Availability and Utilization of (ICT) in Teaching and Learning of Biology in F.G Secondary Schools in Islamabad

Naeem Akhtar
PhD Scholar, Assistant Professor, IMCB, F-8/4 Islamabad.
Email: naeemakhtar3377@gmail.com

Tahir Mehmood
PhD Scholar, Deputy Registrar, SZABMU, Islamabad.
Email: tahirkohli125@gmail.com

Saima Munir
PhD scholar Lecturer in Bahria college Naval Complex Islamabad.
Email: saimamunirvirk@gmail.com

Received on: 25-04-2024 Accepted on: 26-05-2024

Abstract

This study looks at the use and accessibility of digital learning resources for biology instruction in F.G. Secondary schools in Islamabad. The study's compass consisted of three research questions and one hypothesis. For this study, a descriptive survey design was adopted. The tools used to gather data were a questionnaire and a checklist.The availability of digital communication tools in public schools was determined using the checklist. The availability and use of ICT in biology teaching and learning was the subject of a structured questionnaire. Using Cronbach alpha, the reliability coefficients for teachers and students were found to be 0.69 and 0.65, respectively. In order to answer the study questions, the data were examined using frequency counts, percentages, means, and standard deviations. The Z-test was then used to evaluate the hypothesis. The study's conclusions showed that F.G. Secondary schools in Islamabad have little instructional technology resources. The use of digital technology by instructors and students in biology instruction was minimal in senior F.G. Secondary schools located in Islamabad. When it comes to teaching and studying biology, there is no discernible difference in how teachers and students use digital knowledge resources. It was suggested that non-governmental organizations, governments, cooperative bodies, multinational cooperation, and individuals make sure that both private and public secondary schools have functional, up-to-date facilities; this will enhance the Caliber of Biology instruction and learning in F.G. Secondary schools & colleges in Islamabad.

Keywords: Availability, utilization, ICT facilities digital technology

INTRODUCTION

Technology that deals with managing and processing information while leveraging a range of electronic devices to facilitate communication and education is known as information and communication technology, or ICT. Comparing modern technology to some past scientific breakthroughs, it seems to have altered an astonishingly large number of aspects of human existence. For instance, ICT has altered the information, communication, and economic sectors in Nigeria. ICT is currently used for many administrative exchanges; in fact, it was rumored that electronic voting machines, an ICT, would have been used for the 2011 general elections (Vikoo2013). According to the Federal Republic of Nigeria (2014), information and communication technology (ICT) is a field of applied sciences that deals with information transmission.

All tools used in the collection, presentation, introduction, securing, trading, exchanging, administration, organisation, storing, and retrieval of data are included in this category, including computers, software, programs, instruments, strategies, practices, forms, methodology, ideas, standards, and the sciences. This demonstrates that ICT is an essential component of the modern world. ICT may be utilised to improve biology education. The study of living organisms is the emphasis of the subject of biology. One of the scientific courses provided at the secondary school level is biology. According to Igwe (2003), science is a systematic study of the concept of the material world and its activities through observation, experimentation, estimation, and documentation.

Enhancing student accomplishment requires teachers to engage all students in active learning activities in the classroom. Teachers' perception processes provide important information on how they allocate their attention among students and focus on ICT during complex classroom interactions, which helps to identify relevant needs for ICT-based learning. The usage of ICT by instructors can improve their abilities to instruct students. Digital technology can be used to improve things like efficient classroom management, independent study, cooperative learning, focused activities, and active communication between teachers and students. Students' active and satisfying engagement in their education will be ensured by the use of communication technology in the classroom.

