**IMPACT OF EDUCATIONAL TECHNOLOGY ON THE TEACHING AND LEARNING OF INTEGRATED SCIENCE**

**Abstract**

This study investigated the impact of Educational Technology on the teaching and learning of Integrated Science in Makurdi Local Government Area of Benue state. The purpose of the study was to investigate the impact of educational technology on the teaching and learning of Integrated science, find out the availability of educational technology facilities in the teaching and learning of integrated science and the extent to which integrated science teachers improvise educational technology in the teaching and learning of integrated science. In order to accomplish this task, three research questions and three hypotheses were formulated and tested to guide the study. The research design adopted for this study was survey design. A sample of 120 respondents were drawn from schools within the study area. The researchers made use of Questionnaires as the instrument to elicit the responses from the respondents. Data collected from the respondents were presented, analysed and interpreted using the mean, standard deviation and chi-square (X2) statistics (at an Alpha level of 0.05). Results of the study indicated that Educational Technology have significant impact on teaching and learning of Integrated Science as it appeal to the five senses of the learners thereby making learning real, comprehensive and enjoyable during teaching and learning activities. Also that there were no sufficient educational technologies in teaching and learning of integrated science and that integrated science teachers do not improvise educational technology materials during teaching and learning activities in the study. The study therefore recommended among others that School authorities and time-table planners should try and fix lessons or allocate time for practical classes in teaching and learning of Integrated Science so that both teachers and students would have enough time for maximum utilization of Educational Technology.

**CHAPTER ONE**

**INTRODUCTION**

**1.1 Background of the Study**

Integrated Science is a unified science discipline in which the study of Science is not restricted to physics, chemistry or biology but as a combined science course. It can be seen as a science subject that brings the content of several courses together into a coherent whole. Integration is also vital considering the increase and diversification of knowledge. The pursuit of knowledge becomes increasingly difficult as it advances and as the number of specialized fields increase. Science, treated as an integrated subject will enable the students to grasp its patterns and generalizations which will form a sound basis for later specialization and study in depth. The processes involved in science are common to all branches of science. Only an integrated course will establish in the students' mind an appreciation of the unity of science.

Logical content development and prevention of overlapping is also possible through integration. This makes teaching and learning more economical and efficient. An integrated approach will increase the breadth of students’ participation in a variety of science fields. Integrated science eliminates the ill effects of early specialization. When students are expected to study several science subjects at an early age, they get little formal education outside their specialties. Hence it is not surprising that they leave school with little knowledge of or interest in the problems of the society. It is hoped that through integrated science, all students will be able to study a balanced course in science and also find the time to take an interest in social problems, arts and humanities.

The world we live in now is fast changing and is becoming more scientific and more technical; as this transformation occurs, education in all forms and in all subjects cannot be left out but the mere mention of the word “technology” seems to frighten most people and unfortunately, many teachers who ought to be most informed and enlightened are not. Most teachers feel the usage of these instructional materials or gadgets is too ambitious and ahead of its time; others feel the economy is not just prepared for such sophisticated technology. The history of educational technology cannot be credited to a particular individual. It was a gradual process starting from the use of visual materials and also varying contributions from several individuals and organizations. As a matter of fact, the use of visual materials dates back to the Stone Age (ancient times). According to Aduwa-Ogigegbaen & Iyamu (2005), during this period, visual aids such as stones, pebbles, sticks and cowries were used to enhance effective learning. Also in Africa, some of the early missionaries fostered the development and diffusion of certain aspects of educational technology during the colonial era; one of such missionaries was David Livingstone. He encouraged the use of visual materials such as slides, charts, films, Audio-tapes and models. By mid 1950s, the missionaries were said to have formed movements which encouraged the use of visual materials. The practice started in Nigerian schools particularly in teacher training colleges. (TTC)

Educational technology as explained by Descryver (2011) is a theoretical knowledge from different disciplines (communication, education, psychology, sociology, philosophy, artificial intelligence, computer science etc.) plus experiential knowledge from educational practices. It has also been said to be the application of teaching equipment and instructional materials such as radio, computer, projected and non-projected aids, internet, television, posters and film strips in teaching integrated science for anyone. The term educational technology is often associated with instructional materials or learning technology with its impact in teaching and learning becoming one of the most important and widely discussed issues in contemporary education policy (Rosen & Well, 1995; Thierer, 2000). Many different types of educational software are designed and developed to help students learn specific subjects. Examples include pre-school software, computer simulators and graphics software structure that is more amenable to measurement and improvement of outcomes. With proper structuring it can become easier to monitor and maintain students’ work while also quickly gauging modifications to the instruction necessary to enhance students learning. Educational technology provides the means to focus on active students’ participation and to present differentiated questioning strategies. It broadens individualized instruction and promotes the development of personalized learning plans. Students are engaged in the use of multimedia components and to incorporate the knowledge they gain in creative ways.

The use of internet in teaching and learning of Integrated Science has had a positive and negative impact on the student’s performance, educators as well as the educational system as a whole. Effective technologies use many evidence-based strategies (adaptive content, frequent testing, immediate feedback, among others). Studies done in “computer intensive” settings found increases in student centre, cooperative and higher increases in learning, student writing skills, problem solving and using technology. In addition, positive attitudes towards technology as a learning tool by parents, students and teachers can improve the quality of teaching and learning of integrated science (Yusuf, 2000).

The internet itself has unlocked a world of opportunity for students in Integrated Science. Information and ideas that were previously out of reach are a click away. Students of Integrated Science can connect, share and learn on a global scale, without waiting for the teacher as materials are sole property of the teacher and learning is mostly through the reaching of the teacher to the class. This helps to improve student self-esteem. It has the potential to contribute to substantial improvements in the educational system (Moursund, 2005).

Many students have different types of learning styles and using different types of technologies is a great way to help all kinds of learners by providing remedial instruction for low-achieving students, providing enrichment activities for students who successfully complete the regular lesson before students who require more time to learn.

Using computers or other forms of technology can give students practice on core content and skills while the teacher can work with others, conduct assessments or perform other tasks. Technology such as computer in the classroom, class website, class blogs and wiki, wireless classroom microphones, mobile devices, interactive whiteboard, Digital Video-on-Demand, online media, document cameras, podcast, among others allow teachers to effectively organize and present lessons. Multimedia presentations can make the material more meaningful and engaging.

An easy way teachers can display their students’ work is to create a web page designed for their class and also with the computer in the classroom, the teachers are able to demonstrate a new lesson, present new materials and illustrate how to use new programs. Interactive White boards enhance the experience in the classroom by showing anything that can be on a computer screen. This not only aids in visual learning but it is interactive so the students can draw, write or manipulate images on the interactive whiteboard. Noisy classrooms are a daily occurrence and with the help of wireless classroom microphones, students are able to hear their teachers clearly thereby beneficial to teachers such that they do not lose their voices at the end of the day’s lesson.

Technology allows students to maintain running dialogue such as a journals, ideas, thoughts and assignments that also provide for students’ comment and reflection. They are more group focused to allow multiple members of the group to edit a single document and create a truly collaborative and carefully edited finished product. Technology allows the students to express their knowledge of the information learned in their wish. Although there are still some aspects of a classroom setting that are missed by using these resources and technologies, they are still helpful tools to buffer an already existing educational system.

