European Journal of
Technology
(EJT)

The Use of Assistive Technology Devices and Its Effects on the Academic Achievement of Pupils with Visual Impairment in Some Inclusive Schools in Bamenda

Ambei Moses Chu (PhD), Nyambi Caroline Lema Nanga

European Journal of Technology
ISSN 2520-0712 (online)
Vol.8, Issue 6, pp1 1 - 27, 2025
www.ajpojournals.org

The Use of Assistive Technology Devices and Its Effects on the Academic Achievement of Pupils with Visual Impairment in Some Inclusive Schools in Bamenda

Ambei Moses Chu (PhD)[1*], **Nyambi Caroline Lema Nanga**[2]
[1]Lecturer, Faculty of Education, The University of Bamenda-Cameroon
[2]Faculty of Education, The University of Bamenda

.

ABSTRACT

Purpose: This study aimed at investigating the use of assistive technology devices and its effects on the academic achievement of pupils with visual impairment in some inclusive schools in Bamenda. Three specific objectives were raised: To examine the use of mobile phones, audiobooks and screen magnifiers and its effects on the academic achievement of pupils with visual impairments in inclusive schools within Bamenda. From the objective of the study, research questions were formulated for guidance. Three theories were highlighted; Piaget's Cognitive Development Theory (1936) B.F. Skinner's Operant Conditioning theory (1938), and Lev Vygotsky's theory of cognitive development (1970).

Materials and Methods: The study adopted a mixed method with the concurrent nested research design for data collection. Questionnaire and interview guide instruments were used to measure the effects of assistive technology on academic achievement of pupils in inclusive schools. The researcher used a four range Likert Scale such as Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2 and Strongly Disagree (SD) = 1 for the teachers to choose. The questionnaires were structured in closed ended for the teachers and open ended interview guide for the pupils. The responses were analyzed with the used of simple descriptive statistics (frequencies and percentages).

Findings: The results from the hypothetical perspective, findings show that, there is a significant effect on the use of assistive technology devices on the academic achievements of pupils with visual impairments in inclusive schools. The use of mobile phones shows that the calculated P-value is less than 0.05and retain the null hypothesis if P-value is greater than 0.005. Findings reveal that, considering the t-value the result are significant (p=0.000). Thus, the null hypothesis is rejected and the alternative which state that mobile phones has a significant effect on the academic achievements of pupils with visual impairments in inclusive schools in Bamenda with (R Square)=0.268 and p=0.00. Audiobooks significantly affected the academic achievements of pupils with visual impairments, given (R Square)= 0282 and p=0.00. same with a significant positive effect of screen magnifiers with a coefficient determinate of (R Square)=0.049 and p-0.007.It was concluded that assistive technology devices are useful and a supportive tool for both teachers and learners in the teaching learning process.

Implications to Theory, Practice and Policy : Recommendations were made to teachers and parents to make efforts to carry out continuous training with adequate knowledge in the use of assistive technology to better equip the learners. The government should subsidize the purchase of assistive device and draw up policies that will affect the implementation of inclusive education hitch free. Furthermore, suggestions for further research were made, asking other researchers to broaden the scope to get a larger sample size.

Keywords*: Assistive Technology Devices, Visual Impairment, Academic Achievement, Inclusive Schools*

.

INTRODUCTION

Assistive technology refers to the devices and services that are used to increase, maintain, or improve the capabilities of a student with a disability (Dell, Newton, & Petroff, 2012). While the phrase assistive technology may make us think of computers and computerized devices, assistive technology can also be very low-tech. For example, pencil-grips (the molded plastic grips that slip over a pencil) are considered assistive technology. Assistive technology that helps students with learning disabilities includes computer programs and tablet applications that provide text-to-speech (e.g., Kurzweil 3000), speech-to-text (e.g., Dragon Naturally Speaking), word prediction capabilities (e.g., WordQ), and graphic organizers (e.g., Inspiration).

In comparison to other interventions, assistive technology may have a significant effect in helping students with disabilities progress towards the goals outlined on their Individual Education Plans (Watson, Ito, Smith, & Andersen, 2010). Assistive technology helps in two ways: it can help the student learn how to complete the task and it can help to bypass an area of difficulty. For example, when a student decides to listen to a digital version of a book, they are bypassing an area of difficulty. However, if the student focuses on the computer screen as highlighted words are read aloud, they can learn unfamiliar words.

Assistive technology refers to tools and software that help persons with disabilities, such as text-to-speech software, speech-to-text software and other adaptive technology which assist learners with disabilities to improve productivity and accessibility. Assistive technology is an umbrella term, and the International Classification of Functioning, Disability, and Health (ICF) viewed assistive technology devices as any product, instrument, equipment or technology adapted or specially designed for improving the functioning of a person with a disability (Ellis, 2016). This device include screen readers, for example JAWS, NVDA that read aloud text on the computer or mobile phone, screen magnifiers, closed-crcuit television system that magnify text and images, speech-to-text software's like Dragon NaturallySpeaking, that types out spoken words, adaptive and braille displays that raise and lower braille dots electronically (Cook and Polgar, 2008). The definition of Assistive Technology can vary slightly around the world. The United States U.S. Department of Education, IDEA 1998, revised in 2004, the description of an assistive technology device is any item, piece of equipment, or product system whether acquired commercially off the shelf, modified, or customized that is used to increase, maintain or improve functional capabilities of individuals with disabilities.

Assistive technology is equally of several types and categories; thus, it is necessary to considered when choosing a device some are consider low technology (low tech) to high technology (high tech) devices. Cook and Polgar (2008) describe low technology devices as those ATD that are inexpensive and are simple to make and easy to obtain. Examples include head pointers, whiteboards, using pictures for communication, and modified eating utensils. Another additional category of devices stated by Glennen and DeCoste (1997), point out strategies with no technology (no tech). This category of assistive technology No tech strategies involve no equipment, low tech strategies involve simple equipment, and high-tech strategies involve more sophisticated, usually programmable, types of equipment. From this perspective, a computer device can represent high technology and a technology assistive device can be considered light tech or high tech. For example, they illustrate using special paper to help learners read, write, or use a simple pencil grip as a light tech device. A high-tech device would include computers with extended keyboards and modified screens (Dyal, et al, 2009),.

The first assistive technology law was the Technology Related Assistance for Individuals with Disabilities Act which was signed in 1988, by US Congress. The importance of the Act was

that it was the first official document that defines assistive technology, devices and services (Tech Act, 2004). Disability.gov (2012) on its part, defines assistive technology as any device, piece of equipment, product or system that helps people with disabilities fully participate in school, the workforce or in their communities. AccesIT (2012) has a broader and up to date definition of the assistive technologies as technology used by individuals with disabilities in order to perform functions that might otherwise be difficult or impossible such as hardware, software, and peripherals that assist people with disabilities lke the visually impaired in accessing computers or other information technologies.

When appropriate to the user and the user's environment, assistive technology is a powerful tool to increase independence and improve participation (Funk, 2012). It allows children with special needs to become independent and to participate in learning activities with their peers. Children with visual impairments have a variety of specialized issues that need to be addressed to make them successful in the inclusive classroom. Choice of the appropriate assistive technology device is paramount to effectively helping pupils with vision problem succeed in the teaching and learning process. Brown et al. (2011) indicate that assistive technology devices when used effectively with pupils with visual impairments have produced positive results in performing day-to-day activities. Brown et al. suggest that game-based learning and location-based services (high tech) can be useful in helping users navigate the "real-world". Tamakloe and Agbenyega (2017) concur and tell us that AT devices can create a positive environment for the independence and improvement of skills for pupils with visual impairments. This was confirmed that effective use of ATD enable young children with disability such as visual impairments to bypass their weaknesses because the devices augment children's strength to reach their potential. Robitaille (2010) claims that a positive attitude towards assistive technology by the children using the technology positively affects the motivation of both the children using assistive technology devices and their classroom teacher.

Effective assistive technology instruction needs to be a component of both in service and pre-service training programs. However, according to Koch (2017), in general, in-service teacher education programs, whether for special education or in general education preparation, do not adequately train teachers to implement assistive technology into their classrooms. One issue at the pre-service level is that colleges or universities often do not have sufficient resources or funding to stay current. Koch suggests that by providing appropriate knowledge of assistive technology to teacher candidates and general education classroom teachers, they will effectively differentiate instruction and make accommodations to reach all students. One issue for pre-service teaching programs is often the lack of curriculum to support assistive technology knowledge and skills. Since teachers often have large numbers of children in their classrooms, differentiated instruction for all students can be challenging. This lack of training, materials, and funding can be an ongoing issue. Chmiliar's (2007) report on special education teachers, regarding their familiarity of, and access to, assistive technology, notes that there are serious shortcomings in the pre-service training provided for teachers

Mobile Phones and Pupil's Achievement

Mobile phones are valuable tools that could increase access to basic services and offer support in many important activities in the daily lives of learners with visual impairments (Foley and Masingila 2014).