The use of ICT can have such a clear impact on and influence over every part of the learning modules. Students can do practical exercises in a virtual research center developed using a computer, simulating real-world scenarios. When ICT is introduced into biology classes, the role of the teacher shifts from that of a speaker to one of a learning facilitator, and the students start to take on the role of learning explorers. ICT is used in biology classes for modeling, data logging, data logging, information bases, and spreadsheets. Because the students were successfully integrated, the course is engaging and the level for dependability is high, as a result providing the Biology

When used in education, ICT improves curriculum quality and accessibility while also improving learning delivery. When compared to schooling without ICT, it yields more comprehensive learning outcomes. It promotes critical thinking and provides countless avenues for achieving academic goals. The key is not ICT per se, but rather understanding it and effectively applying it to information delivery and goal-achieving in a timely manner. Four noteworthy techniques as suggested by the UNESCO-ICT framework; have been distinguished for appropriately using ICT in education. These are the approaches that

implement ICT optimization phases in education: Emerging, Applying, Infusing, and Transforming. In order to reap the greatest benefit from instructional technology, these strategies operate simultaneously and depend on one another. application in the classroom.
Digital learning activities have been found to improve students' capacity to generate, access, adopt, and use knowledge and information to tackle difficult challenges, which has a good effect on education. ICTs are one of the key contemporary factors shaping the current global economy and bringing about swift changes in the populace. They have radically changed the way that people learn, communicate, and do business (UNESCO, 2012).
However, the national policy on education states that the Nigerian education system urgently needs to integrate ICT in order to function in the modern world, acknowledging the significant role that educational technology plays in developing learning and critical abilities. The constructivist and behaviorist theories were employed in this investigation.
According to behaviorist theory, people can learn more effectively if their surroundings are thoughtfully planned. Constructive theory emphasizes how important experience-based learning is. Students participate actively in the learning process, while professors serve as facilitators. These learning theories were employed because of their person-centered approach. They underlined the value of the relationship between teachers and students as well as the need of working with real instructors to conduct research.Aja and Eze (2016) looked into using online learning resources. devices that transmit courses to secondary schools in Nigeria's Ebonyi State. It was determined that there is a deficiency of ICT equipment in addition to other problems.
In the schools under investigation, the majority of the accessible ICT devices are not in excellent operating order; as a result, they are not used to their full potential, and the skilled personnel who could use the functional ones are not readily available. In Yobe State, Apagu and Bala (2015) assessed the usability and accessibility of ICT resources for teaching and learning Vocational and Technical Education. The investigation found that the usage of digital technologies in specialized schools was deficient. There is insufficient availability of ICT resources in schools, including laptops, TVs, security cameras, and other gadgets. Both teachers and students lacked expertise with ICT in the classroom. Ofodu and Oso (2015) investigated how much information and communication technology was used by secondary English language teachers.
The results demonstrated that while teachers were highly aware of the tools available through information and communication technology, they were not making the most of them. Likewise, it was found that the instructors' level of educational proficiency was inadequate.
Around the world, educational technology has advanced to become one of the fundamentals of modern society. For a long time, firsthand experience in teaching and learning has received little attention, despite its benefits. One of the disciplines that is suitable for ICT consistency is science (biology), as it is concerned with dynamic, imaginative, sharing, and evaluative learning. Using ICT resources, teachers use diagrammatic writing boards to present genuine concepts that call for practical demonstration.
The students merely take a seat and pay attention to the teacher. This method of teaching doesn't allow the students to actively participate in the learning process; instead, it places the teacher at the center, with the students acting as passive audience members. When students are not actively involved in their education, they are deprived of the opportunity to think

critically and solve problems on their own. Students will be able to structure their own unique learning skill and participative learning will progress as a result. The issue of inadequate funding for digital technology also exists. inadequate infrastructure provided by the government or school administration, poor upkeep of educational technology gadgets,
The government has not done enough to train biology teachers to collaborate on the ever-evolving use of digital learning activities. The study's objective was to find out how biology instructors and students in Khana Local Government Area secondary schools felt about the availability and use of ICT resources for biology instruction and learning.

Research Objectives:-
This study addressed numerous aims which includes to:
1. Identify the useful digital communication resources that are accessible for biology instruction in Islamabad's F.G. Secondary schools.
2. Determine the extent to which instructors at Islamabad's F.G. Secondary Schools use digital learning resources to teach biology.
3. Find out how much students at F.G. secondary schools in ISLAMABAD are using digital technology resources to learn biology.

