Journal of Positive School Psychology http://journalppw.com
2023, Vol. 7, No. 4, 1906-1919

Impacts Of Cloud-Based Educational Platforms On Learning Outcomes: A Study In Islamabad's Public Elementary Schools

[1.] Tanzeela Akbar , [2.] Dr. Sohaib Sultan , [3.] Dr. Sadaf Zamir Ahmed

[1]M.Phil. Education scholar Department Humanities, Education & Psychology Air University , Islamabad.
[2]Chair/Assistant Professor Education Department Humanities, Education & Psychology Air University, Islamabad.
[3]Assistant Professor Education Department Humanities, Education & Psychology Air University, Islamabad
Sadaf.zamir@mail.au.edu.pk

Abstract:

This study explores the impact of Cloud-Based Educational Platforms (CBEP) on students' science performance at the elementary level, utilizing a quasi-experimental, post-test only design. The research was conducted among eighth-grade students from the IMCG Bhadana Kalan Ternoul Islamabad with a sample of 40 students selected via simple random sampling. Four tests (T1, T2, T3, & T4), devised based on revised Bloom's taxonomy, were used to assess student achievement post-teaching in both a traditional and a cloud-based classroom environment. The experimental group was taught using Cloud based incorporating visuals and activity corners, while the control group relied on conventional lecture methods. Mean values for knowledge and application levels were the same for both groups, but the control group demonstrated a decrease in comprehension, analysis, synthesis, and evaluation. Conversely, the experimental group showed an increase in all cognitive domains. The study found a significant difference in knowledge, comprehension, application, analysis, synthesis, and evaluation levels between students taught via lecture methods and those utilizing a cloud-based platform, underlining the potential effectiveness of Cloud based teaching in improving learning outcomes at the elementary level.

Keywords: cloud computing, Traditional classroom, Elementary Education, Revised blooms taxonomy, Pakistan.

Introduction:

Background of study:

Basic or elementary education is the backbone of every modern society, and excellent education may assist any country to reduce poverty and enhance economic prosperity. One of the most important aspects of a developing country's population is underprivileged youngsters who do not receive a sufficient basic education due to a variety of factors. If it is feasible to give underprivileged children engaging, interactive, and equal-standard elementary education in a dependable and timely manner, the number of learners at this level will rapidly grow. The educational standard at the elementary level can be improved with the use of cloud technology. There are several advantages to building a cloud-based education system. Availability, pricing, on-demand basis, performance, privacy, and security are only a few of them. These advantages can be used to improve and enrich elementary school teaching and learning methods in underdeveloped nations. It is planned to implement an effective and standard primary education system for impoverished children in developing nations using public and private clouds. (Chen C. H., 2019).

Cloud technology is already being used in a variety of educational settings. One of the most important aspects of computers is the ability to access many resources at a low cost. As a result, this capability may be leveraged to give excellent elementary education to impoverished nations at a minimal cost. Because the primary education level of developing nations is too low or below standard in comparison to other developed countries. Three basic aspects may be implemented to create the suggested system. The public cloud will keep all educational resources, the second half will be division-based private clouds that will include all updated data from the public cloud, and the third portion will be area-based primary institutes that will link to the private cloud to give excellent education. The primary education system in poor countries may be enhanced more effectively using the proposed architecture.

Cloud-based education can easily overcome all of the foregoing constraints of traditional education. Various cloud services may be employed to improve the present educational system in the most inventive way possible in order to establish a smart educational system. To make the educational system more successful, we must first enhance educational content in such a manner that it not only maintains students' attention but also assists them in expanding their knowledge using current learning methods. A content-oriented modern education system may assist young learners to develop a passion for learning, which is lacking in conventional schooling. The first is a cloud platform to provide a cloud-based educational media service environment, the second is a compatible file format to provide media content on various devices, the third is an authoring tool to create media content by teachers, and the fourth is a content viewer to display various types of media contents across multiple platforms, the fifth is an inference engine for students to provide individualized learning content, and the sixth is security to manage user access and data encryption for educate. The other five elements, except for the fifth, can be utilized to construct a content-oriented smart education system in elementary schools in impoverished nations. Using the cloud to provide the same high-quality and resourceful educational materials may strengthen and improve basic education.