In the last decade, mobile phones have become invaluable allays in the everyday lives of learners with disabilities. Even in low and middle-income countries, mobile phones are highly popular and the penetration rate of mobile technology is almost three times higher than for Desktop computers and broadband lines (Rouse and Kock 2018). Despite their diffusion and

their importance, large datasets on how people with disabilities in lower resourced settings use mobile phones, the services they access and the barriers they encounter when interacting with mobile technology, are scarce. The presence of a mobile gap with many people with disability struggling to acquire and operate mobile phones independently had only access to basic or feature phones that lacked appropriate accessibility features and offered limited functionality. However, many pupils still described mobile phones as a necessity tool for them to access education than the use of the traditional means of achieving education through the means of braille writings which is a system of touch reading and writing for blind persons in which raised dots represent the letters of the alphabet tool (Ellis, 2016; (Willings, 2017).

Assistive technology devices like mobile phones are generally devices whose "primary" purpose is to support the independence and promote the wellbeing of persons with disabilities. Any device that cannot help a learner to gain achievements in education is obsolete. For example, the use of the traditional assistive aids of slate and stylos is obsolete to the use of mobile phones in the teaching learning process (Ellis, 2016). Technologies might not have specifically been designed with that purpose in mind but add benefit none the less to the lives of the user. Mobile phones are an interesting and potentially unique case as they simultaneously belong to both categories of products. A mobile phone can effectively work as an assistive technology (AT) in one or two ways. Firstly, a mobile phone can offer important support to a pupil with disabilities through built-in features or applications that were not specifically designed with that purpose in mind for example, a mobile phone can easily be used by a pupil with memory loss to receive text messages with reminders about which medication needs to be taken and when. Alternatively, a mobile phone can work as an AT due to external applications or accessibility features that were explicitly designed for pupil with a visual impairment, were they can use an application such as BlindSquare to receive relevant information about their surroundings in order to locate the school, shops or other points of interest and navigate to these. Due to their versatile nature, mobile phones have the potential to become incredibly powerful, bespoke and cost-effective tools for leaners with disabilities especially visual impaired, essentially clustering together multiple assistive technology in a single device. Arguably, laptop and desktop computers can offer similar capabilities. However, the penetration rate of laptops and desktop computers is significantly lower than for mobile phones

In the 21st century, the growing interest in pedagogical and instructional technologies has encouraged researchers in bringing solutions that can foster and maximize the integration of special needs learners within regular mixed classrooms. To this end, mobile devices, gadgets, smartphones, tablets and open-source apps among others has proved to be efficient as practical learning alternatives for pupils with special needs (Sharples, et.al., 2009). This has improve the learning performance of learners with visual impairments. Mobile devices provide easy and instantaneous access to learning for persons with disabilities. Mobile phones can be used by special needs pupils in a variety of ways, such as independent daily living and learning activities. Provision of hands-free capability, screen reading and text-to-speech functionality, relay services, Internet browsing, home automation, emergency response among others. In addition to enabling them perform tasks such as paying bills, shopping, booking tickets, reading books, working, and the impact it has on the academic achievement and social life of learners living with one disability or the other (Narasimhan &Axel, 2012).

Without a doubt, the use of mobile devices is becoming ubiquitous by pupils in mainstream learning environments, thus the skills that are needed to access information, data and knowledge they can deliver are vital for providing inclusion in mainstream culture. Exclusion from these devices puts the non-user at a disadvantage and less able to access education and training, nor other range of benefits, support, social status and democratic representation

(Hayhoe, 2013). Despite the increasing importance of mobile devices to learning, little attention has been placed on its capacity to assist learners with disability learning process better than what it is. According to, Foley and Masingila, (2014), the use of mobile phones for pupils with visual impairments, provides such learners with access to education, the means to participate in everyday life and the opportunity to create a community of practice

Audiobooks and Pupil's Achievements

An audiobook is an electronic book format which is listened to instead of being read in the traditional sense. Long before e-books became available, literature appeared in the form of audiobooks in electronic and digital formats (Hiebert et al, 2010). Historically, the audiobook has been described as a kind of by-product of the printed book and as a service for readers who for various reasons have difficulty reading printed books—either because they do not see well, have not learned to read (yet), or because they are dyslexic (Slivan & Brown, 2013). This has changed with the advent of digital media: first, the audiobook is no longer a by-product which, if the sales figures for the printed book are high enough, is recorded long after the book is printed. Today, the market for audiobooks is so big that they are often published at the same time as both the printed and the e-book, which creates a flexibility of reading choice from the moment of publication. Second, audiobooks are no longer for the few, but for everyone. The digital audiobook appeals to a much broader group of consumers than audiobooks did previously. As early as 2006, an American study showed that people who listened to audiobooks on an average became younger, compared to earlier years, and more well off (Audio Publishers Association 2006: 1). In addition, around half of audiobook customers are men, who otherwise only buy one in four books sold (Arvin 2010). By definition, an audiobook is a recording of a printed, published book, but the explosion in usage of audiobooks has caused a detachment from the printed original, so the audiobook is recognized as a medium in its own right. The mobility of the audiobook and the possibility for readers to engage with literature (Have and Pedersen 2016)

The digital audiobook raises a number of interesting issues regarding its modal aspects—not at least compared to the experience of reading a printed book. We have previously discussed the distinct features of the experience of book reading and audiobook reading, building on Lars Elleström's ideas of the modalities of media (Elleström 2010; Have and Pedersen 2012, 2016). Here we have been highlighting that according to Elleström's model for understanding media (2020), the digital audiobook and the printed book differ in a number of aspects, which makes it evident that we need to understand the different literary experiences in a media sensitive way. This means that we underline the importance of technology and the context of the reading situation, while being sensitive to the specifically auditory sensory aspects of the audiobook (for example. the voice and the temporal aspects of the experience)

Technology has changed education forever. Teachers no longer have to rely solely on textbooks and lectures to teach students. Instead, technology allows teachers to deliver content in an engaging manner. For example, instead of using a textbook to teach reading comprehension, teachers can use interactive books such as iBooks. They can also use apps such as Duolingo to provide language learning opportunities. This helps pupils learn faster and retain information better. And these tools allow teachers to focus on delivering quality content rather than spending time on lesson preparation. Learning isn't supposed to be boring. Therefore, teachers should strive to make learning fun. They can do this by incorporating games into lessons, encouraging students to participate in debates, and offering rewards for academic achievement. Students enjoy learning when they feel engaged and excited about what they're doing. By

creating a positive environment, teachers can motivate learners to achieve higher grades with the use of audiobooks.

Whether it makes sense to call an audiobook a book is an open question, since it as a medium, as experience and in usage is fundamentally different from the printed book (Have and Pedersen 2016). Technologically and materially, the audiobook has nothing in common with the printed book; rather, it shares its technology and formats with music. Thus, the technological histories of the audiobook and of recorded music run parallel. The starting point was Edison's invention of the phonograph in 1877, the original aim of which was to record speech. Later, in around 1900, the vinyl record was invented, and in the 1970s, the cassette tape became the audiobook's primary storage medium, so that it could now be listened to on cassette recorders, Walkmans and the inbuilt tape decks in cars. It was also with the invention of the cassette tape that the term 'audiobook' began to be used about recorded books (Rubery 2011: 8).

That it nevertheless makes sense to speak of an audiobook, in spite of the technological, aesthetic and usage-based differences from the printed book, is due to it requiring, according to our definition of an audiobook, a prior or contemporary printed book and an institutionalised literary context in the form of authors, publishing houses, bookshops, libraries and so on. This means that not all recordings of texts read aloud are audiobooks and that a recorded oral tale without a written source is not an audiobook either. This also means that there are differences between audiobooks, talk radio and podcasts—even though they all more or less consist of texts read aloud—because the two last-named typically arise from media institutions and 'on-demand blogging culture'. At the same time as the audiobook is part of the literary ecology, it is also part of the culture surrounding mobile sound media—that which Michael Bull described as "iPod culture" (2007), but which has today become part of a broader smartphone culture. With the smartphone as the primary platform for listening to audiobooks, the discussion of the audiobook as a medium is also inscribed in a broader discussion about media convergence, where it merges with various other everyday private and social digital activities (Schulz 2004). By defining the audiobook as a sound recording of a literary or academic book which is read aloud, usually by professional actors or the author him/herself, we understand the audiobook as a remediation of the book (Bolter & Grusin 2000), which underlines that the auditive mediation of literature adds substantial new aspects to the work. The narrative and its structure are the same, but in the audiobook the way in which it appears, and thus is experienced, changes radically (Bednar 2010: 80). Seen historically, the audiobook is not just a remediation of the printed book but also refers back to the oral tradition of oral tales and the reading aloud of novels, long before literature became an institutional concept (Ong, 2002).