Research findings indicate that technology shifts the learning environment away from teacher-centred and teacher-controlled model to a student centred model (Sigri & Nielsson, 2003). But it should be remembered that social and emotional skills cannot be developed in vacuum. Proper mental health grows only by social contacts with parents, neighbours, classmate or teachers. Children get practical lessons on leadership, cooperation, team work only by constant interactions with peers. There is no short cut to the attainment of social and emotional health. The rewarding route though time consuming is through normal social interaction in the home, school and not in front of a computer screen which of course is a valuable supplement since both instructor and learners are responsible for the parts of the teaching process (Husmann & Miller, 2001).

However, educational technology has its own weak points and that is why it could not survive or has not been tried much in most developing countries like Nigeria. First is the high expense involved in providing materials for every student during lessons. Secondly educational technology materials provide task at the low cognitive level of learning that is the information level. This is because of the belief that the learner is passive and therefore is merely to receive information to memorize it. Normal classroom teaching and learning provide tasks at the informational level and after higher cognitive levels, like the understanding level. By concentrating too much on independent learning of students, group interaction like class discussion, peer interactions are lost.

**1.2 Statement of the Problem**

Observations reveal that the performance of students in integrated science has been on the decline over the years most especially in Makurdi Local Government Area of Benue State due to the inadequacy of school authorities in Benue state to adopt educational technology. The incompetence of teachers in the area of usage of some of these technological facilities such as computers has greatly affected the performance of students. Many different types of educational software have been developed to help students learn specific subjects therefore the suitability of adopted technology as compared to the target objectives becomes an issue of concern. It is on this note that the researchers have considered it necessary to find out the impact of educational technology on the teaching and learning of integrated science in Makurdi Local Government Area of Benue State.

**1.3 Purpose of the Study**

The purpose of this study is on the impact of Educational Technology on the teaching and learning of Integrated Science in Makurdi Local Government Area of Benue State. Specifically, the study seeks to:

i. Determine the impact of Educational Technology on the teaching and learning of Integrated Science.

ii. Find out the availability of educational technology facilities in the teaching and learning of integrated science.

iii. Determine the extent to which integrated Science teachers improvise Educational Technology in the teaching and learning of Integrated Science.

**1.4 Research Questions**

In order to guide the study, the research questions below were posed.

1. What is the impact of Educational Technology on the teaching and learning of integrated science?

ii. Are the Educational technologies available for teaching and learning of integrated science?

iii. To what extent do integrated Science teachers improvise Educational Technology in the teaching and learning of Integrated Science?

**1.5 Research Hypotheses**

The following null hypotheses are formulated to be tested at 0.05level of significance:

Ho1 There is no significant impact of Educational Technology on the teaching and learning of Integrated Science.

Ho2 Educational technologies are not available for teaching and learning of integrated science teaching.

Ho3 Integrated science teachers do not improvise Educational Technology in the teaching and learning of Integrated Science.

**1.6 Significance of the Study**

It is hoped that the findings from this study would help the following:

The integrated science teachers, school administrators, innovators and researchers.

The research findings will supply feedback to the Integrated Science Teachers on the impact of the use of educational technology during teaching and learning activities thereby making them to evaluate and select the appropriate educational technology needed for effective delivering of contents during their teaching activities to equip the students in solving problems of scientific nature effectively and probably enhance their academic performance.

The research findings will provides knowledge and vital information to the school administrators to help them make available educational technology in their school to support good and quality of education for both teachers and learners in their respective schools.

The research work would inform the inventors of technology about the output of their work in education and make them to see the need to design and create technology that will stimulate the effective teaching and learning of integrated science in specific as it is the gateway for all sciences.

The findings will provide researchers with empirical evidence on the performance of students exposed to educational technology when compared with other instructional materials.

**1.7 Scope of Study**

This study was restricted to six Secondary Schools in Makurdi local government area of Benue State where Integrated Science is being offered as one of the pure Science Subjects in the school. The research is delimited to the impact of Educational technology on the teaching and learning of Integrated Science in JSS in Makurdi local government area of Benue State with the JSS III students as the respondents. The study will cover the effects of Educational Technology on student academic performance, the extent to which Integrated Science teachers improvise Educational Technology for students and the availability of educational technologies.

**1.8 Operational Definition of Terms**

**Educational technologies**: These are tools used by teachers like the computer to illustrate the learning processes. That is, the use of technology to improve education.

**Improvisation**: This is a process whereby a local material is produced in absence of the real material.

**Impact**: Significant or effect that technology has on teaching and learning of integrated science.

**Integrated science**: This is a science discipline in which the study of Science is not in the form of physics, chemistry or biology but as a combined science course.

**Teaching and learning**: The process by which knowledge, skills and experiences are transferred from one person (teacher) to another (learner).

**CHAPTER TWO**

**REVIEW OF RELATED LITERATURE**

**2.1 History Educational Technology in Nigeria.**

Educational technology could be traced back to the emergence of very early tools, e.g., paintings on cave walls. But usually its history starts with the introduction of educational films (1900s) or Sidney Pressey's mechanical teaching machines in the 1920s. The first large scale usage of new technologies can be traced to US WWII training of soldiers through training films and other mediated materials. Today, presentation-based technology, based on the idea that people can learn through aural and visual reception, exists in many forms, e.g., streaming audio and video, or PowerPoint presentations with voice-over. Another interesting invention of the 1940s was hypertext, i.e., V. Bush's memex.

The 1950s led to two major, still popular designs. Skinners work led to "programmed instruction" focusing on the formulation of behavioral objectives, breaking instructional content into small units and rewarding correct responses early and often. Advocating a mastery approach to learning based on his taxonomy of intellectual behaviors, Bloom endorsed instructional techniques that varied both instruction and time according to learner requirements. Models based on these designs were usually referred to as computer-based training" (CBT), Computer-aided instruction or computer-assisted instruction (CAI) in the 1970s through the 1990s. In a more simplified form they correspond to today's "e-contents" that often form the core of "e-learning" set-ups, sometimes also referred to as web-based training (WBT) or e-instruction. The course designer divides learning contents into smaller chunks of text augmented with graphics and multimedia presentation. Frequent Multiple Choice questions with immediate feedback are added for self-assessment and guidance. Such e-contents can rely on standards defined by IMS, ADL/SCORM and IEEE.

The 1980s and 1990s produced a variety of schools that can be put under the umbrella of the label Computer-based learning (CBL). Frequently based on constructivist and cognitivist learning theories, these environments focused on teaching both abstract and domain-specific problem solving. Preferred technologies were micro-worlds (computer environments where learners could explore and build), simulations (computer environments where learner can play with parameters of dynamic systems) and hypertext.

Educational technology, sometimes termed Edu Tech, is the study and ethical practice of facilitating e-learning, which is the learning and improving performance by creating, using and managing appropriate technological processes and resources. The term educational technology is often associated with, and encompasses, instruction theory and learning theory. While instructional technology is "the theory and practice of design, development, utilization, management, and evaluation of processes and resources for learning," according to the Association for Educational Communications and Technology (AECT) Definitions and Terminology Committee, educational technology includes other systems used in the process of developing human capability. Educational technology includes, but is not limited to, software, hardware, as well as Internet applications, such as wikis and blogs, and activities. But there is still debate on what these terms mean.