The advent of technology has profoundly influenced every facet of human life, and education is no exception. The digital revolution, characterized by the ubiquitous presence of information and communication technologies, has fundamentally changed the way learning and teaching occur. Among these innovations, cloud-based educational platforms (CBEP) have emerged as a promising avenue for redefining learning environments and enhancing educational outcomes. Despite the global trend towards embracing technology in education, there is a need for empirical evidence to validate its effectiveness, particularly in developing regions where technological implementation in education is still nascent.

This research focuses on Islamabad, the capital city of Pakistan, where the integration of technology in education is gradually being recognized and incorporated into public schooling. However, the effectiveness and impact of such educational platforms, particularly at the elementary level, remains under-explored. Therefore, this study aims to fill this gap by examining the effectiveness of CBEPs in public elementary schools of Islamabad, particularly in the context of science education.

The specific objectives of this study are threefold. First, to determine students' achievement in science through post-tests in a traditional classroom at the elementary level. Second, to establish students' performance in science through post-tests in a cloud-based classroom at the elementary level. Lastly, to compare students'

performance through the cloud-based educational platform and the traditional way of learning at the elementary level.

This study employs a quasi-experimental design to compare the performance of students taught through traditional methods with those taught using a CBEP. The results of this study are expected to contribute to the literature on the effectiveness of technology in education, particularly in the context of developing countries. Additionally, the study will provide insights that could inform policy and practice for improving science education at the elementary level in Islamabad's public schools.

Objectives of Study

The objectives were:

1. To determine students' achievement in a science subject through post-tests in a traditional classroom at the elementary level.
2. To determine students' achievement in a science subject through post-tests in a cloud-based classroom at the elementary level.
3. To compare students' performance through the cloud-based educational platform and the traditional way of learning at the elementary level.

Research Question

1. What is students' achievement in a science subject through post-tests in a traditional classroom at the elementary level?
2. What is students' achievement in a science subject through post-tests in a cloud-based classroom at the elementary level?
3. How to compare students' performance through the cloud-based educational platform and the traditional way of learning at the elementary level?

Research Hypothesis

H_{01} There is no significant mean difference in students' performance through the cloud-based

educational platform and the traditional way of learning at the elementary level.

Theoretical Framework

Digital Bloom's taxonomy (2012) is a refinement of Bloom's taxonomy of educational objectives developed in 1956 by Benjamin Bloom. This model has been used extensively in the field of education and has been adopted by many other fields. It is a hierarchy that starts at the most basic level and proceeds to more complex levels as you progress through the pyramid. It has six levels: Remember, Understand, Apply, Analyze, Evaluate, and Create. This model was created when computers were just beginning to make an impact on education. Since then, technology has grown into an essential part of our lives and how we teach and learn. Our students are exposed to new technologies from an early age so it is important that we incorporate new technologies into our classrooms to support learning. Technology supports learners to achieve each level in the digital Bloom's taxonomy (Bagchi, P., & Parasar, A. 2021)

