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Assistive Technology for Teaching Visually Impaired Agricultural Science Students in Secondary Schools

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ABSTRACT

The paper aimed at exploring the assistive technology for teaching visually impaired agricultural science student. Assistive technology is a technology used by individuals with visual impairment in order to perform functions that might otherwise be difficult or impossible. Assistive technologies like the use of braille device, electronic magnifiers, screen reader and white canes has been made to assist person with visual impairment. Agricultural science is a broad multidisciplinary field of biology that encompasses the parts of exact, natural, economic and social sciences that are used in the practice and understanding of agriculture. Visual deficiency (VD), also referred to as vision impairment or loss of vision, is a diminished capacity to see to a degree that creates complications that are not normally fixable, such as glasses. It is believed that when an individual is visually impaired his learning, social interaction, locomotion, general operation and adjustment are bound to be adversely affected. According to the CDC and the World Health Organization (2022) the classification of visual acuity and impairment includes: Low visual acuity means vision between 20/70 and 20/400 with the best possible correction, or a visual field of 20 degrees or less; The roles of teachers in teacher visual impaired students are evident in assessment and evaluation; Educational and instructional strategies and learning environment. It was recommended that increased funding of the teaching and learning among visual impaired and curriculum content of agricultural education should be enriched to meet the demand of visual impaired student.

Keywords: Assistive technology, teaching, visually impaired, agricultural science, secondary schools.

INTRODUCTION

Agricultural science is a broad multidisciplinary field of biology that encompasses the parts of exact, natural, economic and social sciences that are used in the practice and understanding of agriculture.

It is one of the core vocational curricular subjects taught at senior secondary schools in Nigeria. Agricultural science is taught in secondary schools in Nigeria to encourage independence and to get students ready for tertiary education. Agricultural science is therefore designed for inculcation of the necessary skills for the practice of agriculture for effective citizenship and contribution to food security for national sustainability (Adeosun, Abu and Ahmed, 2020).

More so, agricultural science is taught in secondary schools to stimulate students interest in agriculture; enable students acquire basic knowledge of agriculture; develop basic agricultural skills in students; enable students integrate knowledge with skills in agriculture; expose students to opportunities in the field of agriculture; prepare students for further studies in agriculture and to prepare students for occupations in agriculture (Modebelu and Nwakpadolu, 2018).

Attainment of the above objectives depends on students and teachers' factors. Students come to the school with diverse sets of experiences, challenges, strengths, abilities, disabilities and backgrounds; and these experiences and challenges affect them in one way or the other. Also, teachers are faced with challenges on how to incorporate the different learners' capabilities for inclusive learning. Federal Republic of Nigeria (2019) states that learners in an inclusive education are those with different intellectual and physical difficulties such as not being able to walk, manipulate objects, use one or both arms and legs, run or maintain balance. Inclusive education as opined by Nwahunanya, Abiamuwe, Attah and Asogwa (2020) means more educational funds, improved educational facilities, and different teaching approaches to address challenges of visually impaired students.

Visual deficiency (VD), also referred to as vision impairment or loss of vision, is a diminished capacity to see to a degree that creates complications that are not normally fixable, such as glasses (Ogochukwuka,Obaghwarhievwo and Osagie, 2021). It also includes those who have a diminished ability to see because they have no access to contact lenses or glasses (De Carlo Woo and Woo, 2016). Visual impairment is sometimes defined as the best visual acuity correction that is worse than either 20/40 or 20/60 (WHO, 2017). For total or almost full vision loss, the word blindness is used. In normal daily activities such as reading and walking without adaptive training and equipment, visual impairment can cause difficulties (Oduntan, 2016). However, some of the components that can aid effective teaching and learning of agricultural science among visually impaired students are; teachers, teaching pedagogy, students, the school, supportive special education services and instructional aid like assistive technology (Federal Ministry of Education, 2015).

According to the Assistive Technology Industry Association (2020), the term "assistive technology" broadly refers to hardware, software, and systems that are intended to increase, maintain, or improve the functional capabilities of people with disabilities. While the term is frequently associated with specially created software and hardware, there are many low-tech alternatives, from room design to pencil grips that improve information or educational experiences for specific users. However, teacher's ignorance of the challenges faced by students with disabilities in the classroom at all levels worsens their issues and keeps us from realizing the value of technology in addressing these issues. There is clearly a need for improvement in the design and implementation of information technologies, as Dawe (2016) reported that about 35% of

purchased assistive technology ends up being abandoned and not used. Additionally, according to recent Pew research data, people with disabilities avoid the internet at a rate three times higher than non-disabled users (Pew, 2017). Therefore, recognizing education as a sociotechnical system within which user-centered design principles can be applied to assistive technologies may help us address the shortcomings of many current approaches.