Many educators would agree that one way to enhance reading fluency is by being read to by fluent readers. The purpose of this study was to examine the impact of providing students with audio books via an iPod Shuffle during silent reading time at school. For six weeks, Kindergarten participants spent time either silent reading or listening to a recorded story on an iPod Shuffle during daily dedicated silent reading time. Results show that there was no impact of using the iPod Shuffle on reading fluency; however, students exhibited greater motivation to read, greater engagement in the process, and sustained interest in stories 'read.' The benefits to pupils self-esteem and study skills warrant the use of this strategy for pupils who may not have opportunities to be read to by a fluent reader on a consistent basis."(Cahill & Richey, 2015). Audiobooks as a window to the world. In IASL Annual Conference Proceedings.

Screen Magnifiers and Pupil's Achievements

A screen magnifier is a type of software or hardware which is used to enlarge content of the computer screen, printed materials or any object. It is a type of assistive technology suitable for visually impaired people with some functional vision who cannot read on a normal screen. Visually impaired people with little or no functional vision usually use another type of assistive technology called screen reader. (Titchkosky, 2011)

The simplest way of magnification is to present an enlarged portion of the focused area of the original screen content, so that it covers some or the entire full screen. This enlarged portion should include the content of interest to the user. Besides this the mouse pointer or cursor also enlarged to a bigger size. As the user moves the pointer or cursor, the screen magnifier track with it and show the new enlarged portion Stiker, (1999) Sometimes, user might not be interested in tracking mouse pointer or cursor and would prefer to track the focused portion of the screen like menu, button etc. For example, if the user presses a keyboard shortcut that opens a menu, the magnified portion should jump to those menu pop-up windows and should display enlarged view of the newly focused menu item. (Taylor, 2006)

Screen magnifiers are developed for people with low vision. A low vision user can magnify the contents of the logical computer screen by using screen magnifiers. Most on the physical computer screen, user gets a, portion of the normal screen and can view the whole screen by scrolling over the screen using the mouse or the keyboard (Sikanku, 2018). While moving the mouse the information on the screen changes. While using video magnifier user place printed material and objects under a camera and the magnified image is displayed on a video screen, computer monitor or television screen the important thing is to decide which features are the most important to you and which ones you can live without (RyKottoh, 2017). Following factors should be considered for choosing suitable screen magnifiers for your needs. If you are going to purchase a video magnifier then it is strongly recommended that you get some hands-on experience of using a video magnifier before making a purchase.

Magnification programs are designed to work like a magnifying glass moving over a page. Programs can automatically follow the cursor, magnifying the area around it. It IS also common to be able to automatically move across and down a magnified page at a preset speed. Additionally, in the event of losing your place in a magnified document, programs can show the unmagnified screen, emphasizing the magnified area with colour or shading (RyKottoh, 2017). Fonts used in magnification programs are usually designed to smooth out the jagged or "stairstep" appearance of computer-produced diagonal or curved lines This type of magnifiers is used to work with portable devices like mobile phone, smartphones and other handheld devices running with Symbian or Windows Mobile operating system. By using this type of magnifier user can take advantage of most features including contact directories, caller ID, text messages, help files, access to the web browser, and other screen content, available on their mobile phones and other portable devices. People with sufficient visual acuity to read the screen using two-time magnification or less may find magnifier helpful when using their cell phones but user with lower levels of vision may not find it helpful because the higher the level of magnification in the magnified window, the more challenging cell phone screen magnifier is to use efficiently (Russell, et al, 1997)

These magnifiers provide most features available for desktop-based magnifiers like enlarges screen contents, smoothest curves and edges of magnified fonts and graphics, different color schemes, makes the text cursor and highlighted items easier to track on the display, magnifies the whole screen or just areas of interest, allows easy panning and scrolling of screen contents even in magnified view (Russell, et al, 1997). A video magnifier is a simple way of producing

large text, images and maps for people with some useful vision. These are electronic devices that use a camera, LeD screen, lenses and/or digital magnification. Video magnifier uses a stand mounted or handheld video camera to project a magnified image onto a video monitor, a television (TV) screen, or a computer monitor (Russell, et al, 1997). In this type of magnifier printed material and objects can be placed under a camera and the magnified image is displayed on the video screen. They are mostly used for reading, but can also be used for writing and other activities and to view objects at a distance such as a board in a school classroom. There are a large number of different types of models to choose from and they vary widely. in the features offered.

Video Magnifiers are not a replacement for hand magnifiers, but do have real advantages for some tasks. These include the ability to vary magnification levels, to get very high levels of magnification, to get a comfortable reading distance, and to vary reading distance. (McDonald et al, 2018). Many people find they can read more comfortably and therefore for longer periods with a video magnifier than with a hand magnifier.

Academic Achievement

Academic achievement is the measurement of learner's achievement across various academic subjects. Teachers and education officials typically measure achievement using classroom performance, graduation rates, and results from standardized test (Gadagbui,2010). Academic achievements is the term that indicates a pupil's achievement after completing a course or subject from an institution. It measures leaners' learning across various academic subjects, which is assessed by formative and summative assessments.

Educators and researchers have long been interested in exploring variables contributing to the quality of academic achievements of learners. Academic achievements are affected by many factors including parents' educational levels and income, teachers' knowledge of the subject, truancy, textbooks availability and accessibility, libraries, practical laboratory, meals provision and many other factors (Babad, 2007). The home environment has been recognized as having a lot of effects on academic achievements. Children who experience poverty may live in physical environments that offer less stimulation and fewer resources for learning. Education at the primary and secondary school levels are supposed to be the bedrock and the foundation towards higher knowledge in tertiary institutions (Hall, 1995). Consistent lower academic achievements at the elementary levels to Senior High School is a threat to every country's educational system, especially our country Cameroon. There is therefore the need to review the literature on academic achievement, an insight into factors and their effects on academic achievements of Pupils in primary schools because it has a cause effect on students at Senior High Schools.

One other factor that has the propensity to affect the academic achievements of the pupil is the natural surroundings he/she belongs to. However, such surroundings that could soothe the achievements of the learner can be given by the parents (Luce,1995). Parents can also benefit from sessions of guidance and counselling from school leaders to help enhance the academic work of pupils at home. For pupils to achieve a higher degree of academic excellence, several researchers have posited that pupils reaching this fate mainly rely on the academic influence of their parents (Malouff & Schutte, 2007). As a result, in their work inferred that the mark of pupils from literate parents exceeds those from illiterate parents on a standardized exam. This is because literate parents can share information with their children concerning school or engaged in the use of assistive technology and what is being studied. Additionally, they are capable of helping their wards in their academic work and their involvement in school activities.

Therefore, the education of parents is significant in anticipating the achievements of pupils and this has been frequently pointed out in several types of research reporting on pupils' performance (Houghton et al, 2002). Among the parents, mother's higher education reflected in the achievements of pupils in Mathematics and Reading due to their increased hopes from their wards. He further asserted that a higher level of achievements-associated conduct by mothers in the house and a more definite insight of achievements by the children was projected by more definite confidence and hopes from mothers.

The textbook and assistive technology devices are instructional material that also determines the success of a pupils. This has been confirmed by several studies which have indicated the role textbooks and assistive technologies play in a pupil's academic achievement. Then also these instructional materials serve as the only material from which information for the student and program of study are gathered. A study investing that the effect of assistive technology and textbooks and other factors on pupils' achievements when data was collected from eight-grade Mathematics classes across the country in Thailand. It was observed that textbooks and the use of assistive technology affected achievements by presenting a complete and well-detailed curriculum as well as replacing subsequent mathematics education after primary school (Al Lily, et al, 2020). Moreover, according to, textbooks are principal at every stage of a school because nothing has substituted books as a vital part of the educational process.

Teachers striving for the enhancement of pupil's education esteem that, enhancing teaching books would certainly result in the alteration of instruction and another author asserted about teacher's dependence on textbooks. Several teachers assume that textbooks and the use of assistive technology in inclusive schools could offer significant and efficient information without taking into consideration the role of instructors (Anderson, & Dron, 2011). Textbooks and assistive technologies have been emphasized as so essential to academic improvement that, posited that unavailability of significant textbooks for instruction and studies is an unfortunate incidence. Then also, pupils not able to buy textbooks or have access to assistive technologies especially learners with special abilities are one of the factors accounting for their unavailability among learners. In this way, it would only be from teachers that pupils will get access to information and in this situation, a teacher's choice of instructional material will be partial. Partial because, it will rely on sensibly deficient standards such as the appealing nature of books taking into consideration the assistive gargets, print, pictures as well as the credentials and acknowledgement the writer has received in his or her other writings (Artino, 2012).

Theoretically, Piaget`s theory focuses on the leaner`s capabilities and the learning is hinged on the realization of such capabilities. Education within this theory is conditioned to be extrinsic that is the abilities of a Learner are based on the available resources in respect to the chronological and mental age. Hence the place of the learning environment in this study is essential. Another point of interest in this theory is the cognitive domain whereby the behaviour of the pupil reflects the emergence of various psychological structures, organized units or patterns of thinking that influence how children interpret information. Kendra (2014) states that the cognitive developmental theories explain the change in reasoning level of a child acquiring new ways of understanding their world. Piaget's theory of implication assumes that all children go through the same sequence of development, but they do so at different rates. Based on these theories, teachers must make a special effort to provide classroom activities for individuals and small groups, rather than for the total class group. Assessment should be based on individual progress, rather than on the normal standards of same age peers. Individuals construct their own knowledge during the course of the interaction with the environment. With the cognitive theory, behavior reflects the emergence of various psychological structures, organized units or patterns of thinking that influence how children interpret information.