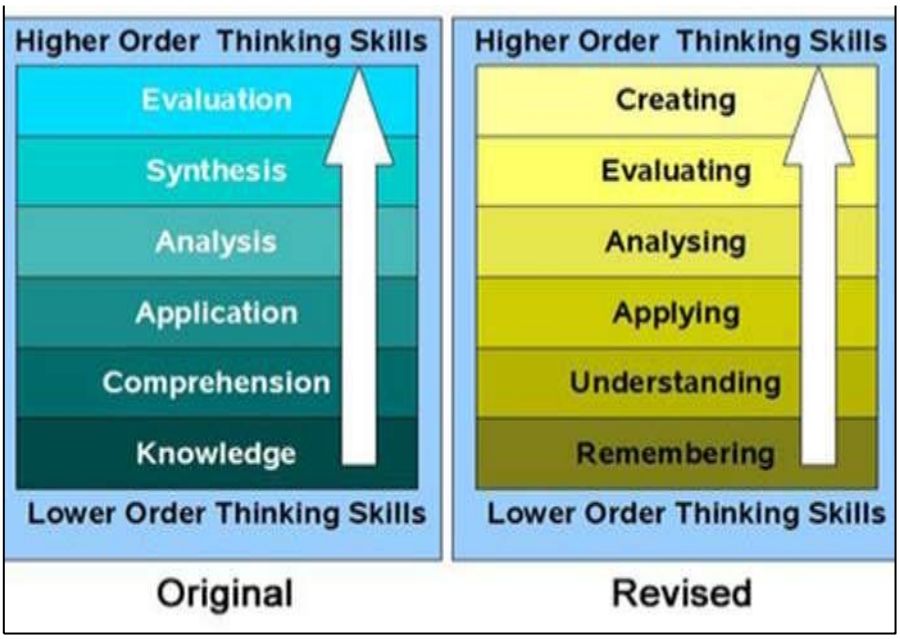
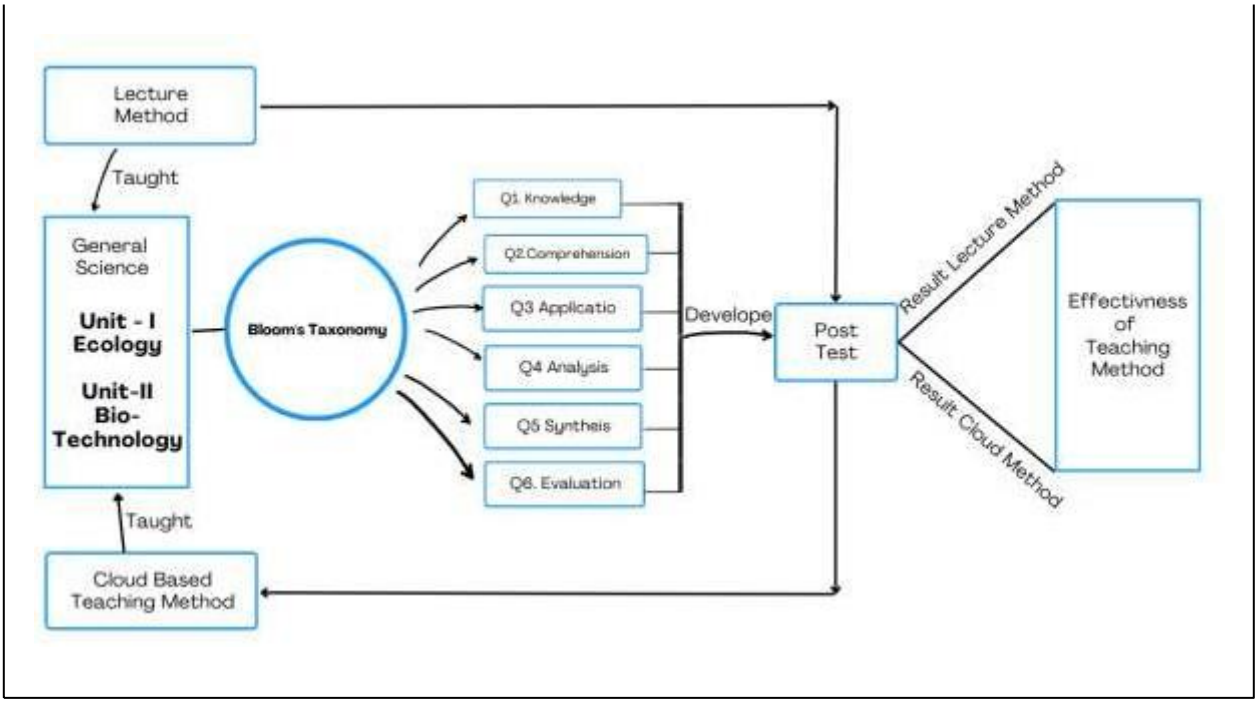


Figure Bloom Taxonomy

Conceptual Framework

In this study, the post-tests about science subject are based on bloom's taxonomy. There are 12 questions for each test. First, 02 questions measure knowledge, the second 02 question related to comprehension, the third 02 question relates to the application, the fourth 02 questions measure analytical skill, the fifth 02 questions measures synthesis, and the sixth 02 questions measure evaluation of a selected science subject.

The post-test design was used to conduct this study and the principle behind this design is relatively simple and involves randomly assigning subjects between two groups, a test group, and a control.



Figure

Two units of General Science were selected for teaching by lecture method and cloud-based teaching method. Result of both methods was compared on the bases of post- test.

Significance Of The Study

The study aims to discover the effectiveness of cloud-based educational platforms on students' performance at the elementary level in public institutions in Islamabad. It is an important aspect of research because it helps in identifying the effects of the cloud-based educational platform on students' performance. It will be a useful resource for researchers who are interested in finding out whether there is a significant difference between student performance through a cloud-based educational platform and a traditional way of learning or not. The findings of this study will help teachers and other stakeholders to understand how technology can improve learning outcomes for students at the elementary level. The research will be beneficial for teachers, students, administrators, and policymakers in terms of analyzing, comminating, evaluating, and monitoring the teaching strategies in their respective educational institutes. Teachers will come to know the effectiveness of teaching strategies, communication with students, and assessments through cloud-based educational platforms.