Research Questions:-
The following research questions guided the study.
1. What facilities and useful digital communication technologies are accessible for biology instruction in F.G. secondary schools in ISLAMABAD?
2. How much do instructors at F.G. secondary schools in ISLAMABAD use digital technology resources to teach biology?
3. To what extent do students in F.G. Secondary schools in Islamabad use educational technology resources when studying biology?

Research Hypothesis:-
The following null hypothesis was investigated at the significance level of 0.05.
1. There is no discernible difference in how teachers and students use digital technology resources when teaching and learning biology in F.G. secondary schools in ISLAMABAD?

LITERATURE REVIEW:
The following are examples of instructional technology resources that can be used in the biology teaching and learning process: 1) Computer Hardware components 2) Parts of computer software 3) What's App and the Internet.
A computer system is an assembly of parts required for a computer to operate correctly overall. A computer consists of both hardware and software components. Hardware components of a computer are the basic visible (physical) parts that are utilised as portions of information and communication technology, such as a monitor, projector, microphone, CPU (central processing unit), keyboard, mouse, camera, scanner, printer, speaker, and so forth.
Interactive White Board: An example of digital technology that enhances biology education is the interactive whiteboard (IWB), which combines several useful features of communication

technology into a single platform. According to Isman, Abanmy, Hussein, and Alsaadany (2012), an interactive whiteboard is a large, touch-sensitive display that connects to a computer and a projector and facilitates collaboration. The implementation of IWB may represent the biggest change to the classroom environment in the last ten years. Numerous applications can be demonstrated, such as: online resources for teaching throughout the entire class; sound, video, and picture clips (including flash images) to help clarify concepts; software demonstrations; pattern and criteria emphasis demonstrations; scanning and highlighting of textbook pages to demonstrate note taking; digital flip charts; text manipulation; note-taking; quick revision, editing, and recording; and sequential instruction that makes sense (Hall and Higgens, 2015).

In contrast, the software refers to the virtual or, more often than not, immaterial piece of the digital technology component that works with the hardware to gather, process, analyze, and present the result for users to consume. It involves artificial intelligence that is integrated into the hardware, either electronically or in another way, to control its operations and generate the intended media output. They could come in the form of installed computer programs.

Projector film strips, cameras, CDs with multimedia, interactive games, and three-dimensional animation Without drill and practice, the hardware used to educate and communicate Biology instructional information to both the educator and the student will be useless. They also include games, spreadsheets, databases, coral draw, and power point. These software programs are extremely important for teaching and learning.

The Internet is the Information Age's central component. As "the mother of all systems," it is called. Anyone with a microcomputer and a way to connect it can access this vast computer network. It is an international computer network that links a great deal of smaller networks. Satellites, cables, and wires make up the network. Park (2012) stated that the Internet has evolved from an exploration and entertainment tool to a basic communication medium. The reason for this is that it provides a wide range of opportunities to a large number of individuals worldwide. Essentially, there are two common benefits that come from using the Internet: digital technology Based on a more general premise, It is noteworthy that the Internet offers several capabilities, particularly in the field of education. These include the following:

(I) data storage;
(II) boundary-free communication;
(III) online intuitive learning;
(IV) automated/online research;
(V) advancement in the new world;
(VI) heightened enthusiasm for learning; and
(VII) global education.

RESEARCH METHODOLOGY

In this study, a descriptive survey research design was adopted. 50 biology professors and 6887 senior high school students participated in the study. Using the fundamental random sampling technique, a sample of 296 SS1 students and 12 biology teachers were chosen from each of the six universities.