Piaget believed that humans also adapt to their physical and social environments in which they live. The process of adaptation begins from birth. Piaget saw this adaptation in terms of assimilation and accommodation (Stiker, 1999). Assimilation refers to the process by which new objects and events are grasped or incorporated within the scope of existing schemes or structures. This means that when you are faced with new information, you make sense of this information by referring to information you already have (information processed and learned previously) and try to fit the new information into the information you already have. This theory is relevant to this research in that, the use of assistive technology will help pupils with visual impairments to be comfortable with his learning environment. This is because the learning needs of a pupil can be made extrinsically without much attention form the teacher. Visual impair pupil can be present, participate and achieved academic excellent like other peers through means of assimilation and accommodation information with the help of assistive technology.

Skinner's Operant Conditioning theory is focused on the method of learning that employs rewards and punishments for behavior. Through operant conditioning, an association is made between a behavior and a consequence (whether negative or positive) for that behavior. Operant conditioning relies on a fairly simple premise: Actions that are followed by reinforcement will be strengthened and more likely to occur again in the future. If a pupil with visual impairments understands that late coming will limit his/her chances to gain access to an ATD because of its limitations, and the fact that the teacher will give it only when the pupil scores a mar above 17, the pupil wl always have the tendency to eithr be eary or wok vry hard to gan access to ATD. Also, if a pupil raises the hand to ask a question and the teacher praises his polite behavior, they will be more likely to raise their hand the next time the teacher asked a question or comment because the behavior was followed by reinforcement, or a desirable outcome, the preceding action is strengthened. This will be different with actions that result in punishment or undesirable consequences will be weakened and less likely to occur again in the future. If you shout out an answer in class and your teacher scolds you, then you might be less likely to interrupt the class again.

This theory is indicative relevance to this study showing how the application effect of behaviorism based on the use of reward and punishment in inclusive education setting can mar or fix the academic achievement of pupils with visual impairments, which clearly appears in the emphasis on pupil's behaviors and achievements in manipulating stimulus materials (Ertmer & Newby, 2013).

Vygotsky's theory comprises concepts such as culture-specific tools, private speech, and the zone of proximal development. Vygotsky believed cognitive development is influenced by cultural and social factors. He emphasized the role of social interaction in the development of mental abilitie. For example, group work. During group work, pupils socialized and learn the cultural diversity of their peers. Cognitive development is a socially mediated process in which children acquire cultural values, beliefs, and problem-solving strategies through collaborative dialogues with more knowledgeable members of society. When learners with disabilities such as those with visual impairments socialized, they have the opportunity to participate in class exercises and show case their ability which might have been hiding.

Pupils' interactions with more knowledgeable peers will increase not only the childs ability to acquire quantity information but the number of skills the child will develops, and also affects the development of higher-order mental functions such as formal reasoning. Vygotsky argued that higher mental abilities could only develop through interaction with more advanced others.

Thus, this theory is out to showcase and encourages collaborative and cooperative learning between children and teachers or peers with or without disabilities in inclusive schools.

Statement of the Problem

The teaching and learning process for pupils with special needs like the visually impaired pupils has suffered a lot of challenges over the years because of the kind of didactic and instructional materials available for their use. Braille is the means of communication for the visually impaired especially at the elementary stage of education open to a vision learner. The cumbersome nature of braille writing usually frustrate many pupils with visual impairments making education difficult to most learners thus, affecting their academic achievement.

Blind or partially sighted pupils may excel in their education if they have the opportunity to use assistive technological devices that can enhance great academic achievements with resources in the teaching learning process. A shortage of assistive resources has a significant impact on visual impaired pupils in academic attainment than equated to print pupils (Spungin, 2012). The (NFP) National Federation of the Blind (2009) reveals that pupils with visual impairments also face challenges largely due to the fact that teachers do not adequately utilize relevant resources such as assistive technology for instruction. Again, the use of assistive technology in the teaching and learning process of pupils with visual impairments in Bamenda is yet to gain popularity as it is obtainable in advanced countries of the world because of the expensive nature of the high-tech assistive technology devices. However, this scenario can be changed if the government put in practice the notion of inclusive education in her schools by providing the right instructional materials for inclusive schools and let pupils be introduced and encouraged with the use of assistive technology earlier and teachers be trained and encouraged to effectively use assistive devices for instruction in inclusive classroom settings. The use of assistive technology in the teaching of pupils with special needs especially the vision learners, will not only ease or improve the teaching-learning process but will also expose them to modern technological trends. it is viewed that, if modern assistive technology like mobile phones, audiobooks and screen magnifiers are used it will increase the academic achievements of pupils with visual impairment. This will be more effective if the inclusive schools make provisions and follow the roles of the universal design on education enforced (Fonkeng, 2005, Tchombe, 2014). Many pupils especially pupils with visual impairments access education without the use of assistive technology device to ease their studies. With such a situation many of them are found lagging behind in their education.

Despite the global attention given to the production and provision of assistive technology in primary schools, there are still challenges children with special needs experience in inclusive schools especially the visually impaired. The academic achievements of these children are not encouraged as assumed. A large percentage of them can hardly see or respond correctly on assessments and assignments in the classroom when teaching is going on, thereby disrupting the teaching learning process. Some research has been carried out on technology and education and a lot research has also been carried out on assistive technology in other areas of the world on Secondary and Higher Institutions to evaluate the achievements, but at the best of the researcher's knowledge, few research has been carried out on the use of assistive technology and its effects on the academic achievements of pupil with visual impairments in inclusive primary schools within Bamenda. It is against this backdrop that the researcher aimed at carrying out an investigating on the use of assistive technology and its effects on the academic achievements of pupils with visual impairments in inclusive schools in Bamenda.

Objectives of the Study

One main objective and three specific objectives were identified to guide this study.

Main Objective

The main objective of this study was to assess the use of assistive technology and its effects on the academic achievements of pupils with visual impairments in inclusive school.

Specific Research objectives

The specific objectives of the study are:

i. To examine the effects of the use of mobile phones on the academic achievements of pupils with visual impairments in inclusive schools.
ii. To find out the effects of the use of audiobooks on the academic achievements of Pupils with visual impairments in inclusive schools.
iii. To examine the effects of the use of screen magnifiers on the academic achievements of pupils with visual impairments in inclusive.

Research Questions

For better understanding, one main research question and three specific research questions were formulated to guide this study.

General Research Questions

What is the effect of assistive technology on the academic achievements of pupils with visual impairments in inclusive schools?

Specific Research Questions

The following specific research questions were stated to guide this study.

i. How does the use of mobile phones affect the academic achievements of pupils with visual impairments in inclusive schools?
ii. How, can the use of audiobooks affect the academic achievements of pupils with visual impairments in inclusive schools?
iii. To what extent does the use of screen magnifiers affect the academic achievements of pupils with visual impairments in inclusive schools?

Hypotheses

General hypothesis

Ho: Assistive technology has no significant effects on the academic achievement of pupils with vision impairments in inclusive schools.

Ha: Assistive technology has a significant effect on the academic achievements of pupils with visual impairments in inclusive schools.

Specific Hypothesis

Ho $_1$: Mobile phones have no significant effect on the academic achievement of pupils with visual impairments inclusion schools.

Ho $_2$: Audiobooks has no significant effect on the academic achievements of pupils with visual impairments in. inclusion schools.

Ho $_3$: Screen magnifiers have no significant effect on the academic achievements of pupils with visual impairments in inclusive schools.

MATERIALS AND METHODS

This study employed a mixed method with the concurrent nested research design for data collection which was qualitatively and quantitatively driven. The study is limited to inclusive primary schools in Bamenda, Mezam Division in the North West Region of Cameroon. More specifically, this study was carried out on pupil of Baptist Primary School and ITTIG- SENTTI Inclusive Demonstration Practicing Nursery and Primary School. The population of the study involved all visually impaired pupils, teachers of the inclusive schools in Bamenda, Mezam Division in the North West Region, to which generalization will be made.

The target population of this study was made of the total population of pupils who needed assistive technology to learn in the two inclusive schools and their teachers

Table 1 Target population

Schools	Pupils' population	Teachers
CBC Nursery and primary school	7	8
ITTGIC- SENTTI	8	6
Total	**15**	**14**

Source: Academic and Records Office of C.B.C Nkwen and ITTGIC- SENTTI 2024

The sample population of this study included all the visually impaired children and their teachers of the two selected schools. Fifteen (15) pupils were purposefully selected for the study and 14 Teachers. The reason for this small population is because the researcher was working with a specific category of learners, that is, the visually impaired, whose population in the two schools were limited to 15 Pupils. The instruments used for data collection were questionnaires and an interview guide. The questionnaires were designed for teachers and consisted of 20 items that were partitioned into sections A, B, C, and D. The questionnaire items addressed issues or concepts related to each research question.