Assistive Technology

Assistive technology has been defined by numerous scholars in different ways and all the definitions are pointing to the same thing. For example, Aderonke, Amos, Tawakalit and Adenike (2020) defined assistive technology as technology used by individuals with visual impairment in order to perform functions that might otherwise be difficult or impossible. Scherer and Stefano (2017) defined assistive technology as technologies used by schools, parents and educators to assist students with special needs by providing a compensatory value, to remediate learning problems and to promote personal independence among students with visual impairment. Adedayo and Olawale (2013) defined assistive technology as any device utilized for improving the level of sound available to a listener.

Fernández-Batanero, Montenegro-Rueda, Fernández-Cerero and García-Martínez (2022) defined assistive technology as a generic term that designates all systems and services related to the use of assistive products and the performance of services. Assistive Technology Act (2018), in the U.S defined assistive technology as "any item, piece of equipment or system, whether acquired commercially, modified, or customized, that is commonly used to increase, maintain, or improve the functional capabilities of people with visual impairment. Assistive technology has two main purposes: on one hand, to increase a person's capabilities so that his or her abilities balance out the effects of any disability and secondly, to provide an alternative way of approaching a task so that disabilities are compensated.

Assistive technology has been proposed as an alternative for the interaction between students with disabilities and new digital devices. It refers to the technologies (devices or services) used to compensate for functional limitations, to facilitate independent living, to enable older people and people with activity limitations to realize their full potential. Some technologies, even if not purposely designed for people with activity limitations, can be configured in such a way as to provide assistance or assistive functions when needed (Emiliani, Stephanidis and Vanderheiden, 2021).

More so, assistive technology refers to products with the primary purpose to sustain individuals' functioning and independence to promote their academic, social and physical wellbeing (McNicholl, Casey, Desmond and Gallagher, 2019). In this study assistive technology are products with the primary purpose of assisting visually impaired person to promote their academic learning in agricultural science classes

Meaning of Agricultural Science

Agricultural science is one of the core vocational curricular subjects taught at senior secondary schools in Nigeria. Egbule (2019) defines agricultural science as a process of training learners in the process of agricultural productivity as well as the techniques for teaching of agriculture. Wikipedia (2019) describes Agricultural science education as a broad multidisciplinary field that deals with the selection, breading and management of crops and domestic animals for economic production. It is a subject taught in secondary

schools as a means for self-reliance and preparation for further studies.

Agricultural science is therefore designed for inculcation of the necessary skills for the practice of agriculture for effective citizenship and contribution to food security for national sustainability. That is why the Federal Republic of Nigeria (FRN) (2017) outlines the seven major objectives of teaching and learning of agricultural science to reflect the;

- Ability to stimulate students interest in agriculture
- Ability to enable students acquires basic knowledge of agriculture.
- Ability to develop basic agricultural skills in students.
- Ability to enable students integrate knowledge with skills in agriculture
- Ability to expose students to opportunities in the field of agriculture
- Ability to prepare students for further studies in agriculture and
- Ability to prepare students for occupations in Agriculture.

Attainment of the above objectives depends on teachers' factors and pedagogical approaches. Teachers in this case are agricultural science teachers. Agricultural science teachers are trained and groomed from teacher preparation institutions for quality impact of agricultural skills, knowledge attitudes and values for self-reliance, promotion of agriculture and food security in their future lives. It is therefore the duty of this group of teachers to; stimulate and sustain student's interest in agriculture, enable students acquire basic knowledge and practical skills in agriculture, enable students integrate knowledge with skills in Agriculture, prepare and expose students for occupation (Ogochukwuka, Obaghwarhievwo and Osagie, 2021).Special need student like visually impaired are also taught together in an inclusive system,

Meaning of Visual Impaired

Visual deficiency (VD), also referred to as vision impairment or loss of vision, is a diminished capacity to see to a degree that creates complications that are not normally fixable, such as glasses. It also includes those who have a diminished ability to see because they have no access to contact lenses or glasses (De Carlo Woo and Woo, 2016). Visual impairment is sometimes defined as the best visual acuity correction that is worse than either 20/40 or 20/60 (WHO, 2017). For total or almost full vision loss, the word blindness is used. In normal daily activities such as reading and walking without adaptive training and equipment, visual impairment can cause difficulties (Oduntan, 2016).

