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Original Article

Impact of Technology-Based Learning on Academic Performance of Undergraduate Level Students

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Abstract

Technology-based learning is a new learning method where students are taught using different digital/ICT tools such as mobile phones, computers, the internet, multimedia, tablets, and many others. The present study aimed to determine the impact of technology-based learning on students' academic performance. A quantitative research method was applied, followed by a survey research design to accomplish this study. The study was delimited to Balochistan province. All the public degree-awarding higher educational institutions were considered for the study. The target population for the study was the undergraduate students. The questionnaire was developed in collaboration with all authors. The reliability and validity of the framed questionnaire were checked through pilot testing. The reliability was found to be 0.87. Data were collected personally and with the help of colleagues. The collected data were analyzed using descriptive and inferential statistics with the assistance of SPSS software version 22. The study's findings indicate that technology-based learning develops students' critical thinking, communication, cognitive, and reading skills, motivates students to become problem solvers, and enhances the professional development of the learners. The study concluded that technology-based learning positively impacts students' academic performance at the undergraduate level and also enables the students to cope with modern-world challenges. The study recommends that the government include technology at all levels of education, train its teachers, and provide all the technology resources.

Keywords: Academic performance, Balochistan province, technology-based learning, undergraduate level

INTRODUCTION

Technology is crucial nowadays in every field of the world, especially education. When computers and technology are applied well, they can transform the teaching and learning process. Technology can change traditional teaching and learning into modern teaching and learning, and the world around us is improving due to the advancement of technology (Shukla, 2010). The invention of technology has facilitated the classrooms through which students adapt to the modern environment and skills that prepare them for the challenges of professional life (Cunha & Heckman, 2007). A student-centered approach was found more effective than the combination of skills-building approaches. In the classrooms, students learn by collaborating with their peers and collaborators when provided with direct opportunities for independent expression, exploration, and freedom to experience developing their skills. The students of school slid from pencil and paper to computer use. The learners need to have mastery over the use of technology to sustain themselves in this competitive world. The learners of the current era are interested in technology as they are seen using laptops, mobile phones, tablets, and other technology sources. The tools that are very helpful in education include online dictionaries, search engines, language learning and translation, and others.

Technology motivates students to study with zeal and rigor and get motivated towards further study. Furthermore, by using technology, students' dropout ratio decreases because they take an interest in the use of technology, which results in low absenteeism in the classroom. According to Carnevale et al., (2010), when learners complete high school, they are more inclined to attend college. Nowadays, teachers use ICT in their teaching practice, bringing students to the point of learning. Teachers pay attention to discussion, not just to their lectures; through this process, students go through investigation and develop critical thinking skills. Therefore, technology provides many chances to learn in a better way. Ahmed et al., (2019) indicate that information communication and technology affect teachers' professional development, ultimately affecting students' academic performance.

Moreover, technology motivates students to have control of their studies. When technology is added to the curriculum, the students can learn through technology-based activities. When technology is a part of learning, students actively participate in class discussions. The learner who used ICT in their learning process scored more than those who did not use ICT. Khan et al., (2019) state the highest achievement in favor of the experimental group taught with ICT instructional methodology.

LITERATURE REVIEW

Funchs and Woessmann (2004) conducted a study on international student assessment and found

that students who were provided with ICT had higher performance and positive achievement than those who did not have the availability of ICT, and their results were less attractive. Therefore, integrating technology into the learning process brings a positive attitude and positive performance of students. Technology increases learning because students are not dependent on their teachers and prefer to learn through technology at home. In the modern world, the traditional teaching method has changed into technology-based learning, and it can engage and provide them with related information and enhance their educational experiences. Educational research shows that technology has different methods to increase students' learning and how technology increases their learning.

Technology does not have limits rather it is being used everywhere and serves many purposes. Technology adds to students' knowledge, as it makes work easy for humans and saves time (Ertmer & Ottenbreit-Leftwich, 2010). It polishes the talent of students, and students can have more opportunities to learn new things. It gives new knowledge to pupils and teachers, and students get many benefits from the usage of technology. Technology is not only used for people's entertainment. It is used for many purposes. It brings enjoyment to the teaching and learning process so that students learn faster and in a better or more effective way. They take an interest in their learning. Technology brings effective teaching methods. The teacher uses those modern methods and teaches the learners so the learners understand well. With the help of technology, teachers change their teaching methods so the students take an interest in learning. With the help of technology, the teacher solves the problems of the class. The teacher takes help from technology and solves the solution. Technology also has a significant role in running an educational institution. It is helpful in many places; without the help of technology, the educational institution cannot run well and cannot run effectively (Voogt, et al., 2013). Everything has two sides: positive and negative effects. Technology also has positive and negative effects on students' learning. Problems arise when students get attached to the internet device, and the use exceeds to the extent that it affects their academic performance. This results in depression and they minimize their interaction with people.