Technology in education is most simply and comfortably defined as an array of tools that might prove helpful in advancing student learning and may be measured in how and why individuals behave. Educational Technology relies on a broad definition of the word "technology." Technology can refer to material objects of use to humanity, such as machines or hardware, but it can also encompass broader themes, including systems, methods of organization, and techniques. Some modern tools include but are not limited to overhead projectors, laptop computers, and calculators. Newer tools such as smartphones and games (both online and offline) are beginning to draw serious attention for their learning potential.

Media psychology is the field of study that applies theories of human behavior to educational technology.

The word technology for the sister fields of Educational and Human Performance Technology means "applied science." In other words, any valid and reliable process or procedure that is derived from basic research using the "scientific method" is considered a "technology." Educational or Human Performance Technology may be based purely on algorithmic or heuristic processes, but neither necessarily implies physical technology. The word technology comes from the Greek "techne" which means craft or art. Another word, "technique," with the same origin, also may be used when considering the field Educational Technology. So Educational Technology may be extended to include the techniques of the educator.

Digitized communication and networking in education started in the mid-80s and became popular by the mid-90, in particular through the World-Wide Web (WWW), email and Forums. There is a difference between two major forms of online learning. The earlier type, based on either Computer Based Training (CBT) or Computer-based learning (CBL), focused on the interaction between the student and computer drills plus tutorials on one hand or micro-worlds and simulations on the other. Both can be delivered today over the WWW. Today, the prevailing paradigm in the regular school system is Computer-mediated communication (CMC), where the primary form of interaction is between students and instructors, mediated by the computer. CBT/CBL usually means individualized (self-study) learning, while CMC involves teacher/tutor facilitation and requires scenarization of flexible learning activities. In addition, modern ICT provides education with tools for sustaining learning communities and associated knowledge management tasks. It also provides tools for student and curriculum management.

In addition to classroom enhancement, learning technologies also play a major role in full-time distance teaching. While most quality offers still rely on paper, videos and occasional CBT/CBL materials, there is increased use of e-tutoring through forums, instant messaging, video-conferencing etc. Courses addressed to smaller groups frequently use blended or hybrid designs that mix presence courses (usually in the beginning and at the end of a module) with distance activities and use various pedagogical styles (e.g., drill & practice, exercises, projects, etc.). The 2000s emergence of multiple mobile and ubiquitous technologies gave a new impulse to situated learning theories favoring learning-in-context scenarios. Some literature uses the concept of integrated learning to describe blended learning scenarios that integrate both school and authentic (e.g., workplace) settings.

**2.2The Concept of Educational Technology in Nigeria**

Educational technology in Nigeria began with the visual era that is the use of simple teaching aids like apparatus and the preparation of lesson notes. Emphasis was placed on the preparation of simple (low cost) teaching aids in school particularly in Teacher Training Colleges. It was in 1932, under colonial Britain, that the first form of communication media appeared in Nigeria. A Radio Receiving Station was constructed in Lagos. Since then, the development of media has been rapid following the technological development in various parts of the world which have contracts and relationship with Nigeria.

The visual era is followed by the Era of Radio media in Education which occurred between early 1940s and 1950s according to Ogunranti (1982). The first educational radio programs were for English language and were broadcast by the Radio Distribution Service under the Post and Telegraphs Department. The Nigerian Broadcasting Service (NBS) was established in 1951 and it took over the educational programme of the station.

In 1957, the NBS was instituted into the Nigerian Broadcasting Corporation (NBC). Another landmark for Educational Technology in Nigeria was I January 1958, when the Western Nigerian Ministry of Education’s Audio Visual/Centre at Ibadan, and NBC broadcast their first educational programme. Other regional ministries of education took the clue and opened audio-visual centers in which broadcasting to schools was established. In 1960, the educational radio broadcasting quickly develop into NBC’S School Broadcasting unit, and later in 1982 the Federal Radio Corporation of Nigeria (FRCN) Education Service was established with the headquarter in Ibadan.

The Radio media was followed by the Era of Audio Visual which was in 1950s. During this era, audio- visual centers were established by all Ministries of Education in the country with the assistance from United States Agency for International Development (USAID). Each unit of the Audio-visual centers in the region liaised with broadcasting houses for the broadcast of their recorded programme.

In October 1959, the first television sub-Saharan Africa was established. This introduced a new dimension to resources and education in Nigeria. Education programme were part of the television experience from the beginning even though the establishment of the TV (then WNTV) was aimed only at Secondary Grammar Schools and Teacher Training Colleges to:

• Reduces teaching deficiencies in subjects such as sciences

• Provide examples of good teaching to help upgrade the general quality of classroom instructional activities.

In the tertiary institutions, the first official support for educational technology was directed towards both pre-service and in-service training of teachers and audio-visual loan services (Imogie 1984). Apart from the development in the areas of schools broadcast, there were the sponsored projects of the United Nations Educational Scientific Cultural Organization (UNESCO) in 1962 at the Institutes of Education, University of Ibadan. The audio-visual Unit was established in the Institute. Through this, UNESCO introduced New Methods and Techniques in Educational Practices. Moreover, programmed learning method and its application was introduced.

In 1964, three workshops were held to this effect, two of these were in Nigeria (University of Ibadan and Ahmadu Bello University, Zaria), and the third was in Accra Ghana, at the institute (which later became the Research Centre for Programme Instruction Techniques). Many programmes were designed and tried out in science, biology and mathematics.

Apart from Ibadan where Educational Technology began, other universities like ABU Zaria, Nsukka, Benin, Ife, Ilorin etc. now have Departments of Educational Technology or/and Centre for Educational Technology. Lastly, in 1977, the National Educational Technology Centre (NETC), Kaduna was established.

**Technology Education**

Technology Education is practice of educating students about different technology and engineering concept as they relate to the "human made" World. This can be done at any point in a student's educational career.

**Technology**

In most dictionaries, technology is defined as "applications of tools and methods" or something similar. To the general public, and especially in education, the term technology is spelled "c-o-m-p-u-t-e-r-s," equating "technology" to one technological tool. A computer is a tool, but provides a very narrow view of the scope of technology as a whole. Computers are definitely one form or type of technology, but technology is much, much more than computers alone.

Technology encompasses several different constructs that have been categorized by several state and national programs, organizations and standards. They include: Bio and Medical Technologies, Construction, Engineering and Manufacturing Technologies, Electronics, Energy and Power, Information Technologies and Transportation. Within these constructs are a plethora of sub-technologies. For example, Energy and Power technologies can include sub-technologies from automobile engines to green energy sources such as solar and wind energy.

2.3 Conceptual and Theoretical Framework of Educational Technology

Educationists are of the opinion that the educational problems relating to quantity and quality could be tackled by the proper utilization of instructional technology which is composed of modern instructional materials. Instructional technology is a systematic way of designing, carrying out and evaluating the teaching learning process. Instructional technology makes instruction more effective, understandable and meaningful. All types of resources are used to make the learning easy. Traditional teacher-centered approach in the classroom has been shifted from teaching to learning. It is called student centered or resource-based approach, the student being the resource.

Bilbao (2006) pointed out that learning through hearing alone proves to be the least effective means of learning. One learns eleven percent by hearing as against eighty-three percent by seeing. As far as retention of hearing is concerned, learning through hearing again stands at the lowest ebb because after three days, we recall only ten percent of what we learn through hearing as against fifty percent of what we learn through both hearing and seeing; and ninety percent of what we acquire by applying three of our senses i.e. seeing, hearing and doing.