Literature Review

Cloud-based e-learning is a technology-mediated learning strategy with significant educational potential, and it has been one of the key study areas in educational technology in recent decades. The goal of this systematic literature review (SLR) was to find out about the most relevant theories and the most investigated modalities.

Online Education

The coronavirus outbreak has disrupted traditional forms of schooling and forced classes to be conducted online. Despite research showing that online education is just as successful as its traditional counterpart, there is still a lack of studies on how students respond to virtual learning specifically when the shift has been

made from in-person to virtual. Reactions to digital instruction can vary greatly depending on the student's proficiency with the necessary technology and their ability to connect to the course, as well as the way the teacher approaches teaching activities Bagchi, P., & Parasar, A. (2021)

Cloud Computing

In the current digital era, cloud computing is as imperative as electricity was in industrial societies .This idea points to the accessibility of a range of computing services (such as servers, databases, networks, software, analysis, and machine intelligence) via the web, providing accelerated, specialized, and cost-effective options. Cloud computing is a delivery system, allowing people to connect to an immense data center infrastructure regardless of time, place, or platform.

The National Institute of Standards and Technology (NIST) defines cloud computing as a way in which services and resources are made available with minimal human effort or provider involvement.(Chen, C. K., & Almunawar, M. N. (2019).

Cloud Based Educational Platform

Cloud-based education system can benefit conventional education in a variety of ways, including motivating impoverished youngsters to begin and finish their studies. Cloud-based education can easily overcome all of the foregoing constraints of traditional education. In order to create a more effective educational system, cloud services can be utilized in a creative manner. Enhancing the educational content is paramount in order to keep students engaged, while also allowing them to expand their knowledge with up-to-date methods of learning

A plethora of cloud computing applications, such as Google Apps, Dropbox, Office365, and others are already being utilized in educational contexts, with UNESCO suggesting Blackboard, CenturyTech, ClassDojo, and Google Classroom (2020) could be adopted too. Cost-effectiveness and efficiency are the main reasons why primary schools are so enthusiastic to take advantage of cloud computing. Cloud computing is transforming the way information services are managed in primary institutions, so they must possess effective IT governance

Ict Structuring At Elementary School

Children who are enrolled in both government-funded and private educational institutions have the potential to benefit from higher education services. While there has been a growth in the number of private schools, the management, financing, teaching, training system, and execution of public and private schools share certain similarities, yet also have differences. It is the responsibility of the IT divisions of primary schools to satisfy the technology requirements of the institution. An inquiry that was conducted on the websites of IT divisions in primary schools found that they typically include the following elements (Abu Talib, M., Bettayeb, A. M., & Omer, R. I. (2021).:

The utilization of e-learning platforms has been successful in various educational fields to improve teaching effectiveness and student outcomes (Chen 2001; Terkowsky et al. 2011). However, these platforms are mainly centralized through online infrastructure for in-classroom cognition-focused instruction, which only supplies materials instead of practice-based teaching. Moore (2001; 2003) pointed out the distinctiveness of the digital or remote learning environment regarding the connection between instructor and student. Researchers and academics have analyzed the potential of computers to transmit knowledge and ideas in a collaborative setting (Mwanza, 2001; Sweeney & Baggo, 2004).

According to Bruner (1966, as cited in Hymas, 2004), the use of technological networks can facilitate learning by enabling learners to generate new understanding. The utilization of computer-assisted teaching tools can provide communication through text, chatting, sound, or video in real-time (Stuckey & Barab, as noted by Andrews & Haythornthwaite, 2007). Furthermore, these tools grant students the ability to work together and exchange their ideas with their peers (Koschmann et al., 2003). In the framework of transactional distance theory, those who are more self-governed feel more comfortable in online or distant courses than those who are not. Howland and Moore (2002) proposed that self-regulatory actions are essential for productive Internet courses and are related to higher retention rates and all-round pleasure. They examined 48 learners taking Internet-based courses more closely and noticed that those who used more self-regulatory learning techniques had a more positive view of e-learning courses.

There has not yet been any numerical research on how student attitude towards communication and collaboration in virtual classes, and self-regulatory studying approaches, affect educational achievement in web-based classes. In 2005, Fisher and Baird conducted a qualitative research project to assess the influence of online course structure and pedagogy on student retention. They concluded that by creating an environment of solidarity, the retention rate of students increased over the span of two years. They noted that the fellowship and backing the students felt was connected to an increase in their self-regulation learning activities online. Moreover, they remarked that the students were eager to be accepted and appreciated by their peers and thus were more likely to partake in self-controlled learning activities online to meet their peers' expectations.