According to Gonzales (2014), text-based communication should be more valuable for self-esteem than face-to-face or cellphone communication. According to a survey of 300 adolescents, the research determined that communication via text and face-to-face communication was the most suitable way of communication. It further highlighted the fact that face-to-face communication is perceived with phones as well as texting is also perceived by the phones, and through this process, the feeling of someone can be understood better, and too much feeling cannot be shared, which saves someone's emotions better than others. Burdette et al., (2013) showed that 21st-century teachers must be computer-literate. Although some teachers teach without the use or presence of technology, they try to enroll themselves in workshops, seminars, and short certificate courses to develop their computer skills. This is essential because it creates changes in the professional development that assess teachers to learn according to the requirements of the work environments. Teachers who are computer literate must know the advantages of using technology in teaching.

According to Roschelle et al., (2000), computer-based learning enhances learners' graphical skills, a deeper understanding of scientific approaches, and motivation for learning. According to Becker (2007), if learners use computers in their learning, they get international achievements and a better understanding of their subject materials, and when working with groups, students get information about the discussed topics. When a teacher uses PowerPoint in the classroom and teaches the students how to make presentations in PowerPoint, the students show their creativity skills. It creates an opportunity for learners to actively participate in the classroom, resulting in a deeper understanding of the content being taught there. The technological device creates an amusing environment in the classroom and develops excitement for teachers and students.

Technology plays a vital role in enhancing the academic performance of learners. It provides many opportunities in many organization to take benefits from it. When technology is incorporated into education, students and teachers will use it. Technology provides help to students to fight the 21st century world. However, there are many educational institutions where technology is not used because the required resources are unavailable. There has been a growing interest in incorporating technology into primary mathematics education in recent years. This interest stems from technology's potential

benefits in enhancing students' academic achievement. This study aims to conduct a meta-analysis of experimental studies conducted between 2013 and 2019 to determine the overall effect of using technology in primary mathematics education on students' academic achievement (Akçay et al., 2021).

If the teachers continue using technology, students will become interested and motivated to learn. Cakir (2012) noted that technology provision in the classrooms has shown that there can be positive impacts on students' achievement. Today, everyone integrates technology in the classroom, while the world is running after more and more advancement in any field, so why educational institutions should be left behind? Technology has been transformed in all generations, from printing machines to copy machines, from wire of telephones to mobile and many more advancements. So, the attention of schools towards modern technology also improved from black or chalkboard to white board, it is seen through multi-media or projector, radio, computer, internet, digital boards, smart boards and so (Wen & Walters, 2022). Previously, students just had textbooks, notebooks and pens through which they could write their lessons and homework, while the current era's students want to learn something technical; for example, they feel cool learning digital skills, computer literacy, internet hacks and other advanced tools.

Technology has become a part of learning in educational institutions. Many educators are in favor of using technology in teaching and learning. Further, technology has become an important part of curriculum mapping, classroom instruction and assessment (Wen & Walters, 2022). Technology was brought into education in America by the Vocational Education Act in 1963. It aimed students to learn programming language. Technology has become important in education because students require digital and computer literacy skills. Through technology, students learn creative skills, communication skills, collaborative work projects, problem-solving skills and decision-making skills. Technology evaluates society. Most people in the world apply technology, and the use of ICT has brought changes, and it is spreading all over the world very fast. Technology changed the routine of people. AlShawabkeh et al., (2023) believe that students are growing up in a busy world. The young people have much access to technological devices which they are connected every time. Technology has become an essential part of the world, and teenagers are connected by cell phones, the internet, television, video games, and other devices, making technology an essential element of society.

According to many teachers, technology should be included in education so students can learn via technology and use digital tools to enhance their academic performance. They further state that students get engaged in creating videos and graphics, increasing their academic performance. The use of technology by students enables them to gather different information about many issues in the world. Thus, the purpose of using technology in school is to enhance students' academic performance, which requires proper attention of students. In today's era, students are surrounded by technology and get help through it to perform well. Chai et al., (2021) note that technology is developing the brains of students in different ways. Rafiq et al., (2020) found that the Technology Acceptance Model (TAM) has effectively determined students' attitudes towards e-learning.

