

Impact of Information and Computer Technology on Students' Reading Comprehension

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Abstract

This paper examined the impact of information and computer technology on students reading comprehension in Ebonyi local government area of Ebonyi state in Nigeria. The concept of reading comprehension was examined. Kintsch's construction and integration theory and the Schema theory were explored as it relates to reading comprehension. Also, the importance of information and communication technology tools in reading comprehension was examined. It was observed that it offers the learners the opportunity of controlling the learning process and creates room for collaborative learning. Problems of using ICT for reading comprehension were enumerated to include: lack of software and hardware, lack of knowledge of available information technology resources, unavailability of computer laboratories, epileptic electricity power supply and lack of internet services among others. Then, ICT tools useful for improving reading comprehension were explored to include internet reciprocal teaching, computer aided instruction, text-to-speech software, digital texts, visual learning software etc. Finally, related literature relevant to this study was also reviewed. Based on this, one of the recommendations was that the government should ensure adequate provision of various ICT tools and functional computer laboratories in all the schools in the federation.

Keywords: information and computer technology (ICT), reading comprehension, students,

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1. Introduction

Eguavoen (2016) defined ICT as an umbrella term which includes the utilization of any specialized gadget or application, incorporating: radio, television, phones, PC and organization equipment and programming, satellite frameworks, etc. just as the different administrations and applications related with them, for example, videoconferencing and distance learning. Other forms of ICT infrastructure include wireless communications gadgets, sound conferencing, video tapes, DVDs, and CDROMs which could be utilized to facilitate teaching-learning even across the border without undermining quality of instruction, learning outcomes or certificates obtained. According to Yusuf & El-Yakub (2020:321) ICT is a combination of three concepts, namely, information, communication and technology. Information is a message that is transmitted and received in the process of communication and these message ideas or feelings are shared by both the receiver and reader at the same time. Communication refers to any process in which people share the same information, ideas and feelings. It involves spoken and written words, body language, personal mannerism and styles. Technology refers to the systematic application of the tools and art. In practice, communication cannot be effective if information is not accurately received by the target audience and the passage of information cannot be complete without the instruments of communication and feedback. Hence technology makes communication easier, faster and effective as ICT use a combination of computer, telecommunication and information system services and products. According to Arimbawa (2013) ICT based materials refer to instructional materials which are related to technology as tools used to obtain, process and store data in various ways in order to produce qualified information.

According to Sandhu & Blakeley(2022) reading is defined as a cognitive process that involves decoding symbols to arrive at meaning. It is a process that involves recognizing words, leading to the development of comprehension. Arimbawa (2016) sees reading as a complex process that involves both perception and thought. It consists of related processes: word perception which refers to the process of perceiving how written symbols correspond to spoken language and comprehension which refers to the process of making sense of words, sentences and connected texts. Maduabuchi and Emechebe (2016) define reading as the basis for learning different subjects. It is an interaction between the reader and the text which result comprehension. Reading is a receptive language process.

On the other hand, comprehension is the understanding and interpretation of what is read. To be able to accurately understand written materials, children need to be able to decode what they read, make connections between what they read and what they already know and think deeply about what they have read. According to Kintsch (2018) reading comprehension is a complex, multidimensional process that requires coordination and integration of multiple underlying processes. This process involves establishing the purpose of reading, the use

of textual codes and prior knowledge about textual information, the use of control and monitoring strategies, and the self-regulation of understanding. He further describes reading comprehension as a complex process of constructing meanings, which involves making inferences, interpreting information and establishing logical connections between ideas until the person is able to create the macrostructure of mental state of the text.

Westerveld, Armstrong & Barton (2020) see reading comprehension as the process of simultaneously extracting and constructing meaning through interaction and involvement with written language. This shows the importance and the insufficiency of the text as a determinant of reading comprehension. According to them, comprehension entails three elements: the reader who is doing the comprehending; the text that is to be comprehended and the activity in which comprehension is a part.

Hence, when investigating reading comprehension, one needs to consider what the reader brings to the process, including the readers reading experience, world knowledge, motivation and self perception as well as their overall cognitive and linguistic (oral skills). The modern era is characterized by the use of technological tools especially those of telecommunications and information technology: e-mail, internet, social networks, video games, etc. No doubt this has affected teaching, learning and reading tremendously.