Visual impairment (VI) is a significant public health issue around the world because it has a detrimental impact on student's psychosocial and economic well-being, as well as the well-being of their family, community and the country as a whole (Ezinne, Shittu, Ekemiri, Kwarteng, Tagoh, Ogbonna and Mashige, 2022). Among the school students, this leads to lifelong consequences, including a lower level of educational achievement (World Health Organization, 2022). Addo, Akuffo, Sewpaul, Dukhi, Agyei-Manu, Asare, Kumah, Awuni, and Reddy (2021), showed that about 36 million individuals are blind, 217 million have a moderate-to-severe visual impairment and 253 million are visually impaired. World Health Organization (WHO) (2020) reported that the population size of the visually impaired has increased to 2.2 billion, and 1 billion cases of VI could have been prevented (Steinmetz, Bourne, Briant,

Flaxman, Taylor, Jonas, Abdoli, Abrha, Abualhasan and Abu-Gharbieh, 2020). Visually impaired people make up a larger population in developing nations and are 50 years and above (Thapa, Bajimaya, Paudyal, Khanal, Tan, Thapa and Van Rens, 2018).

According to estimates, low- and middle-income nations have a four times higher prevalence of distance VI than high-income countries (WHO, 2022). Approximately 4.25 million adults aged≥40 were visually impaired in Nigeria. The prevalence of blindness and VI in Nigeria were reported to be 6.1% and 4.2%, respectively, which was significantly higher than reported globally (Steinmetzet al., 2020). Akano (2017) indicated that the prevalence of blindness and VI is highest in the north–east (8.2% and 6.9%) and lowest in the south–west (2.8% and 3.3%) of Nigeria. Agricultural teachers effectively accommodate the visually impaired in their classes by understanding their characteristics for their effective teaching.

Characteristics of Visual Impaired

Visually impaired refers as range of vision loss that effects an individuals ability to see or interpret visual information. The characteristics of visual impairment can vary depending on the severity and type of visual condition, here are some of the characteristics associated with visual impairment are

- Blurred vision; object may appear unclear or out of focus, making it challenging to recognize details.

- Low vision acuity; difficulty seeing objects from a distance or reading small print even with corrective lenses

- Night blindness; difficulty seeing in low light condition or at night

- Sensitive to light; some individual may experience discomfort or pain in bright light known as photophobia

- Nystagmus; Involuntary eye movement that effect visual focus.

- Eye strain; feeling discomfort or strain in the eyes, especially after focusing on close –up task and

- Loss of depth perception; Trouble judging distance between object accurately

It is also important to note that visual impairment is a broad term encompassing various conditions like hyperopia, myopia, astigmatism cataracts, glaucoma and retinal disorder.

Classification of Visual Impaired

The World Health Organization (WHO) International Classification of Impairment, Disabilities, and Handicaps (ICIDH) system is used to classify the types of visual impairment (Ananya, 2023). According to the Center for Disease Control (CDC) and the World Health Organization the classification of visual acuity and impairment includes:

- Low visual acuity means vision between 20/70 and 20/400 with the best possible correction, or a visual field of 20 degrees or less.

- Blindness is defined as a visual acuity worse than 20/400 with the best possible correction, or a visual field of 10 degrees or less.

- Legal blindness in the US means visual acuity of 20/200 or worse with the best possible correction, or a visual field of 20 degrees or less.

- Visual acuity of 20/70 to 20/400 (inclusive) is considered moderate visual impairment or low vision.

Communication Approach for Teaching Visual Impaired Students in Agricultural Science

Visual impairment among students makes learning challenging and affects academic performance (Otyolaet al., 2017). Students learn from their teachers mostly by listening to teaching and reading lecture notes or relevant materials—students with good vision benefit from listening to lectures and reading. In contrast, students with visual impairment mostly find reading very difficult because of their poor sight (Fox, 2022). Students who are visually impaired and students who have good vision do not read at the same pace. In the Nigerian case, visually impaired individuals rely on their ability to listen to speech to gain information quickly and effectively to aid learning.. This is because the visually impaired cannot see, while some others have low vision to comprehend any written text. To this end, there is a need for a system to be put in place to give a synthesized speech representation of text for a compelling study, thereby engendering active learning (Hew and Brush, 2017).