Descriptive and inferential statistics were used for data analysis. Descriptive statistics were used to answer the research questions while inferential statistics were used to test the hypotheses. After the collection of data from the field, it was handed to the statistical analyst who then re-organized, coded and analyzed the data using the SPSS (Statistical Package for Social Sciences) version 26 and Microsoft excel. Descriptive statistics used included frequencies and percentages and presented using tables and charts. Concerning inferential statistics, linear regression analysis was used as a statistical tool to verify the hypothesis at the 0.05 level of significance.

Decision Rule

The hypotheses are verified at the significance level of 0.05. Once a hypothesis is verified and the level of significance is below 0.05, the null hypothesis will be rejected and the alternative hypothesis uphold. On the other hand, when the significance level was above 0.05 the null hypothesis will be retained while the alternative hypothesis will be rejected.

FINDINGS

The findings of this study are presented based on the research questions under investigation.

Research question one: How does the use of mobile phones affects the academic achievements of pupils with visual impairments in inclusive schools in Bamenda?

In an attempt to answer research question one, data from items 1 to 5 of the teachers' questionnaire were analyzed and presented in the form of frequencies, percentages, mean and standard deviation as follows:

Table 2 The Prevalence of the Use of Mobile Phones by Teachers

Items	SA	A	D	SD	Collapsed agreement	Collapsed disagreement	Mean	SD
I use Mobile Phones to help learners do task during lessons	11	3	0	0	14(100%)	0	3.78	0.41
Mobile Phones helps my learners in reading during lessons	8	6	0	0	14(100%)	0	3.76	0.49
Mobile Phones gives my learners auditory feedback	10	4	0	0	14(100%)	0	3.78	0.45
I motivate learners using mobile phones.	1	2	4	7	3(21.4%)	11(78.6%)	3.1	0.32
I ensure that pupils write their exams thanks to the use of mobile phones.	0	14	0	0	14(100%)	0	3.21	0.40
Multiple response set average					**12(92.3%)**	**2(7.7%)**	**3.52**	**0.41**

Source: Fieldwork (2024)

Table 2 shows that all the 14 (100%) respondents agreed they use mobile phones to help learners do task during lessons. In like manner, all the 14 (100%) respondents agreed that mobile phones help their learners in reading during lessons. The trends continued with 14 (100%) agreeing that mobile phones give their learners auditory feedback. A minority of 3 (21.4%) of the respondents agreed that they motivate learners using mobile phones while 11(78.6%) disagreed. All the 14 (100%) respondents agreed that they ensure that pupils write their exams thanks to the use of mobile phones. Summarily, from the multiple response set, an average of 12 (92.3%) responses on the use of cell phones were positive and 2 (7.7%) were negative. The mean for the use of cell phones was 3.42 on a four-point scale. It can be inferred that the use of cell phones by teachers of visually impaired pupils, was high. The standard deviation for the use of cell phones was 0.41. This was quite small and so it can be inferred that the responses were closer to the mean, meaning that the respondents gave similar responses.

Verification of Hypothesis One

Ho1: Mobile phones have no significant effect on the academic achievements of pupils with visual impairments in inclusive schools in Bamenda.

In order to test hypothesis one, a linear regression analysis was used as the statistical tool to verify the hypothesis at a 0.05 level of significance. Decision rule: reject the null hypothesis if the calculated P-value is less than 0.05 and retain the null hypothesis if the P-value is greater than 0.05.

Table 3 Model Summary for Mobile Phones

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.517[a]	.268	.263	3.25028

A linear regression analysis was conducted to verify the strength of mobile phones on the academic achievements of pupils with visual impairments in inclusive schools in Bamenda. The coefficient of determination (R Square) was 0.268 indicating that 26.8% of the variance in

the academic achievements of pupils with visual impairments in inclusive schools in Bamenda, was accounted for by mobile phones.

Table 4 Coefficients of Effects for Mobile Phones

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	11.654	1.250		9.327	.000
	Mobile phones	.458	.062	.517	7.354	.000

From Table 4 the regression equation is predicted academic achievements of pupils with visual impairments in inclusive schools in Bamenda = 11.654 + 0.458 mobile phones. When there is zero usage of mobile phones, the academic achievements of pupils with visual impairments in inclusive schools in Bamenda will be 9.327. According to the slope, for each additional unit change in the use of mobile phones, the academic achievements of pupils with visual impairments in inclusive schools in Bamenda will increase by 0.458. The constant term is positive. This means that there are still some factors not included in the model that aggregately influenced positively the academic performance of pupils with visual impairments in inclusive schools in Bamenda within the period of study. Increase in these factors will positively impact the academic achievements of pupils with visual impairments, everything being equal. Considering the t- value for the use of mobile phones, the result is significant (p=0.000). Thus, the null hypothesis is rejected and the alternative which state that mobile phones has a significant effect on the academic achievements of pupils with visual impairments in inclusive schools in Bamenda, was upheld.

Table 5 Thematic Analysis According in Relation to Mobile Phones

Questions	Themes	Code descriptions	Quotations
Does your teacher use Mobile Phones in teaching? If yes how beneficial are they to you	Improved engagement and participation	How students view mobile phones as beneficial	It can lead to improved engagement and participation by providing a more interactive learning
	Increased literacy		
	Access to learning materials		With the phone I get access to a lot of learning materials
	Building reading skills		Reading materials from the phone help increase my reading skills
	Facilitation of group work after school		We can use phones to communicate and group assignments

Research question two: How does audiobooks effects the academic achievements of pupils with visual impairments in inclusive schools in Bamenda?

In an attempt to answer research question two, data from items 6 to 10 of the teachers' questionnaire were analyzed and presented in the form of frequencies, percentages, mean and standard deviation as follows:

Table 6 The Prevalence of the Use of Audiobooks by Teachers

Items	SA	A	D	SD	Collapsed agreement	Collapsed disagreement	Mean	SD
I use audiobooks to help tired learners to sleep	10.	2	2	0	12(92.3%)	2(7.7%)	3.64	0.61
I use audiobooks to help the learners improve on their reading skills	9	4	1	0	13(92.9%)	1(7.1%)	3.57	0.62
Audiobooks help me with time management	11	3	0	0	14(100%)	0	3.78	0.41
Audiobooks improve literacy skills of my learners	13	1	0	0	14(100%)	0	3.92	0.25
Audiobooks build fluency in my learners	8	2	3	1	10(71.4%)	4(28.6%)	3.21	1.01
Multiple response set average					**13(92.9%)**	**1(7.1%)**	**3.61**	**0.58**

Source: Fieldwork (2024)

Table 6 shows that a majority of 12 (92.3%) respondents agreed that they use audiobooks to help tired learners to sleep and 2(7.7%) disagreed. Similarly, a majority of 13 (92.9%) agreed that they use audiobooks to help the learners improve on their reading skills and only 1(7.1%) disagreed. All the 14 (100%) respondents agreed that audiobooks help them with time management. Still, all the14 (100%) respondents that audiobooks improve literacy skills of my learners. A majority of 10 (71.4%) agreed that audiobooks build fluency in my learners while 4(28.6%) disagreed.

Summarily, from the multiple response set, an average of 13 (92.9%) responses on the use of audio books were positive and 1 (7.1%) were negative. The mean for the use of audio books was 3.61 on a four-point scale. It can be inferred that the use of audio books by teachers of visually impaired students was high. The standard deviation for the use of audio books was 0.58. This is small and so it can be inferred that the responses were closer to the mean, meaning that the respondents gave similar responses.

Verification of Hypothesis Two

Ho2: Audio books have no significant effect on the academic achievements of pupils with visual impairments in inclusive schools in Bamenda.

In order to test hypothesis two, a linear regression analysis was used as the statistical tool to verify the hypothesis at a 0.05 level of significance. Decision rule: reject the null hypothesis if the calculated P-value is less than 0.05 and retain the null hypothesis if the P-value is greater than 0.05.

Table 7 Model Summary for Audio Books

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.531[a]	.282	.277	3.21896

A linear regression analysis was conducted to verify the strength of audio books on the academic achievements of pupils with visual impairments in inclusive schools in Bamenda. The coefficient of determination (R Square) was 0.282 indicating that 28.2% of the variance in

the academic achievements of pupils with visual impairments in inclusive schools in Bamenda was accounted for audio books.

Table 8 Coefficients of Effect for Audio Books

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	12.414	1.111		11.178	.000
	Audio books	.471	.062	.531	7.618	.000

From Table 8 the regression equation is predicted academic achievements of pupils with visual impairments in inclusive schools in Bamenda = 12.414 + 0.471 audio books. When there is zero usage of audio books, the academic achievements of pupils with visual impairments in inclusive schools in Bamenda will be 11.178. According to the slope, for each additional unit change in the use of audio books, the academic achievement of pupils with visual impairments in inclusive schools in Bamenda will increase by 0.471. The constant term is positive. This means that there are still some factors not included in the model that aggregately influenced positively the academic achievements of pupils with visual impairments in inclusive schools in Bamenda within the period of study. Increase in these factors will positively impact the academic achievements of pupils with visual impairments, everything being equal. Considering the t- value for the use of audio books, the result is significant (p=0.000). Thus, the null hypothesis is rejected and the alternative which state that audio books have a significant effect on the academic achievements of pupils with visual impairments in inclusive schools in Bamenda, was upheld.