2. Concept of reading comprehension

Reading is the process of constructing meaning from text whether written or graphic, paper based or digital, while reading there is an interaction between the reader and the text. Rutzler (2020) observes that the act of reading and the act of comprehending what you read are two very different things. Reading requires the fluent parsing and blending various phonetic sounds to create words. Reading comprehension on the other hand, involves thinking about the words that were just read and deriving a meaning, for just those words and the text as a whole. According to her, reading comprehension is the ability to read, understand, process and recall what was just read without proper comprehension skills students lack the ability to understand what they read. She enumerated the pillars of reading instruction to include phonics, phonemic awareness, fluency and vocabulary and strategies designed to boost comprehension such as learning to summarize or make a graphic representation of a text. Some of the strategies include predicting, activating background knowledge, the text structure, asking questions, visualizing, monitoring and summarizing. Dennis (2013) observes that effective reading comprehension relies on a multitude of factors that relate to the text, the reader, and the act of comprehension itself.

Batanero, Rueda, Cerero & Gravan (2021) state that reading comprehension is a purposeful process in which the reader has an active role and employs cognitive skills that must be developed through strategies that are teachable and can be enhanced through practice over time, prior knowledge and skill successful in reading experience on the internet. Snow (2010) sees reading comprehension is the process of simultaneously constructing and extracting meaning through interaction and engagement with print. According to him, the success of a comprehension event depends on a good match of reader skills, text difficulty and text definition. Reading comprehension is the ability to process a text, understand its meaning and to integrate with what the reader already knows. Fundamental skills required in efficient reading comprehension include knowing the meaning of words, ability to understand the meaning of a word from discourse context, ability to follow the organization of passage etc. Ability to comprehend a text is influenced by readers' skills and their ability to process information. If word recognition is difficult students use their processing capacity to read individual words which interferes with their ability to comprehend what is read, (<https://www.definitions.net/definition>).

With the development of technology, the internet has provided a valuable source for language teachers and learners. It is believed that internet based materials are a remedy to improve student's language ability due to the following reasons; firstly, the materials are continuously updated, reflecting the rapid change of life and society.

3. Theoretical Framework

This work is premised on the theoretical framework of construction-integration theory. Kintsch (2004) developed the construction – integration theory to explain the complex thinking processes by which readers necessarily understand a text. According to him, processing of a text by a reader involves multiple and simultaneous thinking (cognitive) processes that eventually create memories. These cognitive processes are influenced by the following:

- the readers knowledge about the text, topic or message
- the readers goal and motivations
- the readers strategy, selection and use
- the genre, type and difficulty of a text
- the processing constraints of the readers memory and
- the readers ability to learn in aid from and socio-cultural context (group, classroom) if it is available when a text is processed (Kintsch, 2004).

Two phases of mental processing occur for each clause the reader encounters in a text: a construction phase

and integration phase. The construction phase involves lower level processes such as: activating prior knowledge and experience; retrieving word meanings; examining the surface and grammatical structure of the printed idea; analyzing each clause into idea units called popular which include text elements, connecting inferences, and generalizations that are formed into a coherent network of connected meanings.

During the second phase of processing meaning, the integration phase, ideas from the text are connected with what the learner already knows, our prior knowledge and new concepts that do fit with the meaning of the text are deleted from our network knowledge. To achieve a more advanced level of comprehension (e.g., critically examining the authors point of view), students need to integrate the textbase with their pre-existing content knowledge to create a mental model about the overall idea of a text (i.e., the situation model in the construction-integration model of text comprehension), (Kintsch, 2013).

This work is also premised on Schema theory which emphasizes the importance of background knowledge in language comprehension. According to the schema theory as it relates to reading, a text only provides directions for readers as to how they should retrieve or construct meaning from their own previously acquired knowledge. The previously acquired knowledge is called the readers background knowledge and its structures called schemata, (Rumelhart, 1980). On the basis of this theory, comprehending a text is an interactive process between the readers' background knowledge and the text. Hence efficient comprehension requires the ability to relate the textual materials to one's own knowledge,(Ngabut, 2015).

4. Importance of ICT in reading comprehension

According to Wernet, Olliges & Delicatch (2000) ICT empowers education as it offers learners a wide range of information which the teacher may not have control over. With the use of these technologies, the learner does not need to be in the classroom for learning to take place. It offers the learner the opportunity of controlling their learning process. Maduabuchi (2007) observed that ICT plays an important role in helping learners find reading materials from original sources. In finding articles from international journals students can get it just by sitting in front of computers connected to the internet network. ICT facilitates teaching and learning process by providing access to wider sources of information and varieties of articles. With ICT in education, learner centered-approach is encouraged as the students can access and learn from these technologies at their pace, thereby developing learners autonomy. Maduabuchi (2016) observed that ICT help students improve vocabulary building and use. Students are fascinated and enthusiastic about having lessons on reading comprehension when ICT tools are used. More so the learning process and meaningful learning are promoted as online dictionary are readily available to help students with meaning of words, their synonyms and autonomy as well.