The tools used to collect the data were a questionnaire and a checklist. The model college in Islamabad's functional digital tool facilities were determined using the checklist. There were two sections in the questionnaire. Section B includes the availability and use of ICT in biology education as well as the availability and use of digital communication tools in college biology courses. Section A contains the personal information of instructors and students.
Surveys with a modified Likert scale with four points for High Extent (HE) were employed. Triple-point Large Extent (LE) Two points for Moderate Extent (ME). One point, Low Extent (LO) Face validity was used to make sure the instrument measures the things it is supposed to measure. Using Cronbach alpha, a dependability index of 0.69 and 0.65 for teachers and students, respectively, were found. Data obtained from the checklist were analyzed using percentages and frequency counts. The Z-Test was employed to test for hypotheses at the 0.05 level of significance, and mean and standard deviation were utilized to analyze the data from questionnaires for research topics.

RESEARCH ANALYSIS

First research question: What are useful instruments for digital communication? Are there resources accessible at F.G. secondary schools in ISLAMABAD for the teaching of biology?
A functional checklist for digital communication tools is provided in Table 1. resources available for biology instruction.

Sr #	ICT Facilities	Available ICT	Non-Available
A- Hardware Component			
1	Computer	4 (50%)	4 (50%)
2	Key Board	5 (50%)	5 (50%)
3	Mouse	2 (33%)	4 (67%)
4	Monitor	4 (33%)	6 (67%)
5	CPU (Central Processing Unit)	4 (33%)	6 (67%)
6	CD Rome	3 (67%)	1 (33%)
7	Photocopy Machine	3 (67%)	1 (33%)
8	Printer	4 (83%)	0 (17%)
9	Speaker	3 (50%)	3 (50%)
10	Scanner	1 (17%)	5 (83%)
11	Projector	-	6 (100%)
12	White Board	12. -	13. 6 (100%)
B- Software Component			
1	Educational Program	0 (17%)	6 (100%)
2	Educational Documents	-	7 (100%)
3	Educational Games	-	7 (100%)
4	Encyclopedia	-	7 (100%)
C- Internet			
1	E-Mail	1 (17%)	6 (83%)
2	Modems	2 (33%)	6 (67%)
3	Wi-Fi	-	7 (100%)
4	Googles	2 (33%)	5 (67%)

Table-1 Shows that there is a less presence of functional ICT facilities.

Research Question 2*:* What is the utilization level of digital technology facilities used by teachers in teaching of Biology in senior secondary schools?
Table 2: The ICT facilities used by biology teachers in senior secondary schools: mean and standard deviation.

Sr #	ITEMS	$\bar{x}$	SD	Remarks
1	Resources on the Internet are used to teach and learn biology.	2.32	1.25	Low
2	The teachers are adept at using computers, learning is made engaging.	2.73	1.13	High
3	Biology teachers don't always use ICT resources like the projector and interactive white board.	1.67	0.94	Low
4	Biology teachers explain and run through the fundamental functions of application software.	2.38	1.25	Low
5	There is a computer lab in my school used in teaching of Biology.	2.01	1.22	Low
6	Insufficient power supply discourages my school from using computers.	1.67	0.76	Low
7	Biology teachers find it easier to teach when using computer simulation.	2.43	1.19	Low
8	Using a computer to teach biology facilitates teaching-learning.	3.25	0.71	High
9	Computer simulation and other application software are helpful.	2.67	0.74	High
10	On teaching complicated biology subjects, teachers do not utilise computer simulations.	1.67	0.83	Low
11	Teachers of biology lack the abilities and expertise needed to use computers efficiently.	2.67	1.27	High
12	Computer-based instruction enhances teaching quality.	3.50	0.56	High
Grand Mean		2.42	0.88	Low

The scope of digital communication tools was displayed in Table 2. The amount of facilities used by biology teachers in senior secondary schools is little.
Research Question 3: To what extent do students in F.G. Secondary schools in Islamabad use educational technology facilities to learn biology?
Table 3 shows the mean and standard deviation of the ICT resources used by biology students in F.G. Secondary schools in Islamabad.