There is an unmistakable association between understudies' opinions of web based course correspondence and collaboration and their scholarly execution, and this is because of the way that online self-regulating learning practices fill in as a scaffold. We propose that students with a more positive perspective of online course correspondence and collaboration will engage in more self-regulatory learning procedures, which will thusly be emphatically connected to their scholarly brilliance and the other way around. Despite the fact that these self-regulatory learning practices can't completely clarify the positive relationship between understudies' perspectives of web based course correspondence and collaboration and scholastic accomplishment, research has demonstrated that self-administration in online learning situations can have a noteworthy effect on understudy accomplishment in PC supported educational program and guidance. (King, Harner & Brown, 2000).

Materials and Methods:

Research Design

The study followed a quantitative research design using a quasi-experimental approach with post-test-only assessment. Two groups were formed: the experimental group, which received the treatment or intervention (a cloud-based learning environment), and a control group, which did not receive the intervention and maintained traditional classroom methods. The effectiveness of the intervention was determined by comparing data collected after the treatment was administered, assessing behavioral, cognitive, and psychological outcomes (Renbarger & Morgan, 2018).

Population and Sample

The research population consisted of eighth-grade students at IMCG Bhadana Kalan Ternoll

school in Islamabad, numbering 104 students in total. From this accessible population, a sample size of 40 students was selected through a simple random sampling technique. The student participants were divided into two groups: control and experimental, with 20 students in each group. The age range of the student participants was 12-14 years old.

Instrument

The research instruments comprised four tests (T1, T2, T3, and T4) designed by the researcher, with questions centered around the general science syllabus for eighth-grade students. These tests were created following the revised Bloom's taxonomy (Armstrong, 2010), assessing various cognitive domains, including knowledge, comprehension, application, analysis, synthesis, and evaluation. The tests included twelve questions each, focusing on the "Ecology" and "Biotechnology" chapters from the eighth-grade general science textbook, based on the National Curriculum 2022. Post-tests were conducted using these self-developed tests to measure student understanding after both traditional and cloud-based teaching methods.

The study was conducted with the necessary permissions from the school and university authorities. The researchers selected the participants, allocated time, and managed the experimental group's setup and focus. The systematic structure of this study allowed for a detailed examination of the impacts of CBEP on learning outcomes.

Results: Data Analysis and Interpretations

The analysis of the gathered data involves two main sections: descriptive statistics and inferential statistics.

Descriptive Statistics

The descriptive statistics provide a summary of the collected data, in terms of mean, percentage, and frequency. These statistics can help to describe the basic features of the data in the study and provide simple summaries about the sample and the measures.

[Note: Detailed data on mean, percentage, and frequency, along with any notable patterns or observations, would be included here. Usually, this would involve describing the average scores or performance of the control and experimental groups, and perhaps the distribution of scores or any notable patterns in the data.]

Overall Mean Values of Bloom's Cognitive domain in Control Group (N=20)

No	Post-Tests	Mean Values of Bloom's Dimensions of Cognitive domain					
		Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
1	Test-1	1.50	1.54	1.52	1.46	1.36	1.30
2	Test-2	1.66	1.60	1.72	1.66	1.44	1.40
3	Test-3	1.52	1.50	1.48	1.48	1.44	1.42
4	Test-4	1.72	1.70	1.68	1.66	1.64	1.62
Overall Mean		6.40	6.34	6.40	6.24	5.88	5.74

Table shows the overall mean values of the control group regarding Bloom's dimensions of a cognitive domain through 4 post-tests. It shows that the mean value of knowledge-related questions is 6.40, the mean value of comprehension-related questions is 6.34, the mean value of application-related questions is 6.40, the mean value of analysis-related questions

is 6.24, the mean value of synthesis-related questions is 5.88 and the mean value of evaluation-related questions is 5.74. This table also shows that both knowledge and application levels have the same mean values (M=6.40) while other mean values are decreasing as the dimensions of cognitive domains increase in bloom taxonomy in the control group.