For students, ICT provides opportunities to communicate more effectively and develop reading skills including skills in critical literacy. It is a valuable tool for researching, composing and responding and viewing and representing in English language. According to Yusuf & El-Yakub (2020), the use of ICT's in the classroom signal a shift from the conventional position of power held by the teacher to a more collaborative approach to learning. Computer based activities allow the teacher to assume the role of a facilitator while students take responsibility for their own learning. Teachers can use a range of ICT facilities such as computers, laptops, iPad and even mobile phones as tools for delivery in reading comprehension. Hence the use of ICT is a paradigm shift from the traditional chalk and talk form of teaching to a teaching learning process that is more real and practical resulting better performance of student's academically.

They have a very important role to play in teaching reading. It helps the teacher to get various resources and make variations on their instructional design and its implementation in the classroom. Where there is inadequate ICT facility in school, teachers can develop offline ICT based reading materials in which they need to use internet mainly as a resource, accessing the internet to download and print out materials to use offline with classes or create their own electronic reading materials printed out for learners (Arimbawa, 2013:20).

The application of ICT tools such as internet access to various websites, access to computer based comprehension program, access to various applications on a tablet device, CD ROMs etc in the reading classroom provide students with a wide range of strategies to improve their reading comprehension not only in the English language but on various subjects of study across the curriculum. It facilitates the attainment of learning objectives as students take control of their learning and become active participants in the reading classroom where the teacher serves only as a facilitator. It increases their knowledge of vocabulary and builds on their background knowledge thereby creating improvement in their reading ability. When students are exposed to diverse ICTs tools and learning programmes, it provides a collaborative learning environment among the students.

Gozukucuk & Gunbas (2020) suggest that computer-based reading texts with visual support should be used to improve student's reading comprehension. They observe that e-books, as well as interactive stories or online reading contribute significantly to the advancement of learning to read, write and develop different skills as well as achieve the autonomy of students. They also observed that the use digital games favours reading development. According to Schleicher (2019) students' tend to read more in online formats instead of print reading such as

chats, online news or websites containing practical information to fulfill practical needs. He also observed that technology intervention program also improved their academic performance.

Similarly, Onyenweaku & Edem (2018) observe that ICT facilities such as computers, internet, e-mail, database CD-ROM, power-point projectors etc have been found to be useful in the teaching of various aspects of the English language. According to him, the application of these tools shifts teaching from teacher-centered to student-centered, thereby promoting creativity and active participation in the classroom. Similarly, Eguavoen (2016) observes that the use of the internet provides students with opportunities to surf the internet and search for academic information as well as utilize social networking platforms as a medium of information exchange. Technology is an effective tool for enhancing reading comprehension because there are computer applications that provide the meaning of difficult words and read the text aloud to students for the improvement of comprehension skills.

5. Problems of using ICT for reading comprehension

However, problems most prevalent with the use of ICT in the classrooms include: difficulty in classroom control, distractions caused by irrelevant websites, poor maintenance and lack of infrastructure. According to Parker (1997) other obstacles include lack of time, lack of software and hardware, lack of keyboarding skills, lack of knowledge of available information technology resources and unavailability of computer labs and computer lab technicians are some logistical factors hindering the use of ICT.

Delgado & Salmeron (2021) observe that reading on screen leads to inattentive reading that could cause a shallow information processing and lower comprehension. Kinstch (2018) states that multiple factors such as learner characteristics, text characteristics and assessment approaches contribute to the difficulty with comprehending informational passages. Gubbel, Swart & Groen (2020) state that excessive access to ICT resources, excessive use of ICT and excessive interest in ICT is associated with lower digitally assessed reading performance. On the other hand, students with moderate access to ICT resources, moderate use of ICT at school performed better in reading than those with excessive access.

According to DigitalLEARNING Network (2020) other problems include lack of computers and computer-related resources such as printers, projectors, scanners, etc both in government schools in rural areas....The schools lack up-to-date hardware and software availability. Old and obsolete equipment, epileptic power supply, lack of internet services, insufficient funds are major hindrances to ICT adoption and application. Moreover, it has been observed that most students hardly understand what they read and may get discouraged due to difficult texts. Some of the problems students have include lack of basic reading skills, poor background knowledge leading to inability to deduce meaning from texts.