ICT is essential for the application of social capital; it could be in the education system, relationships between members of society, and global communication. Mignone and Henley (2009) resort that incorporating technology can provide a more flexible and new teaching style and learning, making students independent and enhancing their cognitive skills. Technology engages students and encourages them to participate in classrooms, enhancing their academic performance. Technology-based learning in the classroom provides meaningful learning, increases the use of students' prior knowledge, enhances cognitive skills, explanation, and depth of study of the topic, and supports practice.

Statement of the Problem

The new generation of students' learning style is different than the past. They are equipped with technology and easily access the internet and other devices. Technology is crucial for students' learning. Technology positively impacts students' learning because if technology is used, students will be motivated and actively participate in any activity in the classroom. Technology is also important for the teacher because if technology is used in the classroom, the teacher can deliver his/her lecture more effectively. This research provides information on the impact of technology-based learning on students' performance

at the undergraduate level.

Objectives of the Study

The major objective of the study was to determine the impact of technology-based learning on the academic performance of undergraduate-level students.

Research Questions of the Study

- What is the impact of technology-based learning on the academic performance of undergraduate-level students?

METHODOLOGY

The study was quantitative, and a survey design was adopted. All the undergraduate students studying at the public universities of Baluchistan province were the population of the study. The researchers selected a university within proximity for an easy approach and to avoid financial disturbance. The study sample consisted of 210 students of BS level selected on a random basis from all departments, who were given equal opportunities to males and females. The researchers framed the questionnaire, and the instrument's reliability was 0.87. Data collected through the questionnaire was analyzed using descriptive and inferential statistics, and SPSS software version 22 was used in the study.

Data Analysis and Its Interpretation

Table 1

Technology-Based Learning and Students' Critical Thinking

Statement	Area	Frequencies					Mean	SD	t-value
		SA	A	N	DA	SDA			
Technology based learning develops students' critical thinking ideas and motivates to learn	Rural	49	21	15	7	4	4.08	1.15	0.997
	Urban	47	42	14	9	2	4.08	1.00	

Table 1 indicates student's responses to the statement that technology-based learning develops students' critical thinking ideas and motivates them to learn. Data analysis is done using frequency score, mean score standard deviation, and t-value. The respondents from rural areas (49+21=70) and urban areas (47+42=89) agreed that technology-based learning develops students' critical thinking ideas and motivates them to learn, whereas respondents from rural areas (7+4=11) and urban areas (9+2=11) disagreed about the above mention statement. Respondents of rural area (15) and urban area (14) showed that they are undecided about the statement. The rural area and urban area mean scores (4.08, 4.08) and standard deviation (1.15, 1.00), respectively, showed agreement with the statement. The t-value (.977) displays that there is no significant difference in rural and urban area students about technology-based learning developing students' critical thinking ideas and motivating them to learn. It was concluded from the above table that the majority (89%) agreed that technology-based learning develops students' critical thinking and motivates them to learn.

Table 2

Technology-Based Learning and Students' Skills

Statement	Area	Frequencies					Mean	SD	t-value
		SA	A	N	DA	SDA			
Technology based learning develops communication skills, cognitive skills and problem solving skills	Rural	43	26	15	7	5	3.99	1.17	0.331
	Urban	46	47	13	6	2	4.13	0.936	

Table 2 illustrates student responses to the statement that technology-based learning develops communication, cognitive, and problem-solving skills. In both rural and urban areas, most respondents, comprising 69 in rural locales and 93 in urban settings, agreed that technology-based learning enhances communication, cognitive, and problem-solving skills. However, a smaller group of 12 respondents in rural areas and 8 in urban areas disagreed with this assertion. Additionally, 15 respondents from rural regions and 13 from urban environments remained undecided. The t-value (.331) shows no significant differences between rural and urban students regarding the statement that technology-based learning

develops communication skills, cognitive skills and problem-solving skills. It was concluded from the above table that the majority (93%) agreed that technology-based learning develops communication skills, cognitive skills and problem-solving skills.