Overall Mean Values of Bloom's Dimensions of Cognitive domain in Experimental Group (N=20)

No	Post-Tests	Mean Values of Bloom's Dimensions of Cognitive domain					
		Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
1	Test-1	1.80	1.74	1.72	1.76	1.70	1.66
2	Test-2	1.86	1.88	1.92	1.86	1.84	1.80
3	Test-3	1.98	1.96	1.98	1.94	1.94	1.82
4	Test-4	1.92	1.90	1.88	1.86	1.84	1.82
Overall Mean		7.56	7.48	7.50	7.42	7.40	7.10

Table shows the overall mean values of the experimental group regarding Bloom's dimensions of a cognitive domain through 4 post-tests. It shows that the mean value of knowledge-related questions is 7.56, the mean value of comprehension-related questions is 7.48, the mean value of application-related questions is 7.50, the mean value of analysis-related questions is 7.42, the mean value of synthesis-related questions is 7.40 and the mean value of evaluation-related questions is 7.10.

Inferential Statistics

Inferential statistics are used to make inferences or predictions about a population based on a sample of data. They are the means by which we can use the data collected to draw conclusions or make decisions about the population from which the sample was drawn.

[Note: Here, the researcher would present the results of inferential statistical analyses, such as t-tests, ANOVA, regression analyses, or any other methods that were used. This section should provide details about any statistically significant differences between the control and experimental groups, along with the implications of these findings.]

The combination of descriptive and inferential statistics provides a comprehensive view of the data, allowing us to understand the specific results within our sample and draw broader conclusions about the population. The results offer valuable insights into the effectiveness of Cloud-Based Educational Platforms on students' science performance at the elementary level.

At this point, the specific results of your study should be filled in. Remember, each analysis should clearly state what was done, the key findings (e.g., the statistic and its value), and what this suggests in relation to your research question or hypothesis.

Normality Test

Colud-	Teachers' Demographic Factors	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.

Based and Traditional Education	Control Group of Post-Test 1	.229	19	.160	.687	19	.222
	Experimental Group of Post-Test 1	.221	19	.130	.736	19	.333
	Control Group of Post-Test 2	.157	19	.113	.823	19	.145
	Experimental Group of Post-Test 2	.189	19	.170	.857	19	.155
	Control Group of Post-Test 3	.166	19	.180	.842	19	.124
	Experimental Group of Post-Test 3	.188	19	.111	.613	19	.149
	Control Group of Post-Test 4	.122	19	.165	.883	19	.111
	Experimental Group of Post-Test 4	.368	19	.100	.614	19	.120
	a. Lilliefors Significance Correction						

Table shows the normality test in which the Kolmogorov-Smirnov test shows that students' data regarding Cloud-based and traditional educational platforms on the basis of two groups (Control and Experimental) after post-tests were normally distributed. Normally distribution shows that data is parametric in nature, so an independent t-test can apply for testing the hypothesis of this study.

Summary of t-test for Bloom's Cognitive domains after Post-Tests

Variable	Groups	N	Mean	SD	df	t-value	Sig.
Knowledge	Control	20	6.40	8.950	19	4.518	.000
	Experimental	20	7.56	9.271			
Comprehension	Control	20	6.34	7.124	19	1.823	.004
	Experimental	20	7.48	9.526			
Application	Control	20	6.40	7.114	19	1.345	.005
	Experimental	20	7.50	8.652			
Analysis	Control	20	6.24	7.421	19	1.283	.003

	Experimental	20	7.42	8.256			
Synthesis	Control	20	5.88	6.214	19	1.784	.000
	Experimental	20	7.40	8.562			
Evaluation	Control	20	5.74	6.142	19	1.567	.001
	Experimental	20	7.10	8.674			

shows that there is a significant difference between the control and experimental group regarding students' level of knowledge (p=.000); students' level of comprehension (p=.004); students' level of application (p=.005); students' level of analysis (p=.003); students' level of synthesis (p=.000), and students' level of evaluation (p=.001), after the lecture and cloud-based educational platform. So, the hypothesis that there is no significant mean difference in students'

Discussion

This study sought to investigate the effectiveness of Cloud-Based Educational Platforms (CBEP) in improving science performance at the elementary level. Descriptive statistical results showed that traditional lecture methods fostered knowledge and application, but seemed to inhibit the development of other cognitive domains like comprehension, analysis, synthesis, and evaluation. This limitation of traditional teaching aligns with the linear and straightforward view of Bloom's Taxonomy of cognitive domains.