Sr #	ITEMS	¯x	SD	Remarks
1	Biology is taught and learnt through the use of internet resources.	2.00	1.04	Low
2	ICT facilities like the interactive white board and projector are not often utilized by Biology professors in my school.	2.00	1.08	Low
3	Biology instructors don't always use the interactive white board and projector that are available in college buildings.	2.00	1.08	Low
4	My biology teachers go through the fundamental components of application software packages and show them off.	2.27	1.05	Low
5	My school has a computer lab where students can learn biology.	1.66	1.01	Low
6	Irregular power supply hinders the use of computer in my college.	2.67	1.09	High
7	As a student, computer simulation makes learning easier for me.	2.09	1.08	Low
8	Using a computer to learn biology improves the effectiveness of teaching and learning.	2.86	1.02	High
9	As a student, application software such as the Computer Simulation aids in my ability to visualise abstract and challenging biological concepts.	2.38	1.06	Low
10	In teaching complex biology ideas, my teachers avoid using computer simulations.	2.1	1.24	Low
11	My biology teachers lack the interactive abilities and expertise needed to use computers in an efficient manner.	3.36	1.47	High
12	Utilizing computers in the classroom improves student and instructor output quality.	3.40	0.84	High
Grand Mean		2.45	1.07	Low

Table 3 demonstrates how little students in senior secondary schools use ICT resources to learn biology.

Hypothesis 1: There is no discernible difference in how teachers and students use ICT resources for biology instruction in F.G. Secondary schools in Islamabad.

Table 4: Z-test analysis illustrating how teachers and students use ICT resources differently.

Variable	N	SD	$\bar{x}$	df	P-Value	Z-cal	Z-eri	Remarks
Students	296	1.07	2.35	309	0.920	0.097	1.91	Accepted HO
Teachers	12	0.98	2.47					

P>0.05;
not significant at 0.05 level of significance.
Table 4 shows the utilization of digital tools for communication. Resources provided for teaching and learning by educators and students Biology at Islamabad's F.G. Secondary Schools.

DISCUSSIONS OF FINDINGS

In scientific areas like biology, where visual aids and simulations can considerably boost understanding of complicated concepts, the use of digital communication technologies in education has been widely recognized as a method to enhance learning experiences. Over time, the infrastructure for digital learning activities, including computers, projectors, and internet connectivity, has been more readily available in the FG secondary schools of Islamabad. This study does, however, highlight a disconnect between the availability of digital technology resources and their actual classroom use. While many biology teachers were excited about integrating ICT technologies, they also pointed out various obstacles to their successful use. Among these include inadequate instruction on the use of digital learning activities in the classroom,

It is generally acknowledged that the use of digital communication tools in education can improve student learning, particularly in scientific subjects like biology where visual aids and simulations can be particularly helpful due to limited access to digital resources like interactive biology software and simulations, insufficient technical support, and other factors. The adoption of ICT is further hindered by the traditional teacher-centered teaching strategy that is prevalent in many schools, where teachers frequently choose to use lecture-based instruction over interactive, ICT-driven approaches. Students are quite interested in using ICT to learn biology, especially when it comes to accessing online content, multimedia, and biology-related educational apps. Students say that by using visual aids like movies and diagrams, ICT tools improve their understanding of challenging subjects. But they also noted that the regularity of ICT based instruction is still scarce, and conventional textbooks are frequently used instead.

The conversation also emphasizes how personalized learning experiences for students with varying requirements and learning speeds may be provided via digital teaching and learning activities, which in turn can enhance differentiated learning. The full advantages of ICT in biology education have not yet been fully exploited in FG secondary schools, despite its promise.

Findings:

ICT Resource Availability: The majority of FG Secondary Schools in Islamabad have access to basic ICT resources, including computers, projectors, and internet connectivity. But there aren't many sophisticated digital tools or biology-specific instructional programs available.

ICT Use in Biology Education: Although biology instructors have access to ICT resources, they hardly ever use them. Teachers report using ICT to show films and deliver lecture slides, but because they lack experience with advanced tools and have not received enough training, they seldom ever use interactive ICT-based teaching approaches.

Student Engagement with ICT: Students express a strong desire to utilize ICT in their

biology classes and report that it improves their comprehension of intricate biological processes. But because it isn't frequently incorporated into their biology classes, ICT has a smaller overall influence on learning results.