Table 3
Technology Helps to Complete Tasks Quickly and Achieve Better Results

Statement	Area	Frequencies					Mean	SD	t-value
		SA	A	N	DA	SDA			
Technology helps to complete task quickly and achieve better results	Rural	42	30	11	7	6	3.99	1.19	0.296
	Urban	44	51	11	7	1	4.14	0.891	

Table 3 describes students' responses to the statement that technology helps them to complete tasks quickly and achieve better results. Data analysis is done using frequency score, mean score, standard deviation, and t-value. In rural areas, 72 respondents concurred that technology aids in completing tasks swiftly and attaining superior outcomes. Meanwhile, in urban locales, 95 individuals shared this sentiment. Conversely, only 13 respondents in rural areas and an undisclosed number in urban settings disagreed with this viewpoint. The mean scores for rural and urban respondents were 3.99 and 4.14, respectively, indicating general agreement with both groups' statements. The standard deviation was 1.19 for rural areas and 0.891 for urban areas, suggesting slightly more variability in responses among rural respondents than urban respondents. The calculated t-value of 0.296 indicates no significant difference between rural and urban respondents' perceptions of technology-based learning. Thus, both groups generally share similar attitudes towards the role of technology in fostering critical thinking and motivation in learning. It was concluded from the above table that the majority (95%) agreed that technology helps to complete tasks quickly and achieve better results.

Discussion

Technology positively impacts students' interaction. Harris and Al-Bataineh (2015) demonstrated that one-to-one technology is crucial in enhancing learners' academic performance and motivation at school. Al Abdullatif and Gameil (2021) highlight the significant effects of digital technology integration on students' academic achievement. The study concluded that technology-based learning develops learners' communication, listening, and reading skills. It also enhances students' critical thinking and fosters the development of new ideas. Technology motivates students toward learning and enhances their problem-solving skills (Harris & Al-Bataineh, 2015). Online learning enables learners to be independent and understand their courses well (Al Abdullatif & Gameil, 2021). According to this study, learners became more interested in learning through multimedia, which provided a comfortable learning environment (Ali et al., 2022). Technology is particularly beneficial for slow learners as it helps develop their cognitive skills. Using laptops and computers improves students' typing speed and makes it easier for them to research topics quickly. Technology fosters an engaging and safe classroom environment, enabling students to cooperate and collaborate effectively. Siraj and Kirmani (2022) conclude that a sense of learning community is an integral and important element of technology-supported collaborative learning strategies, helping to integrate new technologies in classroom practices and reduce dropout rates in higher education online learning classes. Ali et al., (2022) argue that teaching with educational video clips positively affects student achievement.

Moreover, technology enables personalized learning, allowing students to learn at their own pace and according to their needs (Aliyeva, 2022). This personalization helps cater to diverse learning styles, thus enhancing overall academic performance. Digital tools provide interactive and engaging content that keeps students motivated and interested in their studies. Technology in education also prepares students for the future by equipping them with essential digital skills required in the modern workforce. Furthermore, technology supports differentiated instruction, enabling teachers to address the unique needs of each student more effectively. It also enhances student collaboration through online discussions and group projects, fostering a sense of community and improving social skills. The integration of technology in the classroom has proven to be a powerful tool in transforming education and enhancing student outcomes in various dimensions.

CONCLUSION

The technology-based learning has a positive impact on students' learning. The technological devices are helpful for learning. Technology creates different ways of learning for the students. Technology is almost effortless for learners. Further, the technology is flexible in the classroom and institution. The technology helps students complete their tasks and clarifies their goals. It increases the students' grades, attitudes and attendance. Technology enables students to cope with the challenges of the modern world, and it changes the way of life of human beings. Technology integration into educational settings has been significantly enhancing students' learning experiences. Technological devices serve as valuable tools for facilitating learning and providing diverse and innovative instruction methods that cater to various learning styles. The user-friendly nature of technology makes it accessible to learners, promoting engagement and interaction.

Furthermore, technology offers remarkable flexibility within classrooms and educational institutions, allowing for personalized learning experiences and adaptability to different educational needs. Beyond merely assisting students with their assignments, technology plays a crucial role in helping them to articulate and achieve their academic goals. This has a direct impact on improving students' academic performance, attitudes towards learning, and attendance rates. Moreover, technology equips students with the necessary skills to navigate and meet the challenges of the modern world. It fundamentally transforms how individuals live and interact, fostering a deeper connection between education and real-world applications. As such, incorporating technology in education enhances academic outcomes and prepares students for future societal and professional demands.

Recommendations

- The government should include technology for all levels of education, train its teachers, and provide all the technology resources.
- Curriculum developers must integrate technology into the curriculum for students to achieve better.
- programs.

Competing Interest

The authors had no competing interests.

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