Furthermore, a system can be developed to enhance the learning of visual impaired student from a technological perspective by leveraging on available Information and Communication Technology (ICT) tools (Eligi and Mwantimwa, 2017). By this, we envisage a system that can turn text to speech so that the visually impaired can access all relevant teaching materials through speech. As observed in Wongkia, Naruedomkul and Cercone (2016), the text-to-speech engine is widely used by blind and VI students to support reading the electronic text through computers using a channel for hearing. The interaction when using a text-to-speech system is facilitated by listening to audio recordings of speech and narration (Balan, Moldoveanu, Moldoveanu and Dascalu, 2014). Thus, it becomes crucial to have a system that will give the correct prosody and pronunciation analysis from the written text and process the sound signal dynamically during the speech conversion.

More so, screen readers are used to help the visually impaired to easily access electronic information by teachers. These software programs run on a computer in order to convey the displayed information through voice (text-to-speech) or (refreshable braille displays) in combination with magnification for low vision users in some cases. There are a variety of platforms and applications available for a variety of costs with differing feature sets. Some example of screen readers are Apple (Voice Over), Google (Talk Back) and Microsoft Narrator. This software is provided free of charge on all Apple devices. Apple Voice Over includes the option to magnify the screen, control the keyboard, and provide verbal descriptions to describe what is happening on the screen. There are thirty languages to select from. It also has the capacity to read aloud file content, as well as web pages, E-mail messages, and word processing files.

As mentioned above, screen readers may rely on the assistance of text-to-speech tools. To use the text-to-speech tools, the documents must be in an electronic form, which is uploaded as the digital format. However, people usually will use the hard copy documents scanned into the computer, which cannot be recognized by the text-to-speech software. To solve this issue, people always use Optical character recognition/Optical Character Recognition technology accompanied with text-to-speech software. Furthermore, agricultural science teachers

have roles to perform in helping visual impaired to learn.

Roles of Teachers in Helping Visual Impaired Students of Agricultural Science

Students with visual impairments receive special education and related services in a variety of settings that bring them into contact with a range of personnel. A critical member of this team of professionals is the teacher of students with visual impairments, whose specialized training and experience establish him or her as the individual best qualified to address the unique learning needs created by a visual impairment. Because of recent legislation mandating highly qualified general and special education teachers, however, there is often confusion about the role, functions, and responsibilities of the teacher of students with visual impairments.

The teacher of students with visual impairments (TSVI) is a special educator trained and certified to provide direct instruction, accommodations, and modifications that provide access to the general curriculum for children who are blind or visually impaired. TSVIs are employed in the full continuum of placement options, serving as part of the team providing free appropriate public education to infants, children, and youth with visual impairments in local education agencies, regional collaborative, and specialized schools. Their role ranges from teacher-consultant, to specialized skills instructor, to classroom teacher. TSVIs work with a wide range of students with disabilities (Correa-Torres and Howell, 2018). The teacher of visual impaired student of agricultural education should also help in developing visual efficiency in handwriting to partially sighted student, the teacher should also teach the student the technique of daily living and also be involve in counseling student (Oketoobo and Onipede, 2014)

They teach the alternative skills that facilitate access to general education, and they teach the expanded core curriculum that supports students in and allows them to benefit from the general curriculum In some cases, the TSVI is the primary educator working with the infant, child, or youth with a visual impairment, while at other times the TSVI acts as a consultant to those providing instruction. The roles and responsibilities of the TSVI are unique and varied and require a broad base of professional knowledge and the ability to respond with flexibility to changing conditions (Correa-Torres and Howell, 2018).

The role of the TSVI varies from child to child and school to school, depending on individual student needs, general educator requests, school resources and curriculum content (Wolffe, Sacks, Corn, Erin, Huebner and Lewis, 2022). Responsibilities and time commitments are variable and sometimes unpredictable, because they are adjusted according to student and team needs at any given point in time. Each addition to the caseload increases time commitments exponentially.

The TSVI participates in the provision of FAPE by taking responsibility for the functions outlined below:

Assessment and Evaluation

Visual impairment occurs so infrequently in the school-age population that few school psychologists are able to obtain adequate experience in evaluating students with this disability. TSVIs are trained not only to conduct formal and informal assessments, but to assist other educational professionals in understanding and interpreting testing results. TSVIs therefore:

- Conduct and interpret functional vision assessments.

