, demonstrating that combining these two modes creates an educational environment conducive to frequent access, inclusive disclosure of educational material, enhanced teaching & learning skills. This integration of learning approaches gave rise to the concept of Blended Learning. Since 2000, the integration of internet technology into education has marked significant milestone (Picciano, 2014). It has evolved beyond merely easing distance learning to becoming a fundamental educational tool at all levels in American schools.

The blending of internet-based and traditional pedagogies in curriculum development has proven instrumental in aiding the students' academic course completion (Hui, 2016). Graham et al. (2013) further examined how the online learning serves as a catalyst for enhancing routine teaching and learning practices. Previous research has showcased the successful implementation of the Blended Learning (BL) approach in high school education within developed countries (Hill, 2015), thereby encouraging its adoption in the developing nations. This shift, recognizing teachers as the pivotal stakeholders, underscores need for educators to evaluate and adapt their instructional strategies to equip themselves with the necessary skills to navigate technological advancements in education as students can learn at their own pace, revisiting materials as needed. Consequently, teachers must augment their efforts to enhance their adaptability and proficiency in aligning with learners' needs and embracing technology-driven educational methodologies. This evolution distinguishes 21st-century educators from their 20th-century counterparts. In light of this, there was a call for more empirical studies (Means et al., 2013) to be conducted to enhance the teaching experiences of less-experienced or technologically adept teachers in utilizing blended learning approach within their instructional practices.

Staker (2011) identifies several driving forces behind the emergence of Blended Learning (BL) in education, including the budget constraints, teacher shortages, legislative mandates like 'No Child Left Behind,' students' proficiency levels in core subjects, retention rates, and provision of tutoring both in school and at home. Moreover, other factors forcing integration of technology in education include the imperative to raise student achievement, time constraints within traditional classroom settings, surging student populations facilitated by open enrollment policies (McAlister, 2013), and alarmingly high dropout rates. One significant challenge for teacher was bridging the gap amid teaching practices and learning activities (Nwachukwu, 2015). Pedagogical shift brought about by BL creates a conducive learning environment, seamlessly integrating technology into educational landscape. The incorporation of technology into the online format of BL not only enhances teaching quality (Poon, 2013) but also facilitates collaborative efforts between students and teachers (Staker & Horn, 2012). BL equips schools with the tools to meet contemporary demands of the modern era by leveraging innovative, research-based educational technologies to optimize education process.

The effective execution of BL is shown to enhance both teaching and learning capacities (Gottlieb, 2015; Lam, 2015).

However, it's crucial to recognize that technology should not be perceived as a substitute for the teachers but rather as a vital tool for innovating teaching methodologies and streamlining time and effort (Doom, 2016). Both pedagogically and technically, role of teachers remains indispensable for successfully implementing BL (Kaleta et al., 2007). BL facilitates student retention by fostering efficient interaction amid students and teachers (Gomes, 2014), sustaining student interest through a diverse array of accessible technological resources, and integrating various modalities for content delivery. Moreover, BL aids in assessment customization for individualized assignments (Hudson, 2013). However, adopting the BL approach presents significant challenges for teachers who were familiar to traditional, teacher-centered lessons (Nwachukwu, 2015). Technology does not compel teachers to abandon traditional pedagogies; rather, it empowers them to use technology to enrich students' learning experiences (Shahid, 2017). Teachers can cultivate BL environment by employing various online instructional models in face-to-face classroom settings (Staker & Horn, 2012), as well as outside school environment, such as 'flipped technique,' which combines face-to-face interaction with online activities. Such interactive environments not only support teaching but shell learning skills (Hui, 2016).