6. ICT tools useful for improving reading comprehension

Another key tool in building reading comprehension is the use of vocabulary. Vocabulary helps students retain the information in the text. Context clues can be used to determine difficult vocabulary. Rousseau (2019) enumerated some of the ICT tools that aid students' vocabulary in reading comprehension to include the following:

Text-to-speech software: is another good tool for building reading comprehension. It can read aloud digital or printed texts. This is beneficial as students are more likely to understand a text when unfamiliar words are read to them. This software can improve the reading comprehension of individuals with specific deficits in phonological processing (difficulty hearing letter-sounds) as students can learn to decode new words when highlighted as they are read aloud. Examples of text-to-Speech software include Read & Write(for Google Chrome, Windows PCs, iPad, Macs), Balabolka, Kurzweil 3000 *–firefly*.

Digital texts: some are available only through the use of technology. They greatly facilitate the task of differentiating instruction as most of them include features that help students to better understand the texts. For example, many sites have a menu or table of contents that remains visible on the screen, which help students' understand the structure and main ideas of the text.

Visual learning software: visual learning software such as graphic organizers and mind maps are another indispensable tool to develop students reading comprehension skills. It can be used to illustrate different text structures (narrative, descriptive, argumentative, etc.), and it helps the students identify the most important elements of the text they are reading, as well as see an overview of the entire text, (www.idatscool.ca).

Power-point projector: is a very useful tool for teaching various aspects of English language especially in a large class. This could be used to improve reading comprehension through collaborative learning environment where students are allowed to learn and work together. Power point can be used to teach spoken English, phonetic symbols, The term collaborative learning refers to an instructional method in which students at various performance levels work together in small groups towards a common goal. In a collaborative learning environment students are responsible for their own learning as well as their group members. As a team they are able to use critical thinking skills at a higher level and other skills such as analyzing, synthesizing and evaluating.

Thus, working in collaboration with other students can enhance reading comprehension.

E-mail: This electronic device is very useful in enhancing students reading comprehension as it could be used by the teacher to teach students how to receive and send messages through their e-mails. Assignments on essay writing, debate, novels and drama used in the class could be sent to the teachers e-mail box and he will mark, score and post back to the mail box of each student.

Videodiscs: this device can also enhance reading comprehension among students. Learning activities in the area of spoken English, grammar, reading comprehension and literature can be recorded and played in the classroom for students to listen, read and answer questions. Learning experiences are concretized and retention of ideas are facilitated with the help of videodiscs and compact disc (Read only memory)

Use of E-library resources: Electronic libraries are usually made to provide useful databases containing information in all fields of education. Students should be exposed to useful materials in the electronic library for assignments on reading comprehension to build up their vocabulary and reading skills

Computers: This offers a print rich learning environment for young children, it helps students to talk more and physically do less.

Developmental appropriate programs: There are programs that can record children's voice for example the Graffalo App that allows children to record their voices in time with the story told. They can then listen to their own voice throughout the story as it is being told.

Internet: Help children learn literacy skills in their own language and in the language of their friends. There are at least four general types of reading comprehension skills associated with locating information on the internet: 1) knowing how to read and use a search engine; 2) reading search engine results; 3) reading a web page to locate information that might be present on that page; 4) making an inference about where information is located by selecting a link at one site to find information at another site, (Henry, 2006)

Word Processors: These allow children to weave words and pictures together. Other tools include multi-link headphones, digital cameras, webcams, audio recording software walkie-talkies telephones that also encourage the development of reading skills.

Interactive whiteboards or smart boards: An interactive whiteboard also known as interactive board or smart boards is a large interactive display in the form of a whiteboard. It can either be a standalone touch screen computer used independently to perform tasks and operations, or a connectable apparatus used as a touchpad to control computers from a projector. When utilized in the reading classroom, there is increase in interactive instructional tools, create more interest and motivation among students, display attractive graphics, improve lectures with audio-visual tools, provide better instructional materials and cater for all learning strategies, (Kumar, 2020).

7. Instructional models for teaching reading comprehension

Internet reciprocal teaching (IRT): According to Castek (2015) Internet reciprocal teaching is an instructional model that has been shown to improve reading comprehension. IRT is a very rich model of instruction that involves online information texts, the reading, processing and construction of students own texts (using hypertext links, wikis etc) using varied online texts as sources. It involves a heterogeneous classroom with teacher and student modeling online research and comprehension strategies (questioning, locating, critical evaluating, synthesizing and communicating). Similar to reciprocal teaching there is emphasis on transfer of responsibility for modeling online reading strategies from teacher to students as well as collaboration and discussion among all the students. In the IRT, model the gradual release of responsibility is achieved through three phases of online research and comprehension instruction which aims to increase academic engagement, encourage active reading and promote students as experts in online research and comprehension.