- Obtain and interpret all ophthalmological, optometric, and functional vision reports and explain the implications of these reports for both distance and near vision in education and home environments, to families, classroom teachers, and other team members.

- Modify existing assessment measures and procedures and develop new informal instruments as needed to assess and evaluate disability-specific skills (National Board of Professional Teaching Standards (NBPTS), 2021).

- Conduct and interpret communication skills and learning media assessments in reading, writing, and listening, as well as assessments that identify the most appropriate technology configurations for individual students.

- Recommend and collaborate in appropriate specialized evaluations as needed, including clinical low vision, orientation and mobility, physical therapy, occupational therapy, behavioral, physical education, speech and language, augmentative communication, aptitude, and vocational skills assessments.

Educational and Instructional Strategies: Learning Environment

While the No Child Left Behind Act of 2001 mandates that regular education teachers provide instruction to all students, including those with special learning needs, the TSVI acts as the primary mediator of the learning environment for children with visual impairments. The TSVI implements various strategies to facilitate students' assimilation into the classroom, school, community and work environment (NBPTS, 2021). In order to accomplish this, the TSVI takes steps to:

- Assure that the student has all educational materials in the appropriate format, including textbooks, workbooks, handouts, periodicals, multimedia materials, and teacher-prepared supplements.

- Assure that the student is trained in the use of, and has available, all optical, non-optical, and electronic technology devices necessary for learning.

- Instruct the student in developmental skills, academic strategies, and other activities that require modification, adaptation, or reinforcement as a direct result of the visual impairment.

- Recommend seating and other environmental modifications that maximize students' utilization of visual information and facilitate movement of the student with visual impairments within the class.

- Assure that the educator providing direct instruction fully understands the unique learning needs of infants, children, and youth with visual impairments.

- Suggest accommodations needed for assignments or testing procedures.

Assistive Technology for Teaching Visually Impaired Student of Agricultural Education

Visually impairment is an eye problem in which one losses part or all the ability to see, it is a reduced visual performance that cannot be cured by refractive correction, Some assistive devices were designed to help person with visual impairment.

Braille Device: braille device is a tactile code used by person with visually impairment to read and write in any language, it also help them to read and produce content

Electronic Magnifier: It captures image with camera, enlarge them on a screen and enhance the visual ability, it may include features such as optical characters

Screen reader: Screen reader is soft wares that convert the text on a screen into Brielle or synthetic speech.

White Canes: it helps person with visual issue to travel independently. It can be classified into three viz; long canes, Identification cane and Support canes (WHO, 2017)

Conclusion

Assistive technology is a technology used by individuals with visual impairment in order to perform functions that might otherwise be difficult or impossible Assistive technologies like the use of braille device, electronic magnifiers, screen reader and white canes has been made to assist person with visual impairment. Agricultural science is a broad multidisciplinary field of biology that encompasses the parts of exact, natural, economic and social sciences that are used in the practice and understanding of agriculture.. Visual deficiency (VI), also referred to as vision impairment or loss of vision, is a diminished capacity to see to a degree that creates complications that are not normally fixable, such as glasses. It is believed that when an individual is visually impaired his learning, social interaction, locomotion, general operation and adjustment are bound to be adversely affected. According to the Curriculum development Centre (CDC) and the World Health Organization(2017) the classification of visual acuity and impairment includes: Low visual acuity means vision between 20/70 and 20/400 with the best possible correction, or a visual field of 20 degrees or less; Blindness is defined as a visual acuity worse than 20/400 with the best possible correction, or a visual field of 10 degrees or less; Legal blindness in the US means visual acuity of 20/200 or worse with the best possible correction, or a visual field of 20 degrees or less and visual acuity of 20/70 to 20/400 (inclusive) is considered moderate visual impairment or low vision. The roles of teachers in teacher visual impaired students are evident in assessment and evaluation; Educational and instructional strategies and learning environment.

Recommendations

Base on the conclusion the following recommendations were made.

1. Increased funding of the teaching and learning of agricultural among visual impaired students should be promoted by government and non-governmental organizations since it is vocational in nature and thus requires special kind of funding.