The flexibility and convenience of BL afford teachers the opportunity to develop diverse pathways for the interactive and collaborative learning, even with limited resources such as a single iPad/tablet/whiteboard/computer for all students (Kristin, 2014). It's noteworthy that the availability of technology does not automatically translate to its integration into teaching practices (Dwyer, 2016). In preparation for working within a blended learning environment, a inclusive examination of effective blended learning practices underscores the critical considerations that teachers must address. Oliver et al. (2014) emphasizes three key factors that teachers need to take into account: the classroom context, pedagogical strategies, and integration of technology. This research-based substantiation highlights importance of understanding the specific dynamics of class environment, such as student demographics and learning needs, as well as employing appropriate instructional approaches that align with blended learning principles. Besides, teachers must skillfully leverage technology tools & resources to enhance learning experience and facilitate active communication and collaboration. By thoroughly considering these elements, educators can cultivate readiness for implementing blended learning methods and optimizing diverse educational outcomes in diverse learning environments.

Moreover technology-enhanced teaching roles were evaluated in a Blended Learning (BL) context at Government High School, KPK. Surveying 9class physics students and science teachers, findings suggested improved practices, advocating for the BL adoption over conventional methods, aligning with the strategic integration of technology in education (Ali & Hussien, 2020). Before the advent of online and blended teaching, technology educational training primarily centered on integrating technology into the classroom instruction, as noted by Graham et al. (2017). These researchers thus elucidated that the traditional mode of instruction focused on imparting skills that emphasized students' interaction with digital content. Equally, online teaching introduced physical disconnect

between teachers and students, emphasizing communication skills and engagement with both digital and non-digital content. The amalgamation of skills from traditional and online teaching models forms the foundation of a blended teaching model. In summary, research lacks empirical evidence on effectively supporting less-experienced teachers in implementing Blended Learning (BL) in resource-constrained settings like Pakistan. Understanding how to optimize the BL for these educators is crucial for enhancing teaching experiences and student outcomes at elementary level in the digital age.

RESEARCH METHODOLOGY

This research study adopted a quantitative approach, utilizing an experimental method within the framework of positivistic paradigm, as outlined by Creswell (2014). This approach ensured fairness & impartial selection while effectively controlling for extraneous variables. To minimize potential issues with the accuracy of research findings, the researcher used the pretest-posttest control group design. In this study, two groups (control and experimental) were equally matched through random sampling. The study employed experimental method with pre-test post-test control group design, symbolized as follows.

RE = O1 ——— T ——— O2
RC = O3 ——————————— O4

Where:
O1 and O3 = Pretests
O2 and O4 = Posttests
R for randomization, E for experimental group, C for control group & T for treatment (BL method).

The study followed an experimental approach, the target population encompassed all the 8th class girls of public schools in district Gujranwala, while the accessible population included those in one Tehsil selected public school. The participants shared the similar backgrounds, ages (13-14years), socioeconomic statuses, and cultural characteristics. A sample of the sixty 8th-class students was randomly selected from government girl's high school city Gujranwala, divided into experimental and control groups. The group formed and with random assignment of teaching methodologies to each group. Thus, this approach ensured a systematic investigation into the impact of the blended teaching techniques.

Table 1 Selected Girls Students of Control and Experimental Group of 8th Class

School Name	Control Group	Experimental Group	Total Students
GGHS City Gujranwala	30	30	60

Developing a reliable and valid test was crucial for assessing student learning effectively. At the elementary level, foundational for further learning. The researcher carefully crafted questions from selected chapters of the 8th class science aligned with the learning outcomes and blooms taxonomy, drawing on subject expertise and educational frameworks. Through item analysis, questions were refined to ensure clarity and fairness. Content validity was verified by experts, while reliability was assessed through the test-retest method to ensure consistent results over time. Moreover, pilot study with the students from another school validated the test's effectiveness before implementation. This

rigorous approach ensured that test accurately measured students' understanding of the material, providing educators with valuable insights into student learning outcomes. In this study, use of the blended teaching technique served as the independent variable, while students' achievement in science was dependent variable. Control variables included class level, timing, teacher, classroom conditions, & course content consistency. Uncontrolled variables included learners' IQ, individual inclinations toward subject and student tuition practices beyond the researcher control, potentially impacting test scores.