Table 9 Thematic Analysis in Relation to Audio Books

Questions	Themes	Code descriptions	Quotations
Does your teacher use audio books during teaching and learning process? How does this help you	Reading fluency	How students perceive the usefulness of audiobooks	Audio books increase our ability to accurately read aloud at a reasonable pace
	Listening comprehension		It helps me to be able to listen while reading
	Vocabulary		It helps to open me up to a lot reading materials and I learn new stuffs
	Pronunciation		With audio books I learn how to pronounce words
	Improved memory		Audiobooks can contributor to improved cognitive function

Research Question Three: What Extent Does Screen Magnifiers Affects Academic Achievements of Pupils with Visual Impairments in Inclusive Schools in Bamenda?

In an attempt to answer research question three, data from items 11 to 15 of the questionnaire were analyzed and presented in the form of frequencies, percentages, mean and standard deviation as follows:

Table 10 The Prevalence of the Use of Screen Magnifiers

Items	SA	A	D	SD	Collapsed agreement	Collapsed disagreement	Mean	SD
I used screen magnifier to increases colour contrast of an object during teaching	2	11	1	0	13(92.9%)	1(7.1%)	3.07	0.45
The screen magnifier helps you to enlarge what you write on the bored	4	8	2	0	12(92.3%)	2(7.7%)	3.28	0.45
The screen magnifier helps my learner's understanding. .	4	7	3	0	11(78.6%)	3(21.4%)	3.48	0.41
Most of my learning activities require a lot of intensive eye sight	3	9	2	0	12(92.3%)	2(7.7%)	3.21	0.41
I use the screen magnifier to helps learners have a good view from a distance	7	4	3	0	11(78.6%)	3(21.4%)	3.41	0.45
Multiple response set average					**12(92.3%)**	**2(7.7%)**	**3.41**	**0.43**

Source: Fieldwork (2024)

Table 10 reveals that a majority of 13 (92.9%) they used screen magnifier to increases colour contrast of an object during teaching while 1 (7.1%) disagreed. In like manner, a majority of 12 (92.3%) agreed that the screen magnifier helps them to enlarge what you write on the bored while 2 (7.7%) disagreed. Also, a majority of 11 (78.6%) agreed that the screen magnifier helps my learner's understanding and 3 (21.4%) disagreed. The trends continued with 12 (92.3%) agreeing that most of their learning activities require a lot of intensive eye sight and 2 (7.7%) disagreed. Still, a majority of 11(78.6%) agreed that they use the screen magnifier to help learners have a good view from a distance while 3 (21.4%) disagreed.

Summarily, from the multiple response set, an average of 12(92.3%) responses on the use of screen magnifiers were positive and 2 (7.7%) were negative. The mean for the use of screen magnifiers was 3.41 on a four-point scale. It can be inferred that the use of screen magnifiers by teachers of visually impaired students was high. The standard deviation for the use of audio books was 0.43. This is small and so it can be inferred that the responses were closer to the mean, meaning that the respondents gave similar responses.

Verification of Hypothesis Three

Ho3: Screen Magnifiers has no significant effect on the academic achievements of pupils in inclusive schools in Bamenda.

In order to test hypothesis three, a linear regression analysis was used as the statistical tool to verify the hypothesis at a 0.05 level of significance. Decision rule: reject the null hypothesis if the calculated P-value is less than 0.05 and retain the null hypothesis if the P-value is greater than 0.05.

Table 11 Model Summary for Screen Magnifiers

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.221[a]	.049	.042	3.70392

A linear regression analysis was conducted to verify the strength of screen magnifiers on the academic achievements of pupils with visual impairments in inclusive schools in Bamenda.

The coefficient of determination (R Square) was 0.049 indicating that 4.2% of the variance in the academic achievements of pupils with visual impairments in Bamenda II and III Municipalities, was accounted for by screen magnifiers.

Table 12 Coefficients of Effect for Screen Magnifiers

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	**t**	**Sig.**
1	(Constant)	16.749	1.440		11.629	.000
	Screen magnifiers	.315	.114	.221	2.759	.007

From Table 12 above, the regression equation is predicted academic achievement of pupils with visual impairments in inclusive schools in Bamenda = 16.749 + 0.315 screen magnifiers. When there is zero usage of screen magnifiers, the academic achievements of pupils with visual impairments in inclusive schools in Bamenda will be 11.629. According to the slope, for each additional unit change in the use of screen magnifiers, the academic achievements of pupils with visual impairments in inclusive schools in Bamenda will increase by 0.315. The constant term is positive. This means that there are still some factors not included in the model that aggregately influenced positively the academic achievements of pupils with visual impairments in inclusive schools in Bamenda within the period of study. Increase in these factors will positively impact the academic achievements of pupils with visual impairments, everything being equal. Considering the t- value for the use of screen magnifiers, the result is significant (p=0.007). Thus, the null hypothesis is rejected and the alternative which states that screen magnifiers have a significant effect on the academic achievements of pupils with visual impairments in inclusive schools in Bamenda was upheld.

Table 13 Thematic Analysis in Relation to Screen Magnifiers

Questions	Themes	Code descriptions	Quotations
Does the teacher use image magnifier to help you see the board better? If yes how useful are they to you?	Manage eye fatigue	How students perceive the usefulness of screen magnifiers	It helps me see well, use good posture and manage eye fatigue
	Access to activities		I can access same activities as my mates
	Enhanced visibility		It makes it easier to see especially for those with low vision

Presentation of the Dependent Variable (Academic Achievements of Pupils with Visual Impairments in Inclusive Schools in Bamenda.)

In an attempt to characterized academic achievements of pupils with visual impairments in inclusive schools in Bamenda., data from items 16 to 20 of the questionnaire were analyzed and presented in the form of frequencies, percentages, mean and standard deviation as follows:

Table 14 Teachers' Knowledge of Teaching Methods

Items	SA	A	D	SD	Collapsed agreement	Collapsed disagreement	Mean	SD
My pupils ask questions in class	2	11	1	0	13(92.9%)	1(7.1%)	3.47	0.45
My pupils answer questions during lesson	4	10	0	0	14(100%)	0	3.71	0.45
My pupils do their assignments correctly	2	9	2	1	11(78.6%)	3(21.4%)	3.62	0.41
My pupils pass in their exams very well	3	9	2	0	12(92.3%)	2(7.7%)	3.41	0.41
My pupils engage in group learning	10	4	0	0	14(100%)	0	3.78	0.40
Multiple response set					**13(92.9%)**	**1(7.1%)**	**3.61**	**0.43**

Source: Fieldwork (2024)

Table 14 shows that a majority of 13 (92.95) of the respondents agreed that their pupils ask questions in class and only 1(7.1%) disagreed. All the 14 (100%) respondents agreed that their pupils answer questions during lessons. A majority of 11(78.6%) agreed that their pupils do their assignments correctly while 3(21.4%) disagreed. Equally, a majority of 12 (92.3%) agreed that their pupils pass in their exams very well while 2(7.7%) disagreed.

Summarily, from the multiple response set, an average of 13 (92.9%) responses on the use of screen magnifiers were positive and 1 (7.1%) were negative. The mean for the use of screen magnifiers was 3.61 on a four-point scale. It can be inferred that the academic achievement of visually impaired pupils was above average. The standard deviation for academic achievements was 0.43. This is small and so it can be inferred that the responses were closer to the mean, meaning that the respondents gave similar responses.