2. Curriculum content of agricultural science should be enriched to meet the demands of visual impaired students.

3. The educational institutions for the visual impaired students should be made available with knowledge resources such as qualified instructors, a modern and adequate information technology, infrastructure, maintenance and refurbishment of physical facilities, the provision of special educational facilities and devices such as optical aids, braille, typewriters etc; the availability of mobility equipment such as guides dogs, path sounders and laser canes.

References

Addo, E. K, Akuffo, K. O, Sewpaul, R, Dukhi, N, Agyei-Manu, E, Asare, A. K, Kumah, D. B, Awuni, M and Reddy, P. (2021). Prevalence and associated factors of vision loss in the South African National Health and Nutrition Examination Survey

(SANHANES-1). BMC Ophthalmol, 21(1), 1-12.

Adedayo O. O and Olawale, O. (2013). Assistive technology for hearing and speech disorders. Journal of Biology, Agriculture and Healthcare, 17(3), 116-121.

Adeosun, T. A, Abu, M. O and Ahmed, M. A. (2020). Vocational agricultural education and industrial development in Nigeria: The Problems and Way Forward. African Scholar Publications & Research International, 19(1), 59-68.

Aderonke, K. S, Amos, O. O, Tawakalit, B. A andAdenike, J. A. (2020). Hearing impaired students' self-efficacy on the utilization of assistive technology in Federal College of Education (Special) Oyo. International Journal for Cross-Disciplinary Subjects in Education (IJCDSE), 11(1), 4245-4252.

Ananya, M. A. (2023). Types of visual impairment. Capital Journal of Education Studies, 4(1), 30-40.

Anomonye, F. O. (2017). Integration of the visually handicapped children into Nigeria Regular Schools." A Handbook on Elements of Specials Education. Lagos: NERC.

Assistive Technology Industry Association. (2020). What is AT? Disability & Society, 25(3), 345- 358.

Balan, O., Moldoveanu, A., Moldoveanu, F and Dascalu, M. I. (2014). Audio games—a novel approach towards effective learning in the case of visually-impaired people. In Proceedings of seventh international conference of education, research and innovation, Seville.

Burley, D.A. (2014). Surveys in social research; Unwin Ltd.: London, UK.

Correa-Torres, S. M and Howell, J. J. (2018). Facing the challenges of itinerant teaching: Perspectives and suggestions from the field. Journal of Visual Impairment & Blindness, 97(5), 420-433.

Dawe, M. (2016). Desperately seeking simplicity: How young adults with cognitive disabilities and their families adopt assistive technologies. In R. Grinter, T. Rodden, P. Aoki, E. Cutrell, R. Jeffries, & G. Olson (Eds.), Proceedings of the SIGCHI Conference on Human Factors in Computing Systems-CHI '06, 1143-1152.

De Carlo, D. K, Woo, S and Woo, G. C. (2016).Patients with low vision. Journal of Resourcefulness and Distinction, 7(1), 1-9.

Egbule, P. E. (2019). Fundamentals and practice of agricultural education. Owerri: Totan Publishers Ltd.

Eligi, I. A and Mwantimwa, K. O. (2017). ICT accessibility and usability to support learning of visually-impaired students in Tanzania. International Journal of Education and Development using ICT, 13(2), 87-102.

Emiliani, P. L., Stephanidis, C and Vanderheiden, G. (2011). Technology and inclusion past, present and foreseeable future. Technology and Disability,18(23), 101–114.

Ezinne, N. E,Ojukwu, C. S,Ekemiri, K. K,Akano, O. F, Ekure, E and Osuagwu, U.L. (2021). Prevalence and clinical profile of glaucoma patients in rural Nigeria—A hospital based study. PLoS ONE 16(7), 1-9.

Federal Republic of Nigeria FRN (2017). Blueprint on Family Support Programme. Lagos: NERDC.

Fernández-Batanero, J. M,Montenegro-Rueda, M. A, · Fernández-Cerero, J. A and García-Martínez, I. O. (2022). Assistive technology for the inclusion of students with

disabilities: a systematic review. Educational technology research and development, 10(2), 19-31.

Groom, M. A. (2018). Disability and diversity: A Sociological Perspective; Nova Science Publishers: New York, NY, USA, 2009.

Hew, K. F and Brush, T. (2017). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. Educational technology research and development, 55(3), 223-252.

IDEA (2014). Current Issues in Agricultural Education in Tertiary Institutions in Nigeria. International Journal of Agriculture and Earth Science, 3(1), 13-18.