The experimental group teach through blended learning teaching techniques, teacher conducted lessons on four chapters of 8th-class General science using web pages as the primary platform. The research spanned eight weeks, with classes held five out of seven days each week, consisting of 40-minute periods. Instruction encompassed a blend of theoretical and practical activities, aiming to cover review sessions, introduce new content & facilitate hands-on application. Within classroom, teacher utilized a White Interaction Board in the computer lab to access internet sites, online video lectures, and demonstrate practical activities. To supplement the web pages, course materials were distributed via email, WhatsApp, and IMO accounts, fostering communication and collaboration among students and teachers outside of classroom setting. In contrast, the control group will receive instruction over traditional teaching methods. The researcher personally collected data over pre-test was given before period & post-test after treatment period in order to determine effectiveness of treatment period.

RESULTS OF STUDY

Comparison Of Student's Academic Achievements on Post-Test & Pre-Test of Control Group.

Table 2 Student's Academic Achievements on Post-test & Pre-test of Control Group.

Groups	N	Mean	SD	t-value	f	P-value
Posttest Control Group	30	19.75	3.247	1.927	28	.055
Pretest Control Group	30	17.68	4.002			

Table 2 displays the mean post-test score of 19.75 and SD of 3.247 for the control group. The control group's pre-test score had a mean of 17.68 and an SD of 4.002. In contrast to the table value of 2.16, which was less than the t-value at the 0.05 level of significance, the computed t-value for degree of freedom 28 was 1.927. Consequently, it can be said that students who were taught using a typical form of instruction had roughly the same recall capacity in both the pre- and post-tests as evident from the results.

Comparison of Student's Academic Achievements on Post-Test & Pre-Test of Experimental Group.

Table 3 Student's Academic Achievements on Post-test & Pre-test of Experimental Group.

Groups	N	Mean	SD	t-value	df	P-value
Posttest Experimental Group	30	47.99	3.251	36.891	28	.000
Pretest Experimental Group	30	19.01	5.236			

Table 3 shows that experimental group post-test mean score was 47.99 with a standard deviation of 3.251. These results suggest that data points were generally near the set mean. The experimental group pre-test mean was 19.01, and the standard deviation was 5.236, suggesting that the data points were dispersed across a broader range of values. In contrast to the table value of 2.16, which was not larger than t-value at 0.05 level, computed t-value for degree of freedom 28 was 36.891. Since computed t-value was less than table value and H01 was rejected, it can be said that students who receive instruction using blended learning methodologies see significant improvement in their academic performance.

Comparison of Performance Through Cognitive Levels of Pretest of Both Groups

Table 4 Cognitive Levels Comparison of Performance on Pre-test of Control & Experimental

Cognitive Level	Group	N	Mean	df	t-value
Knowledge	Control Experimental	30	4.13	58	-.130
		30	4.07		
Comprehension	Control Experimental	30	2.53	58	1.00
		30	3.00		
Application	Control Experimental	30	4.00	58	-.548
		30	3.73		

Table 4 shows that observed values in domains of knowledge, understanding, application, analysis, and synthesis were consistently less than critical value at 0.05 level of significance for degrees of freedom (df) 58. In particular, observed values for knowledge, understanding and application, were 1.30, 1.00, and -0.548, respectively, all of which were below critical threshold of 2.00. This suggests that mean scores of experimental & control groups in cognitive domains do not differ significantly. So, it can be said that throughout pre-test phase both group performance in these cognitive domains was comparable.