Table 15 Summary of Findings

Research question/Hypotheses	Descriptive statistics	Inferential statistics
Research question one: How does the use of mobile phones effects the academic achievement of pupils with visual impairments in inclusive schools in Bamenda.? Ho1: Mobile Phones has no significant effects on the academic achievements of pupils with visual impairments in inclusive schools in Bamenda.	An average of 12 (92.3%) responses on the use of cell phones were positive and 2 (7.7%) were negative. The mean for the use of cell phones was 3.42 on a four-point scale. The standard deviation for the use of cell phones was 0.41	Mobile Phones significantly affects the academic achievements of pupils with visual impairments in inclusive schools in Bamenda. with a coefficient of determination of 0.282, p= 0.00
Research question two: How does audiobooks affects the academic achievements of pupils with visual impairments in in inclusive schools in Bamenda. ? Ho3: audio books have no significant effects on the academic achievements of pupils in in inclusive schools.	An average of 13 (92.9%) responses on the use of audio books were positive and 1 (7.1%) were negative. The mean for the use of audio books was 3.61 on a four-point scale. The standard deviation for the use of audio books was 0.58	Audio books significantly affects the academic achievements of pupils with visual impairments in inclusive schools in Bamenda. with a coefficient of determination of 0.268, p= 0.00
Research question three: What extent does Screen Magnifiers affect academic achievements of pupils with visual impairments in inclusive schools in Bamenda.? Ho3: Screen magnifiers have no significant effect on the academic achievements of pupils in Bamenda	An average of 12(92.3%) responses on the use of screen magnifiers were positive and 2 (7.7%) were negative. The mean for the use of screen magnifiers was 3.41 on a four-point scale. The standard deviation for the use of audio books was 0.43.	Screen magnifiers significantly affect the academic achievements of pupils with visual impairments in inclusive schools in Bamenda. with a coefficient of determination of 0.049, p= 0.007

FINDINGS

This study investigated the use of assistive technologies and its effects on the academic achievements of pupils with visual impairments in Bamenda. The case of ITTCIG-SENTTI Inclusive Demonstration Practicing Nursery and Primary School a lay private institution and C.B.C. Nkwen Nursery and Primary School a mission school both Inclusive schools with visual impaired learners. The discussions of findings of the study are presented according to research questions.

Research Question 1: How Does the Use of Mobile Phones Affects the Academic Achievements of Pupils with Visual Impairments in Inclusive Schools in Inclusive?

Based on findings from this objective, it was revealed that there is a significant effect of the use of mobile phones in the teaching learning process (reading performance increases at 3.76 general participation in class.) Mobile phone is hugely important to blind and visually impaired persons as means of accessing literacy and has the potential to promote intellectual freedom, equal opportunity and personal security to the learners in and out of school in Bamenda at 3.52 total average level showing a high level of the use of mobile phones on the Academic Achievements of pupils. It was also revealed that 92.3% of teachers encourage their visual impaired pupils to use mobile phones in the inclusive classroom during the teaching learning process, thus, leading to high academic achievements. The use of mobile phones in the classroom was corroborated by the findings of Smith (2018) who conducted a study on the benefits of mobile phones for visual learners with language challenges. This study argues the importance of allowing vision children to acquire mobile phones from an early age. It demonstrates firstly that the critical/sensitive period hypothesis for language acquisition can be

applied to specific language aspects of spoken language as well as technological devices that can influence speech. (i.e. phonology, grammatical processing and syntax). This makes early diagnosis and early intervention of crucial importance.

Research Question 2: How Does the Use of Audiobooks Affects the Academic Achievements of Pupils with Visual Impairments in Inclusive Schools?

Findings from this research Question indicated that there is a significant effect of the use of audiobooks in Bamenda. at 0.58 level of significance and 92.9% The finding from this research revealed that the total average of 3.61 showing a high level of the use of Audiobooks in the teaching learning process and its effects on the Academic Achievements of pupils with vision problems. The digital audiobook raises a number of interesting issues regarding its modal aspects not at least compared to the experience of reading a printed book. We have previously discussed the distinct features of the experience of book reading and audiobook reading, building on Lars Elleström's ideas of the modalities of media (Elleström 2010; Have and Pedersen 2012, 2016). Here we have been highlighting that according to Elleström's model for understanding media (2020), the digital audiobook and the printed book differ in a number of aspects, which makes it evident that we need to understand the different literary experiences in a media sensitive way. This means that we underline the importance of technology and the context of the reading situation, while being sensitive to the specifically auditive sensory aspects of the audiobook (e.g., the voice and the temporal aspects of the experience)

Education is an important means by which people are empowered to enrich their lives and make a meaningful contribution to societal development. Equal access to learning materials and content plays a key role in achieving this goal. To meet the unique needs of the print disabled, specialized services, materials, appropriate technology, and media must be made available to ensure equal access to the curriculum to enable print-disabled students to compete effectively with their peers in school and ultimately in society (American Foundation for the Blind, 2005). In advocating for improved access to content across the world, the Marrakesh Treaty to Facilitate Access to Published Works for Persons Who Are Blind, Visually Impaired or Otherwise Print Disabled (2013) recommended "non-discrimination, equal opportunity, accessibility and full and effective participation and inclusion in society, proclaimed in the Universal Declaration of Human Rights and the United Nations Convention on the Rights of Persons with Disabilities" (p. iii). This makes it binding on member countries of the World Intellectual Property Organization (WIPO) to follow the good practice of making available "accessible format copies" to the print disabled.

Braille is a valuable format and plays an important role in teaching and acquiring literacy skills for the print disabled or the visually impaired. Many visually impaired relate their knowledge of braille to their competence, independence, and equality (Schroeder, 1998; as cited in Khochen, 2011). For the visually impaired, books in braille are the most commonly used in special education and schools, as they are crucial in supporting literacy for the print disabled in many developing economies. Although the availability of content for the print disabled user in many countries is premised on equal access as the non–print-disabled user, what is available worldwide is grossly inadequate (Brunson, 2005), and challenges with braille literacy include the lack of access to content in braille and low competencies in its use (Brazier, 2003).

A study on the State of Special Schools in Ghana: Perceptions of Special Educators in Ashanti and Brong Ahafo Regions of Ghana," Opoku (2016) revealed that teaching and learning materials provided for these schools were not adequate due to high cost. Similarly, Sikanku (2018) stated that books in braille were not delivered on time, and the ones delivered were not

enough to meet the needs of students, thereby impacting negatively on their academic achievements .

Some of the difficulties faced by the vision impaired pupils includes vision impairment or blindness, physical dexterity problems, learning disability, brain injury or cognitive impairment, literacy difficulties, and early dementia (www.visionaustralia.org). In this article, we use "print disabled" to refer to those who are totally blind or partially blind and persons with low vision because they form the group of participants for our study. According to the National Federation of the Blind (2009), "Worldwide reports reveal that there are still challenges with braille literacy. In a developed country like the United States, almost 90 percent of blind children were not learning to use braille because they did not have access to it or have not been taught how to use it" (p. 1).

Research Question 3: To What Extent Does Screen Magnifiers Affects the Academic Achievement of Pupils with Visual Impairments in Inclusive Schools?

The results from this question indicated that there is a positive and higher significant effect of the use of screen magnifiers in the teaching learning process by both the teachers and pupils. Findings reveal that screen magnifier is significantly has an effect on the academic achievement on pupils with visual impairments on the total average of 3.41 showing a high level of the usage and effectiveness of Screen Magnifiers on the Academic Achievements of pupils with an average of 92.3%. Pupils who are visually impaired can find their way out when navigating the computer. The screen magnifier locates the visually impaired working space or surface area. These findings tie with what Titchkosky (2011) conducted a study on use of screen magnifiers in computers on Pupils' Academic Achievement. The fast-growing nature of technology, warrant schools to adapt and use technology constantly as a tool to enhance academic achievement in the teaching learning process, especially with persons with disabilities. Pupils with vision problems are couping with studies today thanks to assistive technological device and devices. This study mirrors the influence of screen magnifiers in computers and smartphones factors on pupils' academic achievement of visual impaired learners. We propose a model on the influence of computers attitudes using screen magnifiers, computer learning environments, computer learning motivations, computer confidence, computer use, computer self-efficacy, loneliness, mothers' education, parents' marital status and family size on academic achievement. To validate the conceptual model, 286 pupils aged 8 to 14 years old answered an online questionnaire. The most important drivers that positively affect academic achievement are computer use, employment motivations, and mothers' education. While enjoyment attitudes, school environment, interest motivations, and loneliness influence academic achievements negatively. Also, family size and computer self-efficacy work as moderators, and computer use works as a mediator between computer learning environments using screen magnifiers and academic achievement.

Taylor (2006) conducted a study Access to screen magnifiers in computer and academic achievement. Where is it best: at home or at school? The aim of this document is to test whether there is any difference in the effect of having access to a computer using screen magnifiers at home or at school. In contrast to previous literature, we study the access and quality of computer uses in different percentiles of the score's distribution by means of Quantile regression. Our findings indicate that having computer at school with screen magnifier improves the scores more than having computer at home, and the access to computer at school has a higher effect on the performance in sciences. Additionally, it seems to be a digital divide in education, because pupils from nonpublic and public schools tend to be overrepresented in

the lower percentiles of the score's distribution, but at the same time, those who are in the lower quartiles tends to have a worse use of computers.

CONCLUSION AND RECOMMENDATIONS

Conclusions

Assistive technology can be a useful and supportive tool for students with disabilities. It helps both teachers and students create an unforgettable learning experience. Base on the findings in research question one there is a significant relationship between mobile phone and academic achievements. The use of this assistive technology enhances pupil's achievement, pupil's participant correctly in the teaching learning process. The researcher strongly believes that every individual can learn and improve themselves academically, yet individuals must have access to the learning environment in order to achieve these goals.

Recommendations

Based on the findings of this research, the following recommendations were made to; Pupils, teachers, Parent educational stake holders, and Government.

Pupils with visual impairments should be encouraged to continue to integrate themselves with any new technology that will help them forge their education to the next level. They should embraced change and always hope for a better tomorrow as evolution will bring better assistive technologies that will help them. Pupil should use their mobiles phones more for academic achievements and not for leisure.