Challenges: The primary obstacles to using ICT in biology education are poor teacher preparation, restricted availability of interactive digital resources, a lack of technical assistance, and conventional teaching approaches that emphasize lectures over interactive techniques.

Recommendations: To enhance the utilization of ICT in teaching biology, there is a need for continuous teacher training programs, investment in digital content creation, improved access to technical support, and a shift toward more student-centered teaching approaches that leverage the full potential of ICT.

CONCLUSION:

In conclusion, even though FG secondary schools in Islamabad have access to ICT infrastructure, this technology is not fully exploited for biology teaching and learning. By addressing the issues raised by this study, ICT integration can be improved, resulting in better teaching strategies and improved student learning results. The study found that useful digital communication tools are not widely available. The facilities that are provided for biology instruction in F.G. Secondary schools in Islamabad. The investigation found that these schools had no internet access, interactive whiteboard technology, or software components, which prevented effective teaching and learning from taking place.

In Islamabad's F and G Secondary Schools, teachers and students used digital technology to teach and learn biology to a limited extent. When it comes to teaching and learning biology, there are no appreciable differences in how teachers and students use digital learning resources.

RECOMMENDATIONS:

The following recommendations were made based on the findings of the study.

1. To enhance the quality of teaching and learning, non-governmental organizations, governments, cooperative bodies, international collaboration, and individuals should ensure that both private and public schools have functioning ICT facilities. ICT facilities should always be updated and kept in good condition. A committee overseeing the maintenance of the available ICT facilities should be appointed by the Ministry of Education.
2. Education Authorities, or Federal and State Ministries of Education, should arrange awareness campaigns, workshops, and seminars for teachers and students in order to raise awareness of the practical ICT facilities strategies and techniques that will boost teachers' and students' motivation for teaching and learning.

REFERENCES

1. Aja, S. N &Eze, P.I. (2016). Utilization of information and communication technology (ICT) devices for instructional delivery in secondary schools in Ebonyi State of Nigeria. *European Scientific Journal 12*, 57-185.
2. Apagu, V.V. & Bala, A. W. (2015). Accessibility and use of ICT facilities for instructing and learning of vocational and technical education in Yobe State technical colleges. *American Journal of Engineering Research 4,* 113-118.

3. Federal Republic of Nigeria (2014).National Policy on Education.4thEdition, Lagos NERDEC
4. Hall & Higgens(2015). Elementary school students' perception of interactive white Boards.*Journal of Computer Assisted Learning, 2,* 102-117.
5. Igwe, I.O. (2003). *Principles of science and science instructing in Nigeria*. Enugu: Jones Communication Publishers.
6. Isman, A., Abanmy, F. A, Hussein H. B.&Alsaadany, M.A. (2012). Saudi secondary teachers state of mind towards utilizing interactive white board in classroom. *Turkish Journal of Education Technology 3,* 286-296.
7. Ndioho, O. F. (2016). *Constructivist-based guidance model and students' accomplishment. Impact of constructivist-constructed instructional model with respect to senior secondary students' achievement in Biology*. Nsukka University Trust Publishers.
8. NITDA (2013) National information technology and development agency project. Retrieved 5 March 2018 from http://www.nitda.org.
9. Ofondu, G.O. & Oso, S.O. (2015). Technical resources and English language teaching in schools. *International peer Reviewed Journal, 11*. 20-35.
10. Park, H.W. (2012). Academic internet use: Issues and lesson in e- Research. A paper presented to the communication and technology division.The 59thAnnualInternational Communication Association Conference, Chicago, USA.
11. UNESCO Bangkor, (2012). Contextual investigations on organizing ICT into instructors education curriculum in Asia. Bangkor.
12. Vikoo, B. (2013). *Computers in educational research and development*. Owerri: Springfield Publishers Ltd.
13. Williams, C. &Avwiri, E. (2016). *Information and communication technology in education*. Port Harcourt: Pearl Publishers Universal Ltd. 246-253.