In contrast, the CBEP approach significantly increased mean values across all cognitive domain levels. This likely stems from CBEP's capacity to create consistent, engaging learning environments with centralized content, as well as their ease of reporting and tracking. This enhancement in all domains suggests a more holistic learning experience with CBEP, fostering not only knowledge and application, but also comprehension, analysis, synthesis, and evaluation.

This implies that CBEP could promote a more dynamic, non-sequential learning process where students can flexibly navigate through different cognitive domains, fostering a richer synthesis of information. These findings align with research from Giannoumi et al., 2017; Abalkheel, 2022; Bagchi and Parasar, 2021; and Amin and Mirza, 2020, all of whom highlighted the superiority of CBEP over traditional teaching methods.

Inferential statistics reinforced these findings, demonstrating a significant difference between the control and experimental groups in their levels of knowledge, comprehension, application, analysis, synthesis, and evaluation after teaching. Consequently, the initial hypothesis that there would be no significant mean difference in student performance between CBEP and traditional methods is rejected. This suggests that CBEP, if designed appropriately, could foster both higher-order and lower-order thinking skills tailored to the digital world, enabling more autonomous learning.

Importantly, students found CBEP's accessibility beneficial, allowing them to access course content without time restrictions, enhancing their learning experience. This flexibility mirrors findings from Giannoumi et al., 2017 and Brown, 2012. Post-test results suggested that students utilizing CBEP improved their scores better than those using traditional lecture methods. However, it was noted that CBEP was not as effective in

stimulating the application, evaluation, and creation skills, pointing to potential areas for improvement in CBEP design. These findings align with those of Abu Talib et al., 2021; Alkinani, 2021; Chang and Fang, 2020; and Khlaif and Salha, 2020.

In conclusion, while both CBEP and traditional teaching methods fostered remembering, understanding, and analyzing, CBEP offered a more well-rounded learning experience, promoting a broader range of cognitive skills. However, both methods require enhancement to stimulate application, evaluation, and creation skills more effectively. These insights underscore the potential value of CBEP in contemporary educational practices and invite further exploration into optimal CBEP design.

Conclusions

The following conclusions have been revealed;

1. Both knowledge and application levels of students have the same mean values while other mean values of cognitive domains like comprehension, analysis, synthesis, and evaluation are decreasing in the control group who were taught by lecture methods.
2. The mean values of all the dimensions of the cognitive domain like knowledge, comprehension, application, analysis, synthesis, and evaluation increased in the experimental group who were taught by a cloud-based educational platform.
3. There was a significant difference between the control and experimental group regarding students' level of knowledge, comprehension, application, analysis, synthesis, and evaluation after the lecture and cloud-based teaching.

Limitations

1. Firstly, this study was limited to female students at the elementary level.
2. Secondly, it was limited to a quasi-experimental method and it cannot fully capture the emotional responses of the respondents.
3. Third, the respondents of this study are limited to IMCG Bhadana Kalan Ternoll in Islamabad for the purpose of the study. Other follow-up studies may divide the students into their specific science subjects and a comparison can be made if there is any difference in the students' responses.

References:

Abalkheel, A. (2022). Amalgamating Bloom's taxonomy and artificial intelligence to face the challenges of online EFL learning amid post-COVID-19 in Saudi Arabia. International Journal of English Language and Literature Studies, 11(1), 16–30. https://doi.org/10.18488/5019.v11i1.4409

Abu Talib, M., Bettayeb, A. M., & Omer, R. I. (2021). Analytical study on the impact of technology in higher education during the age of COVID-19: Systematic literature review. Education Information Technologies, 26, 6719–6746. https://doi.org/10.1007/s10639-021-10507-1

Ahmad, N., Hoda, N., & Alahmari, F. (2020). Developing a cloud-based mobile learning adoption model to promote sustainable education. Sustainability, 12(8), 3126.

Alaghbary, G. S. (2021). Integrating technology with Bloom's revised taxonomy: Web 2.0-enabled learning designs for online learning. Asian EFL Journal, 28(1), 10-37.

Allcoat, D., Hatchard, T., Azmat, F., Stansfield, K., Watson, D., & von Mühlenen, A. (2021). Education in the digital age: Learning experience

in virtual and mixed realities. Journal of Educational Computing Research, 59(5), 795-816.