Parents should play a vital role in supporting their children at home by providing them with basic assistive devices like mobile phones such as smart phones and tablets so that they children can rehearse or do assignments like their peers. They should be attentive to changes in behavior and needs of their children and provide a safe and supportive environment whenever they express their feelings, needs and interest. Teachers should be able to upgrade themselves with all kinds of assistive technological devices in order to effect changes in the academic lives of all categories learners and provide appropriate support and referrals to the needs and interest to all children in the inclusive school. They can also create a supportive classroom environment that promotes positive behavioral support.

Pupils are encouraged to make good use with the audiobooks, so that it will help them to build their capacity in public speaking in future. They should use it for their academic achievements not for leisure. The pupils should raise awareness among themselves about the complexity and economic value of audiobooks, so as to encourage one another to use it judiciously. Teachers should enhance training and capacity building for the use of audiobooks in an inclusive classroom so as not to call attention for fun instate of learning. Teachers should always give orientations to the pupils before the use of audiobooks in the teaching learning process. This is to guide against children with hyperactivity disorders.

Educational **S**takeholders should ensure that there is the appropriate provision and availability of all assistive technology devices in all-inclusive schools' base on the Universal Design of Learning.

REFERENCES

Adedoyin, O., & Soykan, E. (2023). Challenges and opportunities of online learning resources for the development of learning competencies among students. *Educational Technology & Society, 26*(2), 189-205.

Al Lily, A. E., Ismail, A. F., Abunasser, F. M., Alqahtani, R., & Watfa, M. (2020). Distance education as a response to pandemics: Coronavirus and Arab culture. *Technology in Society*, 63, 101317.

Alkahtani, K. (2013). Teachers' Knowledge and Use of Assistive Technology for Students with Special Educational Needs. Journal of Studies in Education, vol. 3 (2), pp. 65-86.

Almekhalfi, A. & Tibi, S. (2012). The use of Assistive Technology for people with special needs in the UAE. Journal of International Special Needs Education, vol. 15 (1), pp. 56-71.

AlnahdI, G. (2014). Assistive Technology in Special Education and the Universal Design for Learning. TOJET the Turkish online journal of educational technology, vol. 13 (2), pp.18-23.

Al-Samarraie, H., Lundqvist, K. O., & Alzahrani, A. I. (2019). The effect of mobile learning on students' learning behaviours and outcomes: A meta-analysis. *Computers & Education*, 128, 37–53.

Anderson, T., & Dron, J. (2011). Three generations of distance education pedagogy. *International Review of Research in Open and Distance Learning*, 12(3), 80–97.

Artino, A. R. (2012). Academic self-efficacy: From educational theory to instructional practice. *Perspectives on Medical Education*, 1(2), 76–85.

Assistive Technology Industry Association. (2015). What is AT? [online]. [Accessed 15 August 2020]. Available at: https://www.atia.org/home/atresources/what-is-at/

Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking University. *Human Behavior and Emerging Technologies*, 2(2), 113–115.

Best, J. W. & Kahn, J. V. (2006) Research in education. 10th edn. Boston: Pearson/Allyn and Bacon.

Bonk, C. J., & Graham, C. R. (2012). The handbook of blended learning: Global perspectives, local designs. John Wiley & Sons.

Boyle, J. R. & Joyce, R. L. (2019). Using Smartpens to Support Note-Taking Skills of Students with Learning Disabilities. Intervention in School and Clinic, vol. 55 (2), pp. 86–93.

Carstens, A.-M. C. (1996). Differentiation in student responses to literature based on auditory versus visual exposure. ERIC Document Reproduction Service No. ED415524.

Cauley, F., Aiken, K., & Whitney, L. (2009). Technologies across our curriculum: A study of technology integration

Clark, R. C., & Mayer, R. E. (2016). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (4th ed.). Wiley

Cohen, L., Manion, L. & Morrison, K. (2018). Research methods in education. 8th edn. London; New York: Routledge.pg. 70

Coleman, M. (2011). Successful Implementation of Assistive Technology to Promote Access to Curriculum and Instruction for Students with Physical Disabilities. Physical Disabilities: Education and Related Services, vol. 30 (2), pp. 2-22.

Combs, D. (2014). New research on assistive technologies: uses and limitations. New York: Nova Publishers.

Conard-Salvo, T. & Spartz, J.M. (2012). Listening to Revise: What a Studyabout Text-to-Speech Software Taught Us about Students' Expectations forTechnology Use in the Writing Center. The Writing center journal, vol. 32 (2),pp. 40-59.

Cook A, & Hussey SM. (2002). Assistive technologies: principles and practice. 2nd edn. St. Louis: Mosby.

De Witte, L., Steel, E., Gupta, S., Ramos, V. & Roentgen, U. (2018). Assistive technology provision: towards an international framework for assuring availability and accessibility of affordable high-quality assistive technology. Disability and Rehabilitation: Assistive Technology, vol. 13 (5), pp. 467-472.

Elewekere, J. (2007). Strategies for enhancing inclusive education. School of teacher education and leadership, department of special education, Radford University. Retrieved from the punch newspaper on May 11th 2007 from http//www.google.com/ng/govt.x?alNG/iu

Fajry, K., Komariah, E., & Silvianti, T. M. (2016). Audio book: Teaching listening comprehension. Research in English and Education (READ), 1(1), 62–70.

Feyerer, E., Miesenberger, K. & Wohlhart, D. (2002). ICT and AssistiveTechnology in Teachers Education and Training. Lecture Notes in Computer Science, pp. 107-114.

Fichten, Asuncion, and Scapin. (2014) Successful Implementation of Assistive Technology to Promote Access to Curriculum and Instruction for Students with Physical Disabilities. Physical Disabilities: Education and Related Services, vol. 30 (2), pp. 2-22.

Fischer, S., Barnes, R.K. & Kilpatrick, S. (2017). Equipping parents to support their children's higher education aspirations: a design and evaluation tool. Educational review (Birmingham), vol. 71 (2), pp. 198-217.

Flick, U. (2018). An introduction to qualitative research. 6th edn. Los Angeles:SAGE.

Floyd, K.K. & Judge, S.L. (2012). The Efficacy of Assistive Technology on Reading Comprehension for Postsecondary Students with Learning Disabilities. Assistive Technology Outcomes & Benefits, vol. 8 (1), pp. 48-64.

Hopkins, J. (2006). Assistive technology: Ten things to know. Library Media Connection,25(1), 12-14. https://www.edutopia.org/assistive technology for young children.

IDEA (2004). Special education. Contemporary perspectives for school professionals PearsonEducation, Inc. USA

Judge, S. (2000). Accessing and funding assistive technology for young children with disabilities. Early Childhood Education Journal, 28(2), 125-131.

Kuyini, A. B. (2010, April 4). Inclusive education in Ghana: Are we achieving the vision? GhanaWeb.https://www.ghanaweb.com/GhanaHomePage/features/Inclusive-Edcuation-In-Ghana-Are-We-Achieving-The-Vision-179726https://www.ghanaweb.com/GhanaHomePage/features/Inclusive-Edcuation-In-Ghana-Are-We-Achieving-The-Vision-179726

Laary, D. (2016, March 9). Ghana: Mobile phone penetration soars to 128%. The Africa Report. https://www.theafricareport.com/1800/ghana-mobile-phone-penetration-soars-to-128/https://www.theafricareport.com/1800/ghana-mobile-phone-penetration-soars-to-128/

Lauren, E.& Brdar, K. (2019). Assistive technology. The benefits of video medicated instruction.

McCarthy, M. M (2000). Inclusion of children with disabilities: seeking the appropriate balance. Guildford: McGraw-Hill.

McDonald, R., Pettersson, C. & Scherer, M. (2018). Assistive technology and people: a position paper from the first global research, innovation and education on assistive technology (GREAT) summit. Disability and Rehabilitation: Assistive Technology, vol. 13 (5), pp. 437-444.

Merbler, J., Hadadian, A., & Ulman, J. (1999). Using assistive technology in the inclusive classroom. Preventing School Failure, 43(3), 113-120.

Nugaret, A. A., Scruggs, T.E. & Mastropieri, M.A. (2005). Does teacher education produce better special education teachers? Exceptional Children Journal. 71 (3). 217- 229.

Sikanku, S. T. (2018). Challenges in teaching pupils with visual impairments in inclusive classrooms: The experience of Ghanaian teachers. Research on Humanities and Social Sciences, 8(11). www.iiste.orgwww.iiste.org

Türker, S. (2010). The effectiveness of audiobooks on the reading comprehension of selected texts by the university EFL students at different proficiency levels [Unpublished master's thesis]. Bilkent University, Ankara, Turkey.

Watson, S., & Johnston, L. (2007). Assistive technology in the inclusive science classroom.

Wolfson, G. (2008). Using audiobooks to meet the needs of adolescent readers. American Secondary Education, 36(2), 105–117.