**THEORETICAL FRAMEWORK**

Ausubel’s theory is concerned with how individuals learn large amounts of meaningful material from verbal/textual presentations in a school setting (in contrast to theories developed in the context of laboratory experiments). According to Ausubel, learning is based upon the kinds of super ordinate, representational, and combinatorial processes that occur during the reception of information. A primary process in learning is subsumption in which new material is related to relevant ideas in the existing cognitive structure on a substantive, non-verbatim basis. Cognitive

structures represent the residue of all learning experiences; forgetting occurs because certain details get integrated and lose their individual identity. A major instructional mechanism proposed by Ausubel is the use of advance organizers: "These organizers are introduced in advance of learning itself, and are also presented at a higher level of abstraction, generality, and inclusiveness; and since the substantive content of a given organizer or series of organizers is selected on the basis of its suitability for explaining, integrating, and interrelating the material they precede, this strategy simultaneously satisfies the substantive as well as the programming criteria for enhancing the organization strength of cognitive structure." (1963 , p. 81). Ausubel emphasizes that advance organizers are different from overviews and summaries which simply emphasize key ideas and are presented at the same level of abstraction and generality as the rest of the material. Organizers act as a subsuming bridge between new learning material and existing related ideas.

In addition, Lev Vygotsky Socio-Cultural Theory states that students learning could be more effective if it is provided with support or scaffold. Information processing theory supplies the scaffold theory which is also a cognitive theoretical framework that focuses on how knowledge enters and is stored and retrieved from our memory. Cognitive psychologist believed processes influences the nature of what is learned. They considered learning as largely an internal process, not an external behavior change. They looked into how we receive, perceive, store and retrieve information. Sangui (2002) pointed out some assumption in the instructional aid for effective and efficient teaching process. This study also adheres to the constructivist theory that says; providing materials is more effective for the opportunities of the students to test ideas; allows time for students to construct relationship among concepts and the use of higher level embedded assessment (enactive representation).

Above theories are helpful to provide more clarification about the concern and rationale of the study. For better knowledge and clarity, the researchers focused on the modern instructional materials used in teaching biology in relation to the student’s academic p-performance. Moreover, this study may filled the gap displayed to identify some causal link between the teacher instructional materials’ used and its effects to the teaching and learning process.

**Conceptual Framework**

There are very large numbers of studies on the factors that affect student’s achievement. And each of which used different subjects and factors then arrived at different conclusions. It is not possible to arrive at a list of universally valid generalization concerning the factors that in different circumstances seem to have an effect on science achievement (Lewis 2002).

This study tries to elucidate the relationship of the modern instructional materials used by the selected private schools in Rodriguez Rizal to the students’ academic performance and will try to draw some suggestions to improve or strengthen the teaching and learning process of the aforesaid schools.

The conceptual framework of the study is depicted in the form of paradigm of IPO style. The frames show the relationship and the actual pattern that is used in the study.

The first frame shows the input of the study consisting the teacher’s demographic profile, theories related to the study and the Modern Instructional Materials Used.

The second frame shows the process of the study; the evaluation of the questionnaire main concern of the theories stated in frame 1 and the evaluation of the Modern Instructional Materials used to the Students’ Academic Performance in relation to the Instructional Materials used.

The third and the last frame present the output of the study which contains the determined academic performance achievement of the students.

**2.5 Examples of Educational Technology**

Technology and education are pretty intertwined these days and nearly every teacher has a few favorite tech tools that make doing his or her job and connecting with students a little bit easier and more fun for all involved.

Yet as with anything related to technology, new tools are hitting the market constantly and older ones rising to prominence, broadening their scope, or just adding new features that make them better matches for education, which can make it hard to keep up with the newest and most useful tools even for the most tech-savvy teachers.

**Social Learning**

These tools use the power of social media to help students learn and teachers connect.

1. **Edmodo**: Teachers and students can take advantage of this great tech tool, as it offers a Facebook-like environment where classes can connect online.

2. **Grockit**: Get your students connected with each other in study sessions that take place on this great social site.

3. **EduBlogs**: EduBlogs offers a safe and secure place to set up blogs for yourself or your classroom.

4. **Skype**: Skype can be a great tool for keeping in touch with other educators or even attending meetings online. Even cooler, it can help teachers to connect with other classrooms, even those in other countries.

5. **Wikispaces**: Share lessons, media, and other materials online with your students, or let them collaborate to build their own educational wiki on Wikispaces.

6. **Pinterest**: You can pin just about any image you find interesting on this site, but many teachers are using it as a place to collect great lesson plans, projects, and inspirational materials.

7. **Schoology**: Through this social site, teachers can manage lessons, engage students, share content, and connect with other educators.

8. **Quora**: While Quora is used for a wide range of purposes, it can be a great tool for educators. It can be used to connect with other professionals or to engage students in discussion after class.

9. **Ning**: Ning allows anyone to create a personalized social network, which can be great for both teachers and students alike.

10. **OpenStudy**: Encourage your students to work together to learn class material by using a social study site like OpenStudy.

**2.6 Importance’s of Educational Technology**

Technology improves education to a great extent and it has now become a need for revolutionizing education for the better. With technology, educators, students and parents have a variety of learning tools at their fingertips. Here are some of the ways in which technology improves education over time:

I. Teachers can collaborate to share their ideas and resources online: They can communicate with others across the world in an instant, meet the shortcomings of their work, refine it and provide their students with the best. This approach definitely enhances the practice of teaching.

II. Students can develop valuable research skills at a young age: Technology gives students immediate access to an abundance of quality information which leads to learning at much quicker rates than before expanse of material: ThereStudents and teachers have access to an are plenty of resourceful, credible websites available on the Internet that both teachers and students can utilize. The Internet also provides a variety of knowledge and doesn’t limit students to one person’s opinion.

III. Online learning is now an equally credible option: Face-to-face interaction is huge, especially in the younger years, but some students work better when they can go at their own pace. Online education is now accredited and has changed the way we view education.

IV. The Flipped Classroom: This popular technological approach has gotten to everybody’s ears by now. It is a practice in which, students watch lecture videos as homework and discussion is carried on them in the class-time by the teachers. It has resulted in a remarkably better student performance, with noticeable grade boost-up. Students can now learn at their own pace and save class-time for interaction. Effectiveness of EdTech on biology: Technology has proved to be effective for making students efficiently adept with biology. Out of several, there are three remarkable technologies, which in my opinion should be brought to the light. Computer-managed learning is a program that uses computers to assess student learning on Math and assign them with appropriate Math material, which they can work on to score and receive a chart of their progress for self-assessment; Comprehensive models such as Cognitive Tutor and I Can Learn use computer-aided instruction as well as non-computer activities for students to approach Math; Supplemental CAI technology consists of individualized computer-assisted instruction (CAI), to provide additional instruction at students’ assessed levels. Findings indicate that educational technology applications produce a positive effect on biology achievement.

V. Long-term research indicative of the positives of technology on learning: Researches have been performed to address to the question, does the use of computer technology affect student achievement in traditional classrooms as compared to classrooms that do not use technology.