Modebelu, M. N and Nwakpadolu, G. M. (2018). Effective Teaching and Learning of Agricultural Science for Food Security and National Sustainability. Journal of Educational and Social Research, 3(4), 161-170.

National Board of Professional Teaching Standards (2021). Exceptional needs standards for teacher of students ages birth-21+ (3d printing). Arlington, VA: Author.

NcNicholl, A. A, Casey, H., Desmond, D and Gallagher, P. (2019).). The impact of assistive technology use for students with disabilities in higher education: a systematic review. Disability and rehabilitation: assistive Technology.Disability and Rehabilitation Assistive Technology, 16(2), 1–14.

Nwahunanya, I., Ede, E.O., Abiamuwe, N.O., Attah, K.O and Asogwa, U.U. (2020). Assistive technology for inclusive education among vocational education students with physical disabilities in Colleges of Education in South West Nigeria. International Journal of Innovative Science and Research Technology, 5(6), 522-526.

Oduntan, A. O. (2016). Prevalence and causes of low vision and blindness worldwide. S AfrOptom. 2016; 64(2): 44–54.

Ogochukwuka, N. P, Obaghwarhievwo, A. J and Osagie, O. M. (2021). Prevalence of visual impairment among patients attending the University of Port Harcourt Teaching Hospital, Rivers State, Nigeria.GSC Advanced Research and Reviews, 06(03), 097–106.

Oketoobo, E. A.and Onipede .O. (2014).Capacity building needs of Agricultural science teachers in utilization of school farms for skill acquisition among secondary schools. International journals of education and literacy studies P 46-47

Omede, A. A. (2015). The challenges of educating the visually impaired and quality assurance in tertiary institutions of learning in Nigeria.International Journal of Educational Administration and Policy Studies, 7(7), 129-133.

Otyola, W. R, Kibanja, G. M and Mugagga, A. M. (2017). Challenges faced by visually impaired students at Makerere and Kyambogo Universities. Makerere Journal of Higher Education, 9(1), 75-86.

Pew, A. A. (2017) Disabled Americans are less likely to use technology. HTS Teologiese Studies/Theological Studies, 74(1), 42-50.

Scherer, M and Stefano, F. (2017). Assistive technology assessment handbook. CRC Press, Taylor and Francis Group.

Shoulders, S. A andToland, W. N. (2017). Moral wrongs, disadvantages and disability: A Critique of Critical Disability Studies. Disabil. Soc., 29, 638–650.

Steinmetz, J. D, Bourne, R.R. A, Briant, P. S, Flaxman, S. R, Taylor, H. R, Jonas, J. B, Abdoli, A. A, Abrha, W. A, Abualhasan, A and Abu-Gharbieh, E.G (2020). Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: The Right to Sight: An analysis for the Global Burden of Disease Study. Lancet Glob. Health, 9(1), 4-14.

Talbert, A. A, Vaughn, C. T and Croom, M. A (2016). Exploration of the academic lives of students with disabilities at South African universities: Lecturers' perspectives. Afr. J. Disability. 6(1), 1–9.

Thapa, R, Bajimaya, S, Paudyal, G, Khanal, S, Tan, S, Thapa, S. S and Van Rens, G.H.M.B (2018). Prevalence and causes of low vision and blindness in an elderly population in Nepal: The Bhaktapur retina study. BMC Ophthalmol. 18(3), 25-42.

Witt, R. T, Ulmer, A. A, Burris, C. D, Brashears, S. E and Burley, D. A (2019). Access to Higher Education for Disabled Students in South Africa: A Contradictory Conjuncture of Benevolence, Rights and the Social Model of Disability. Disability. Soc. 22(7), 685–699.

Wolffe, K. E., Sacks, S. Z., Corn, A. L., Erin, J. N., Huebner, K. M and Lewis, S. (2022). Teachers of students with visual impairments: What are they teaching? Journal of Visual Impairment & Blindness, 95(4), 293-304.

Wongkia, W. A, Naruedomkul, K. E and Cercone, N. O. (2016). i-Math: Automatic math reader for Thai blind and visually impaired students. Computers & Mathematics with Applications, 64(6), 2128-2140.

World Health Organization (2017). Global initiative for the elimination of avoidable blindness –Action plan 2006–2011. Geneva, Pp. 18.

World Health Organization (WHO) (2022). Blindness and vision impairment. Available online: https://www.who.int/ news-room/fact-sheets/detail/blindness-and-visual-impairment.