Comparison of the Performance Through Cognitive Levels of Posttest of Both Groups

Table 5 Cognitive Comparison of Student's Performance on Post-test of Control & Experimental

Cognitive Level	Group	N	Mean	SD	t-value	df	P-value
Knowledge	Control	30	3.87	1.813	17.443	58	0.000
	Experimental	30	9.87	0.506			
Comprehension	Control	30	4.73	1.856	11.828	58	0.000
	Experimental	30	9.47	0.167			
Application	Control	30	3.80	1.919	16.320	58	0.000
	Experimental	30	9.80	0.610			

There were some startling conclusions in above table. The control group's post-test average in the knowledge domain was 3.87, with a standard deviation of 1.814 indicating a wide range of scores. The experimental group, on the other hand, has a substantially higher average score of 9.87 and a slightly smaller standard deviation of 0.507, suggesting that their scores were narrowly distributed

around the mean. Similarly, in understanding domain, the experimental group scores significantly higher at 9.47 with a lesser standard deviation of 1.167, compared to the control group's 4.73 with a 1.856 standard deviation. The experimental group's mean score in application domain was 9.80, with a tighter standard deviation of 0.610, compared to control group's 3.80 with a standard deviation of 1.919. These findings demonstrate that across cognitive skill domains, the experimental group outperformed control group on a regular basis. Thus, based on their respective teaching strategies, we reject the hypothesis that there is no discernible difference in cognitive development of the two groups of eighth-class science students. Rather, it was evident that compared to the control group, pupils in the experimental group outperformed them in terms of cognitive ability as determined by Bloom's taxonomy.

DISCUSSION

The data analysis presents compelling evidence about the efficacy of blended teaching techniques over traditional teaching methods in enhancing academic achievement & cognitive development. In Table 2, the control group's minimal improvement from pre-test to post-test suggests limitations of conventional teaching approaches in facilitating meaningful learning outcomes. Conversely, Table 3 highlights the substantial improvement in experimental group's post-test scores, indicating the positive impact of blended learning teaching techniques on student performance. Thus, online components can adapt to the individual student's learning pace and style, providing the customized learning experiences. In this regard, the significant difference in t-values between the experimental and control groups underscores the superiority of blended learning teaching methods in fostering academic growth.

Table 4 reinforces these findings by revealing consistent performance across cognitive domains for both groups, implying comparable baseline cognitive growth. This consistency emphasizes distinct advantage of blended learning in driving significant improvements in student outcomes. Table 5 emphasized that higher performance of cognitive skills according to Bloom's taxonomy compared to control group. This verified further emphasizes distinct advantage of blended learning in driving significant perfections in student outcomes. The BL flexibility, interactivity & personalized learning experiences likely contribute to its effectiveness in engaging the students and promoting deeper understanding. By mixing technology with the traditional teaching methods, educators can tailor instruction to meet diverse learning needs, ultimately leading to enhanced cognitive development and academic success.

CONCLUSION

In conclusion, the findings from the data analysis strongly support the adoption of blended learning teaching approaches as a superior alternative to traditional teaching methods. Blended learning not only significantly enhances academic achievement but also fosters cognitive development across various domains. The substantial improvement observed in the experimental group's posttest scores, coupled with consistent performance across cognitive skills according to Bloom's taxonomy, underscores the transformative potential of blended learning in education. Thus, moving forward, educators and policymakers should prioritize the integration of technology as well as innovative

instructional strategies to generate dynamic learning situations that provide to the various needs of students. Embracing blended learning as a cornerstone of educational practice holds promise for empowering learners, enriching teaching experiences, and driving positive educational outcomes in the digital age.

Recommendations

1. Integrate BL courses into teacher training programs, particularly at the elementary level, to enhance teaching quality and student engagement.
2. Ensure blended learning training will inclusive of all the subjects and not limited to science teachers, benefiting all elementary level educators.
3. Encourage experts in curriculum development and educational policymakers to prioritize integration of BL techniques to improve educational outcomes.
4. Provide resources and support for the teachers to effectively implement BL strategies in their classrooms, fostering a conducive learning environment.
5. Continuous evaluation and adaptation of BL practices based on feedback from teachers and students to ensure its effectiveness in enhancing teaching and learning experiences.

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