VI. Educational Technology improves student learning outcomes: Evidence suggests that educational technologies can improve student achievement, so long as such tools are integrated thoughtfully into teaching and learning. When digital capabilities like, online environments are incorporated meaningfully into instruction, students have new opportunities to learn and achieve.

VII. The effect of technology on education depends on the design of instruction: The design of the instruction accounts for more variance in how and why people learn than the technology used to deliver the instruction. Educators and educational researchers should be encouraged to focus on determining how to better integrate the use of a given technology to facilitate learning, rather than asking if it works or if one is more effective than another.

**2.7 Effects of Educational Technology on the remembering ability of the Students.**

Previous studies revealed the positive impact of technology on enhancing the achievement and performance of students and in gaining significant improvement and changes in all areas (Kulik and Kulik, 1991; Kulik, 1994; Rutz, 2003; Sivin - Kachla, 1998; Baker, 1994). For instance, many studies of the comprehensive effort to integrate technology into schools show an increase in test scores related to the use of technology. Kulik (1994) aggregated 500 individual research studies of computer based instruction students. The results of the aggregation demonstrated that students who used computer-based instruction scored better than those in the control condition without a computer. Students also gained more knowledge in less time because the classes became more enjoyable and interesting after the introduction of computers (Kulik, 1994).

Similarly, Sivin-Kachla (1998) found that students studying in a technology rich environment achieved higher marks in all subject areas, gained a positive attitude towards learning, were able to generate new ideas and built self-confidence. The US Department of Education conducted a scientific study in 2001 to assess the impact of technology using two types of student achievement measures –measure assessed reading achievement and assessed mathematics achievement. A significant impact was revealed in the students' scores. Moreover, in a study conducted in Pittsburgh, in which an intelligent tutor –software used to support the curriculum –was used as part of the regular curriculum for ninth-grade algebra (Koedinger, 1999). The results of the study demonstrated that 470 students in the experimental classes outperformed students in compression classes by 15% on a standardized test and 100% on test targeting the curriculum focused objectives (Koedinger et al., 1999). Moreover, in their evaluation of Apple Classrooms of Tomorrow (ACOT), Baker et al. (1994) conducted research in five schools across the nation to assess the impact of adopting interactive teaching and learning technology with an aim to encourage teachers to use computers to support student initiative projects and to assess multiple resources and cooperative learning. The research findings revealed that technology had a positive impact on the attitude of students towards learning. It also changed the teachers’ lecturing load (Schater, 1999).

Recent studies conducted by Banerjee (2005) and Barrow (2009) revealed that adopting an instructional computer program can improve student achievement. Banerjee.(2005) found that by integrating the biology curriculum with educational technology, the mathematics scores of the fourth-grade students in Vadodara, India were increased. In addition, Barrow. (2009) analyzed the effect of an instructional pre-algebra and algebra program on student's test scores in the US, while Rutz (2003), examined the impact of using instructional technology on optimizing the learning styles and process types. They found that using web-based material to supplement the in-class experience can improve student achievement. Murphy (2001) found evidence of a positive relationship between using discrete educational software and student achievement in reading and biology.

Previous studies on the integration of the technology in education have tackled student achievement from a basic aspect, such as the scores, but have ignored many other aspects of student achievement and performance.

Therefore, despite thousands of impact studies, the impact of technology used student achievement remains difficult to measure and open to much reasonable debate (Trucano, 2005).

**2.8 Factors That Affect the Adoption of Educational Technology in Teaching**

Any activity mediated by technology will be influenced by many factors. A number of studies have shown that there are a wide range of factors that influence educators in adopting their teaching with technological tools (Cox, 1999, Mutes, 2000, Mansoon, 2000). Among these factors are the quality of the ICT resources, incentive to change (Cox, 1999, Mutes, 2000), instructor's readiness to adopt and use technology, instructor's confidence, knowledge and ability to evaluate the role of ICT in teaching and learning, technical support, students' acceptance and attitude to the use of IT, effective training and personal development (Manson, 2000), leadership and the availability of IT resources (Balsa, 2011, Cushman, 2006; Chaudire., 2005; Frank, 2004 and Sherry, 2000).

Perrier et al. (2010) identified other factors that are related, especially to ICT, which include access to computers, intensity of computer use, ICT skills and ICT confidence. Means (2001) mentioned that factors, such as lack of technology infrastructure, technical support and high quality digital content, can affect technology implementation in urban schools. Bash (2011) identified institutional support as one of the important factors to be considered in adopting Educational Technology. They discussed institutional support from the lack of policy and planning of using the educational technology and the lack of a reward system or appreciation reward for using such tools.

Factors that may influence the adoption of Educational Technology have been categorized into three groups: personal attitude, socio-cultural and environmental (Yogi 1996, Chignon and Chignon, 2010). Factors such as socio-cultural and instructor's attitude towards using ICT have been considered by Soyinka and Ether (2002) to have a vital impact on the adoption of educational technology. Nazimova (2008) identified social factors, such as sex, age and socioeconomic status, while familiarity with computer and language were identified as critical items of the cultural factors. Muller (2007, 2008) considered the instructor’s attitude towards computing important and argued that this factor is critical to the effectiveness of integrating ICT into the curriculum. If instructors are not comfortable with technology, then low expectations from technology can be perceived. Moreover, the confidence of the instructors in using educational technology will impact their attitude towards using ICT and indicate their level of engagement with ICT, and, therefore, will impact their decision to adopt the educational technology in their curriculum (Cox, 2003, Soyinka and Ether, 2002). In addition to the attitude of the instructors, Nazimova (2008) identified the attitude of administrators as one of the factors that may affect the adoption of Educational Technology. He argued that the lack of support from administrators may hinder the implementation of technology in the classroom. In most cases, the administrators believe that computers and other IT cannot be used by those who are not IT knowledgeable and skilled (Nazimova (2008), Yaghi, 1996).

**2.9Attitudes of Teachers towards Using Educational Technology**

Educational technology is not a new phenomenon. Its history can be as old as the history of education itself.

However, educational technology in its technical sense has entered into education professionals’ focus for less than a century. During this period, different accounts have been provided for the concept of educational technology. Some people regard educational technology as utilizing a variety of tools such as projectors and films. Others consider this field as application of any materials from the use of a piece of chalk or any simple teacher-made instruments to sophisticated tools, all for the purpose of education. Some other people identify the use of various teaching methods and syllabus design with educational technology. And finally, a group of people consider educational technology as a miracle able to solve educational problems caused by small spaces, great numbers of students, and teachers’ inefficiency Historically, educational practitioners have always attempted to employ technology and teaching methods known by teachers and students at that time to meet their educational needs. Technology and teaching methods used by the generation contemporary with World War II were generally presented in auditory mode [audio-lingual method]. However, the same generation besides listening to the radio and talking to each other, enjoyed reading books. Today, students are born in an audio, visual and dynamic world so teachers’ struggle to teach them taking advantage of educational methods and media used in the past will be useful or the result gained are not so considerable. Recent developments in the field of education in general and in the field of educational technology in particular have provided new orientations and approaches that can be regarded as a great revolution. Rapid technological changes in the teaching-learning process have led to extensive developments, aiming to improve the quality of education in schools. New technologies providing appropriate opportunities in the favor of students’ talents and their personal interests have significantly improved the quality of educational system in schools. The results of studies suggest benefiting modern and up-to-date technologies such as computers and the internet in classrooms makes it possible for students to learn with greater speed and higher efficiency and feel satisfied by attending the classroom. Therefore, teachers are needed to know much about new technologies and media and treat them with a positive attitude. It should be mentioned the appearance of new technologies into the field of education is accompanied by some resistance from some individuals, especially from teachers and administrators in the field. The results of research suggest that teachers generally do not show positive attitudes towards new technologies and develop a fear when confronting them. The reason why some teachers welcome the entrance of new technologies into classrooms, while others reject it, is a controversial issue. Creating a positive attitude in teachers towards educational technology and, thus, developing and applying it in learning process is a requirement for the entrance of such technology in education. Based on what has been mentioned and given the significant role of teaching in the development of students’ talents and abilities and the fact that the employment of educational technology by teachers can considerably influence the discovery of students’ potential talents and capabilities, the present study tries to examine teachers’ attitudes in Babol (a city in northern part of Iran) towards utilizing technology in education. Given the objectives of the study, a review of the literature is presented as follows: Aksan and Eryilmaz (2011) conducted a study under the title of “Why don’t biologyachers use educational technology and instructional materials in their classrooms?” The results of this analysis concerning themain reasons why biology teachers in elementary schools do not use educational technology and materials in biology classes indicate that the existing educational system, teachers, students, and factors and processes used in instruction are among possible reasons for such a problem.