Computer-aided instruction (CAI): is a self-learning technique, usually offline/online, involving integration of the student's text with programmed instructional materials. It is an interactive instruction technique where a computer is used to present the instructional material and monitor the learning that takes place. CAI provides opportunity for students to be drilled and practice, tutorials, simulations, demonstrations, designing, data collection and retrieval, analysis of games which are essential competence,(Apagu & Wakali 2015). Building background knowledge in students is a key tool in building reading comprehension. Computer aided instruction allows students to choose five different meaning of words, pick and choose pertinent details and make inferences about the text. In order for the students to understand the text and fully comprehend, they must have a strong foundation of background knowledge about the topic prior to reading, (Newman, Kaefer and Pinkham, 2014).

Web based reading strategies: teachers can model through think aloud how students can use online reading strategies and also guide students on how to access for the most relevant information for accomplishing their reading goals and how to decide on which links to click. Modeling these processes supports students' self-regulation and inhibition while building their background knowledge for how to read non-linear texts. Teachers should guide students on how to purposefully explore the internet.

8. Literature review

Major studies carried out on the impact of ICT on students' reading comprehension have shown various results. Some of the studies related to the present work are summarized as follows.

Yusuf (2018) carried out a study on the effectiveness of using ICT in teaching reading comprehension in secondary schools in Kaduna which revealed that the experimental group which was taught reading comprehension using ICT facilities performed better than the control group. The experimental group who were exposed to reading comprehension lessons using ICT facilities such as computer, laptops, iPads performed better than the control group who were not exposed to the facilities.

Similarly, a study conducted by Davood, Azizollah and Hossein (2015) on the effect of integrating ICT resources into reading comprehension in Iranian high school showed that students whose teachers integrated ICT resources into vocabulary instruction performed better than students whose teacher taught in the traditional method of teaching vocabulary when compared. A similar study conducted by Thanh Do (2019) on using internet based materials to enhance non-English majors reading comprehension. The study was carried out among class K5 Vietnamese studies students. Result showed that students improved their reading comprehension significantly thanks to internet based materials.

A study carried out by Helmers (2017) on using technology and collaboration to support reading comprehension showed that students who were involved in an intervention program infused with technology and collaboration performed better in reading comprehension. Similarly, Yusuf and El-Yakub (2020) investigated the impact of using ICT in teaching reading comprehension in secondary schools in Kaduna. Two randomly selected government secondary schools, (tagged school A, and school B) were used for the study. School A was the experimental group while School B was the control group. The study utilized a pre-test, post-test, quasi experimental research design. The experimental school was exposed to reading comprehension lessons using ICT facilities such as computer, laptops and iPads. The control group was taught without ICT facilities. Both groups were tested after six weeks of teaching reading comprehension test. The result revealed that the experimental group who were taught reading comprehension using ICT facilities performed better than the control group.

Maduabuchi & Emechebe (2016) conducted a study on ICT and the teaching of reading comprehension in English as a second language in secondary schools. Findings of the study revealed that the most important prospects of using ICT in teaching reading comprehension include: the obvious improvement in vocabulary building and usage through the use of online dictionary, as well as the excitement about reading comprehension lessons often expressed by the students, which facilitated students learning process and promotion of meaningful learning among others. Capodiecici, Cornddi, Doerr, Bertolo & Carreti (2020) in a study on the use of new technologies for improving reading comprehension observed that using 3D readers and CACSR were able to promote reading comprehension abilities in middle school students through metacognitive activities. It was also revealed that due to these programs students became more aware of reading strategies and implemented them successfully during text comprehension.

Literature reviewed has shown that no research study has been carried out on the role of ICT in improving the reading comprehension of students in Ebonyi local government area of Ebonyi state. This work will therefore fill this gap.

9. Conclusion

This study has shown that information paid communication technology tools have taken over the traditional classroom technique of chalk and talk. Technological devices in the classroom such as the computer, electronic books or iPad have the potential to influence student's learning in a positive way. Thus, for students to be successful academically and excel in their various subjects of study, the application of ICT tools in the reading comprehension classroom is a pre-requisite.

10. Recommendations

1. Government should make the application of information and communication tools compulsory in the reading classroom.
2. Government should ensure adequate supply of various ICT tools and computer laboratories in all the schools in the federation.
3. Teachers should be exposed to various ICT tools for learning through the organization of professional training computer programs and workshops.
4. Government should help to inculcate the love for reading E-books and reading comprehension programs in students by establishing E-libraries in all the schools and universities in the country.

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