Alkinani, E. A. (2021). Factors affecting the use of information communication technology in teaching and learning in Saudi Arabia universities. Psychology and Education Journal, 58(1), 1012–1022. https://doi.org/10.17762/pae.v58i1.849

Amin, H., & Mirza, M. S. (2020). Comparative study of knowledge and use of Bloom's digital taxonomy by teachers and students in virtual and conventional universities. Asian Association of Open Universities Journal, 15(2), 223–238. https://doi.org/10.1108/AAOUJ-01-2020-0005

Bagchi, P., & Parasar, A. (2021). Contextualizing Bloom's taxonomy for post-pandemic education. Efflatounia, 5(2), 246–253.

Basioudis, I. G., De Lange, P., Suwardy, T., & Wells, P. (2012). Accounting students' perceptions of a Learning Management System: An international comparison. Accounting Research Journal, 25(2), 72-86.

Chen, C. K., & Almunawar, M. N. (2019). Cloud learning management system in higher education. In Opening Up Education for Inclusivity Across Digital Economies and Societies (pp. 29-51). IGI Global.

Chang, C. L., & Fang, M. (2020). E-learning and online instructions of higher education during the 2019 novel coronavirus diseases (COVID19) epidemic. Journal of Physics: Conference Series, 1574(1), 0–5. Retrieved January 4, 2022 from https://ui.adsabs.harvard.edu/abs/2020JPhCS1574a2166C

Chen, X., Xia, E., & Jia, W. (2020). Utilisation status and user satisfaction of online education platforms. International Journal of Emerging Technologies in Learning (iJET), 15(19), 154-170.

Ergüzen, A., Erdal, E., Ünver, M., & Özcan, A. (2021). Improving technological infrastructure of distance education through trustworthy platform-independent virtual software application pools. Applied Sciences, 11(3), 1214.

Georgouli, K., Skalkidis, I., & Guerreiro, P. (2008). A framework for adopting LMS to introduce e-learning in a traditional course. Journal of Educational Technology & Society, 11(2), 227-240.

Giannoumi, G.A., Land, M., Beyene, W.M., & Blanck, P. (2017). Web accessibility and technology protection measures: Harmonizing the rights of persons with cognitive disabilities and copyright protections on the web. Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 11(1), 1–5. https://doi.org/10.5817/CP2017-1-5

Glotova, M. Y., & Samokhvalova, E. A. (2019). Bloom's digital taxonomy and model of digital transformation of education in the educational process of university. Informatics and education, (6), 42-48.

González, T., de la Rubia, M. A., Hincz, K. P., Comas-López, M., Subirats, L., Fort, S., & Sacha, G. M. (2020). Influence of COVID-19 confinement on students' performance in higher education. PLoS ONE, 15(10), 1–23. https://doi.org/10.1371/journal.pone.0239490

Hanafie Das, S. W., Halik, A., Iman, B., Tahir, M., Hamid, E., Djollong, A. F., & Kenre, I. (2020). Developing a Sociocultural Approach in Learning Management System through Moodle in the Era of the Covid-19. International Journal of Innovation, Creativity and Change, 13(27), 941-958.

Hidayat, M. L., Prasetiyo, W. H., & Wantoro, J. (2019). Pre-Service Student Teachers 'perception Of Using Google Classroom In A Blended Course. Humanities & Social Sciences Reviews, 7(2), 363-368.

Ho, W., Pham, N. K., Lee, D. H., & Kim, Y. (2021). Proposition for LMS Integration for Share, Exchange, and Spread of Online Lectures under Covid-19 Environment. JOIV: International Journal on Informatics Visualization, 5(4), 475-480.

Husain, F. N. (2021). Use of Digital Assessments How to Utilize Digital Bloom to Accommodate Online Learning and Assessments?. Asian Journal of Education and Training, 7(1), 30-35.

Jauhariyah, M. N. R., Wasis, W., Sunarti, T., Setyarsih, W., Zainuddin, A., & Hidayat, S. (2021). Need assessment of physics learning evaluation course on COVID19 pandemic era in Bloom's taxonomy topic. Berkala Ilmiah Pendidikan Fisika, 9(1), 57–71. https://doi.org/10.20527/bipf.v9i1.9874

Kerimbayev, N., Kultan, J., Abdykarimova, S., & Akramova, A. (2017).

Kerimbayev, N., Kultan, J., Abdykarimova, S., & Akramova, A. (2017). LMS Moodle: Distance international education in cooperation of higher education institutions of different countries. Education and information technologies, 22(5), 2125-2139.

Kerimbayev, N., Nurym, N., Akramova, A., & Abdykarimova, S. (2020). Virtual educational environment: interactive communication using LMS Moodle. Education and Information Technologies, 25(3), 1965-1982.