Yalcin, Kahraman and Yilmaz (2011) in their study on “The levels of teachers’ self-efficacy in using educational technology in elementary schools” examined teachers’ self-efficacy in elementary schools through benefitting educational technology. To do so, a 28 item questionnaire was administered to 43 elementary school teachers in Arzinkan. Data analysis in this study was performed through SPSS Software. The findings of the study indicated high levels of self-efficacy for elementary school teachers regarding educational technologies. These teachers believed that the application of educational technologies and their advantages have been useful to them..Dogruer, Eyyam and Menevis (2010) conducted a study titled “An examination of English primary school teachers' attitudes towards the use of educational technology in their classrooms”. The results of the study demonstrated that although teachers agreed that the use of educational technology has a positive impact on their experience; teachers needed more information about the use of educational technologies in their classes.

Ozdamlı, Hursen, Ozcinar (2009) in a study on “Teacher trainees’ attitudes toward educational technology” noted that the teacher trainees believed in the positive effects of educational technology. In addition, it was found that there were no gender differences in attitudes toward educational technology. Another important finding indicated that there were no remarkable differences between the participants’ fields of study and all majors showed positive views about the effects of educational technology.

Kabadayi (2006) conducted a study on preschool teachers and part-time teachers to examine their attitudes toward the use of technology in education. Based on the results of the study, 75% of the teachers showed their positive views concerning the use of educational technology in classrooms.

Here a review of studies done in Iran is presents as follows: Zanguyi (2011) in a study under the title of “Examination the teachers’ attitudes towards the use of educational technology in the instruction process” addressed teachers' attitudes towards the use of new educational technologies in teaching process. The results of the study suggested that, the teachers showed positive attitudes towards the use of new educational technologies in teaching process. In addition, the results of Chi-square test showed no statistically significant difference between teachers’ gender, their level of education, and their attitudes towards the use of new technologies in the instruction process.

However, a significant difference was noted between teachers’ workplace, their teaching experience, and their attitude towards application of new educational technologies in the teaching process. Rostami (2010) in a study on “The employment of Information and Communication Technology (ICT) by Teachers of basic science in guidance and high schools” concluded that most teachers under study have stated that they rarely (weekly) use different ICT tools in their classes, indicating infrequent application of these tools by the teachers.

**2.9.1Essential Elements to Ensure Technologies Are Used to Support Real Gains in Educational Outcomes**

I. Leadership around technology use that is anchored in solid educational objectives. Simply placing technologies in schools does little good. Effective technology use is always targeted at specific educational objectives.

II. Sustained and intensive professional development that takes place in the service of the core vision, not simply around technology for its own sake.

III. Adequate technology resources in the school, including hardware and technical support to ensure smooth operation.

IV. Recognition that real change and lasting results take time.

V. Evaluations that enable school leaders and teachers to determine whether they are realizing their goals, and how to adjust if necessary.

**2.9.2 Empirical research**

Zanguyi (2011) showed that teachers’ attitudes towards the use of new educational technologies in teaching process were positive. Similarly Dogruer, Eyyam and Menevis (2010) found that teachers agreed that the use of educational technology has a positive impact on their experience. In the same way, Ozdamlı, Hursen, Ozcinar (2009) observed that teacher trainees believed in positive effects of educational technology.

**CHAPTER THREE**

**RESEARCH METHODOLOGY**

**3.1 Introduction**

In this chapter, we would describe how the study was carried out.

**3.2 Research design**

A research design is a plan or blueprint which specifies how data relating to given problem should be collected and analyzed. It provides the procedure outline for the conduct of any investigation. This study involves the use of descriptive survey research.

**3.3 Sources of Data**

The data for this study were generated from two main sources; Primary sources and secondary sources. The primary sources include questionnaire, interviews and observation. The secondary sources include journals, bulletins, textbooks and the internet.

**3.4 Population of the study**

A study population is a group of elements or individuals as the case may be, who share similar characteristics. These similar features can include location, gender, age, sex or specific interest. The emphasis on study population is that it constitute of individuals or elements that are homogeneous in description (Prince Udoyen: 2019). In this study the study population constitute of five Secondary Schools in Makurdi local government area of Benue state.

**3.5 Samples and sampling techniques**

The samples for this study were taken from randomly selected secondary schools in Makurdi local government area of Benue state. 20 students were taken from each selected secondary school in Makurdi local government area of Benue state and also it should be noted that 100 questionnaires were administered to the students for the purpose of effective job in this study.

**3.6 Instrumentation**

This is a tool or method used in getting data from respondents. In this study, questionnaires and interview are research instruments used. Questionnaire is the main research instrument used for the study to gather necessary data from the sample respondents. The questionnaire is structured type and provides answers to the research questions and hypotheses therein.

This instrument is divided and limited into two sections; Section A and B. Section A deals with the personal data of the respondents while Section B contains research statement postulated in line with the research question and hypothesis in chapter one. Options or alternatives are provided for each respondent to pick or tick one of the options.

**3.7 Reliability**

The researcher initially used peers to check for consistence of results. The researcher also approached senior researchers in the field. The research supervisor played a pivotal role in ensuring that consistency of the results was enhanced. The instrument was also pilot tested.

**3.8 Validity**

Validity here refers to the degree of measurement to which an adopted research instrument or method represents in a reasonable and logical manner the reality of the study (Prince Udoyen: 2019). Questionnaire items were developed from the reviewed literature. The researcher designed a questionnaire with items that were clear and used the language that was understood by all the participants. The questionnaires were given to the supervisor to check for errors and vagueness.

**3.9 Method of Data Collection**

The data for this study was obtained through the use of questionnaires administered to the study participants. Observation was another method through which data was also collected as well as interview. Oral questioning and clarification were made.

**3.10 Method of Data Analysis**

The study employed the simple percentage model in analyzing and interpreting the responses from the study participants while the hypothesis was tested using the non-parametric statistics of chi-square were also used to test research hypothesis. Results of data analysis were tested at 0.05level of significance.

**3.11 Ethical consideration**

The study was approved by the Project Committee of the Department. Informed consent was obtained from all study participants before they were enrolled in the study. Permission was sought from the relevant authorities to carry out the study. Date to visit the place of study for questionnaire distribution was put in place in advance.

**CHAPTER FOUR**

**DATA ANALYSIS AND DISCUSSION**

**4.1 RESULTS AND DISCUSSION**

The chapter is strictly concerned with the result of the data collected in relation to impact of educational technology on the teaching and learning of integrated science. Analysis of the personal information collected on students’ classes and gender. Table below shows that there are three classes in senior secondary school.

**Table 1: Analysis on Number of Students in the Class**

|  |  |  |  |
| --- | --- | --- | --- |
| **S/N** | **CLASS** | **NUMBER OF STUDENTS** | **%** |
| **1** | **J.S.S 1** | **19** | **19** |
| **2** | **J. S.S 2** | **27** | **27** |
| **3** | **J.S.S 3** | **54** | **54** |
| **TOTAL** |  | **100** | **100** |

**Table 2: Analysis on the Gender of the Students.**

|  |  |  |  |
| --- | --- | --- | --- |
| **S/N** | **GENDER** | **NUMBER OF STUDENTS** | **%** |
| **1** | **MALE** | **56** | **56** |
| **2** | **FEMALE** | **44** | **44** |
| **TOTAL** |  | **100** | **100** |

Total numbers of students in all selected secondary school were 100 from which 56 students were males and the remaining 44 students were females.

**Research question 1: What is the impact of Educational Technology on the teaching and learning of integrated science?**

**TABLE 3: Percentage responses on how does educational technology make impact on remembering ability of students.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S/N** | **ITEM** | **S.A/A** | **%** | **S.D/D** | **%** |
|  | Does educational technology improve your learning ability | **94** | **94** | **6** | **6** |
|  | Does your teacher use educational technology tools when teaching integrated science? | **67** | **67** | **23** | **23** |
|  | Do you have educational technology materials in your schools? | **84** | **84** | **16** | **16** |
|  | Do you prefer a class where educational technology materials are used to a class where it is not used? | **100** | **100** | **0** | **0** |
|  | Does educational technology create the best learning environment? | **100** | **100** | **0** | **0** |

From table 3, most students agreed with the question that educational technology improve their learning ability with rating score of 94(94%) respondents while 4(4%) disagreed that educational technology does not improve their remembering ability. 77 of the respondents (77%) agreed that their integrated science teachers use educational technology tools during teaching and learning process while 26 0f the respondents (23%) disagreed. 84 of the respondents (84%) agreed with the question that they have educational technology materials in their schools while the remaining 16 of the respondents (16%)disagreed which implies there is no educational technology materials in their school. All the respondents (100%) prefer class where educational technology materials are used and also agreed that educational technology create best learning environment.

**Research question 2: Are the Educational technologies available for teaching and learning of integrated science?**

**Table 4: Percentage response on extent to which Educational Technology are practice in Classroom related to Students remembering ability.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S/N | ITEM | S.A/A | % | S.D/D | % |
|  | Does the use of educational technology materials accelerate your remembering ability? | 100 | 100 | 0 | 0 |
|  | Can you learning integrated science without the use of educational technology? | 80 | 80 | 20 | 20 |
|  | Does the use of educational technology compatible with your learning of integrated science ? | 100 | 100 | 0 | 0 |
| 4. | Do you find the use of educational technology interesting? | 100 | 100 | 0 | 0 |
| 5. | Does students get easily distracted when using educational technology | 100 | 100 | 0 | 0 |

Educational technology has contributed a lot to the development of the educational in Nigeria and world at large.

All the respondents 100(100%) agreed that educational technology material accelerate their remembering ability while non-disagreed. Majority of the respondents (80%) cannot learn integrated science without the use of educational technology while the 20 remaining respondents can learn integrated science without the use of educational technology. All the respondents 100 (100%) find the use of educational technology interesting. Most of the respondents 90(90%) disagreed that students are easily distracted when using educational technology.

**Research question 3: To what extent do integrated Science teachers improvise Educational Technology in the teaching and learning of Integrated Science?**

**Table 5: Percentage responses on educational technology enhance the learning and remembering ability of students in integrated science .**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S/N | ITEM | S.A/A | % | S.D/D | % |
| 1 | Does the use of educational technology improve your academic performance | 100 | 100 | 0 | 0 |
| 2 | Does the use of educational technology inspire confidence on your remembering ability? | 100 | 100 | 0 | 0 |
| 3 | Does educational technology provide example of good teaching and learning process. | 100 | 100 | 0 | 0 |
| 4 | Does the use of educational technology have great impact on your remembering ability? | 100 | 100 | 0 | 0 |
| 5 | Does educational technology reduce teaching and learning deficiency? | 100 | 100 | 0 | 0 |

All the respondents agreed 100 (100%) that the use of educational technology improve their academic performance whilenon dis agreed which implies that the use of educational technology is the bedrock upon which all other components of education sector lies. 80 of the respondents (80%) agreed that the use of educational technology inspire confidence on their remembering ability while 20 of the respondents (20%) disagreed. 100 of the respondents (100%) agreed that educational technology provide good example of teaching and learning process. All the respondents agreed that the use of educational technology have great impact on their remembering ability and also educational technology reduces the teaching and learning deficiency which indicate that the use of educational technology will reduce the mass failures of students in integrated science and others subjects like physics, English, chemistry and mathematics

**Hypothesis**

**H 1:** There is no significant impact of Educational Technology on the teaching and learning of Integrated Science.

**Table 6: Analysis on research hypothesis 1 using chi square**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Gender | Remembering ability of students in integrated science | | | | Total |
| SA | A | D | SD |
| Male | 30 | 16 | 3 | 7 | 56 |
| Female | 26 | 9 | 3 | 6 | 44 |
| Total | 56 | 25 | 6 | 13 | 100 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Observed(O)** | **Expected(E)** | **O - E** | **(O-E)²** | **(O-E)²/E** |
| 30 | 56×56/100=31.36 | -1.36 | 1.85 | 0.06 |
| 16 | 25×56/100= 14 | 2 | 4 | 0.29 |
| 3 | 6×56/100= 3.36 | -0.36 | 0.13 | 0.04 |
| 7 | 13×56/100= 7.28 | -0.28 | 0.08 | 0.01 |
| 26 | 56×44/100=24.64 | 1.36 | 1.85 | 0.08 |
| 9 | 25×44/100= 11 | -2 | 4 | 0.36 |
| 3 | 6×44/100= 2.64 | 0.36 | 0.13 | 0.05 |
| 6 | 13×44/100= 5.72 | 0.28 | 0.08 | 0.01 |
| **TOTAL** | 100 |  |  | 0.9 |

X² = (O – E) ² /E

X² = 0.9

Df = (c-1)(r-1)

R= number of rows

C= number of columns

Df = (4-1)(2-1)

= 3×1

DF = 3

The critical x² value for 3 at df 0.05 level of significance is 7.82 i.e. (3, 0.05) = 7.82

X² - cal = 0.9

X² - crit = 7.82

The calculated value below critical value; hence the null hypothesis is accepted. This implies that There is no significant impact of Educational Technology on the teaching and learning of Integrated Science.

**H 2:** Educational technologies are not available for teaching and learning of integrated science teaching.

**Table 7: Analysis on research hypothesis 2 using chi square**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Class | Use of educational strategy in remembering ability of students in integrated science | | | | Total |
| S.A | A | D | S.D |
| S.S.S 1 | 9 | 6 | 1 | 3 | 19 |
| S.S.S 2 | 14 | 7 | 6 | 0 | 27 |
| S.S.S.3 | 30 | 13 | 4 | 7 | 54 |
| Total | 53 | 26 | 11 | 10 | 100 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Observed (O)** | **Expected (E)** | **O-E** | **(O-E)²** | **(O-E)²/ E** |
| 9 | 53×19/100=10.07 | -1.07 | 1.15 | 0.11 |
| 6 | 26×19/100=4.94 | 1.06 | 1.12 | 0.23 |
| 1 | 11×19/100=2.09 | -1.09 | 1.19 | 0.57 |
| 3 | 10×19/100=1.9 | 1.1 | 1.21 | 0.64 |
| 14 | 53×27/100=14.31 | -0.31 | 0.1 | 0.01 |
| 7 | 26×27/100=7.02 | 0.02 | 0.0004 | 0.0001 |
| 6 | 11×27/100=2.97 | 3.03 | 9.18 | 3.09 |
| 0 | 10×27/100=2.7 | -2.7 | 7.29 | 2.7 |
| 30 | 53×54/100=28.62 | 1.38 | 1.90 | 0.07 |
| 13 | 26×54/100=14.04 | -1.04 | 1.08 | 0.08 |
| 4 | 11×54/100=5.94 | -1.94 | 3.80 | 0.64 |
| 7 | 10×54/100=5.4 | 1.6 | 2.56 | 0.47 |
| Total | 100 |  |  | 8.61 |

X² = (O – E) ² /E

X² = 8.61

DF = (c-1) (r-1)

R= number of rows

C= number of columns

Df = (4-1)(3-1)

= 3×2

DF = 6

The critical x² value for 3 at df 0.05 level of significance is 12.592 i.e. (3, 0.05) = 12.592

X² - Cal = 8.61

X² - Crit = 12.592

The calculated value below critical value; hence the null hypothesis is accepted. This implies that educational technologies are not available for teaching and learning of integrated science teaching.

**4.2 Discussion of findings**

The current study was conducted to investigate the impact of Educational Technology on the teaching and learning of integrated science in secondary schools. It has been revealed by the results that:

1. Educational technology improves learning ability and academic performance.
2. Educational technology creates best learning environment.
3. The use of educational technology is interesting and compatible with learning of integrated science .
4. The uses of educational technology inspire confidence on remembering ability.
5. Educational technology has great impact on remembering ability of students.
6. Educational technology reduces teaching and learning deficiency.

Previous studies revealed the positive impact of technology on enhancing the achievement and performance of students and in gaining significant improvement and changes in all areas (Kulik and Kulik, 1991; Kulik, 1994; Rutz et al., 2003; Sivin-Kachla, 1998; Baker et al., 1994). For instance, many studies of the comprehensive effort to integrate technology into schools show an increase in test scores related to the use of technology.

Kulik (1994) aggregated 500 individual research studies of computer based instruction students. The results of the aggregation demonstrated that students who used computer-based instruction scored better than those in the control condition without a computer. Students also gained more knowledge in less time because the classes became more enjoyable and interesting after the introduction of computers (Kulik, 1994).

Similarly, Sivin-Kachla (1998) found that students studying in a technology rich environment achieved higher marks in all subject areas, gained a positive attitude towards learning, were able to generate new ideas and built self-confidence. The US Department of Education conducted a scientific study in 2001 to assess the impact of technology using two types of student achievement measures –measure assessed reading achievement and assessed subject achievement. A significant impact was revealed in the students' scores. Moreover, in a study conducted in Pittsburgh, in which an intelligent tutor –software used to support the curriculum –was used as part of the regular curriculum for ninth-grade algebra (Koedinger et al., 1999). The results of the study demonstrated that 470 students in the experimental classes outperformed students in compression classes by 15% on a standardized test and 100% on test targeting the curriculum focused objectives (Koedinger et al., 1999).

Moreover, in their evaluation of Apple Classrooms of Tomorrow (ACOT), Baker et al. (1994) conducted research in five schools across the nation to assess the impact of adopting interactive teaching and learning technology with an aim to encourage teachers to use computers to support student initiative projects and to assess multiple resources and cooperative learning. The research findings revealed that technology had a positive impact on the attitude of students towards learning. It also changed the teachers’ teaching practices towards more cooperative group work and less lecturing load (Schater, 1999).

Moreover, Braun in (1990) indicated that educational technology improves students' motivation and attitudes about learning and also about themselves. It also increases students' attendance and decreases dropout rates.

**CHAPTER FIVE**

**SUMMARY, CONCLUSION AND RECOMMENDATION**

**5.1 SUMMARY**

The main purpose of this research was to find out the impact of educational technology on the teaching and learning of integrated science. Three research questions that battered around the impact of educational technology on the teaching and learning of integrated science in secondary school. Population comprised the selected secondary schools students in Makurdi local government area of Benue state from which 100 respondents were randomly selected as sample from 5 secondary schools. Self-constructed and validated questionnaire was used for data collection. Collection of data was done with the help of a trained research assistant. Retrieved questionnaire forms were checked. The badly filled and the mutilated ones were discarded while the good ones were coded and simple percentage statistic and non-parametric statistic of chi - square was used for data analysis. It was accepted that the gender and class of the students is not significantly dependent on their remembering ability in integrated science using educational technology.

**5.2 CONCLUSION**

Based on the finding of this study, the following conclusions were deduced.

i. Most of the secondary schools have educational technology facilities.

ii. Educational technology enhances the learning ability and provide best learning environment.

iii. Educational technology enables students to have positive attitude to teaching and learning process i.e. it enables students to have self-esteem about themselves.

iv. The use of educational technology is compatible with teaching and learning of integrated science.

This explanation agrees with the observation of (Rutz, 2003, Koedinger, 1999, Baker, 1999, SivinKachla, 1998) who stated that Educational Technology has positive impact in enhancing the performance of the students and the overall teaching and learning processes that have already been proved by many studies.

**5.3 RECOMMENDATIONS**

Educational technology is an integral part of teaching and learning process. Therefore, it is imperative that all the agencies concerned should always fashion out way by which the use of educational technology in secondary will be mandatory in all subjects such as chemistry, physics, Yoruba, agricultural science geography and others.

Considering the Findings of this Study, it was recommended That:

i. The teachers should be trained and retrained on the job to improve on the innovative strategies in inquiry training model in science classrooms. This could be done by the Government or relevant professional bodies like Science Teachers Association of Nigeria (STAN) organizing seminars workshops and conferences.

ii. The government personnel such as curriculum planner and educational policy maker should encourage the use and provision of educational technology that relate to teaching subject in secondary school..

iii. Orientation programme should be organized for the student in order to change their attitude towards the use of educational technology.

iv. Weekly or monthly seminar should be organized for the teachers and the school leader in order to help them to have proper insight and knowledge on how integration of educational technology will help student outside the classroom.

v. Competent teacher should be employed in teaching service in order to facilitate effective and efficient use of educational technology in secondary school.

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