EFFECTIVE STRATEGIES OF VIRTUAL TEACHING METHODOLOGIES AND THE CHALLENGES OF QUALITY SCIENCE AND TECHNOLOGY TEACHERS OF INTELLECTUALLY CHALLENGED IN AFRICA CONTINENT IN THE FAST-MOVING WORLD DURING THE COVID 19 LOCK DOWN CHALLENGES

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ABSTRACT

The pandemic crisis of COVID-19 brought big challenge which makes E-learning to become the mandatory component of all educational institutions like schools, colleges, and universities in and around the world. This challenging situation has flipped out the traditional teaching process and adopt virtual system of teaching and learning. The use of virtual teaching methodology during this COVID-19 pandemic provides an effective teaching method that brings out the best in students living with physical challenges. As several developed countries move into this virtual system of teaching methodology, the case is not so in Africa as several countries are still far behind. From the report of World Bank (2020) on Pivoting to Leveraging Lessons from the COVID-19 Crisis for Learners with Disabilities, it was observed that several people living with disabilities have tendency to spread this Pandemic and they have little or no access to the technology that drives this modern system of learning and several teachers most especially in African countries stick to the use of traditional method of teaching and learning. The report of World Health Organization (WHO) and World Bank (2011), physically challenged persons carry a significant proportion of the world's population, about 15%. As a result of differences in access to quality education to the normal individuals, they are rarely seen as contributor to productive human capital development of the

Society. Most of the Learning Challenged children have little or no access to education, this is as a result of several challenges they face in learning and comprehension. This paper focuses on the effective strategies of virtual teaching methodologies and the challenges of quality science and technology teachers of the intellectually challenged in Africa continent in the fast-moving world during the COVID 19 Lock down challenges. This will enhance the learning ability of this category of Students during this COVID-19 lock down and also motivate their desire to learn. This research work was carried in one of the government school for handicap children in Nigeria. From the learning ability testing of the research, it was discovered that the students learn faster and easier with the use of ICT base assistive technology than normal classroom learning. As a result of this, this paper focus on comparing level of efficiency of the ICT base virtual teaching methodology during this COVID-19 pandemic ing for these categories of Students.

Key words: *Teaching Methodology, Science and Technology, Teachers, Physical Challenges, Education, COVID-19, Pandemic Disease, Virtual Reality, Assistive Technology, ICT, Teaching, Learning.*

1. INTRODUCTION

Despite the ease of COVID-19 lock down in several countries in Africa including Nigeria and schools were opened for normal academic activities, there are still lots of COVID-19 protocols observed to control the spread of this Pandemic disease. There is still tendency for the spreading of this disease by the Intellectually Challenged that may find it difficult to observe the protocols put in place for the control of the spreading of this disease as a result of their level of IQ (Intelligent quotient) World Bank (2020). Learning Challenged persons are vulnerable in the society, they find it difficult to learn and comprehend fast (Radka and Petr, 2016); as a result of this challenges, the need for virtual assistive Teaching Methodology to enhance their learning ability during this Covid-19 Pandemic is imperative. This will help to control them from contacting and spreading this Pandemic disease. The use of ICT in education is nothing new, but the question is where the limit is when the use of ICT does not have the desired effect. Classroom delivery with the use of modern technology is still very low in Nigeria. This brought a draw back in quality

teaching and learning production. The use of ICT based Virtual Assistive Technology is a powerful technique for effective teaching of the Learning Challenged persons in different fields including Science and Technology. In the paper we discuss the effective strategies of virtual teaching methodologies and the challenges of quality science and technology teachers of the intellectually challenged in Africa continent in the fast-moving world during the COVID 19 Lock down challenges. The learner to learner relationships in a classroom with the use of ICT based modern technology is an essential element of sustainable educational development. The success of ICT Based Virtual Assistive Technology use in science and Technology depends on how they incorporated into curriculum and how teacher use it. The most appropriate use of ICT Based Virtual Assistive teaching Methodology most especially for the Intellectually Challenged during this COVID 19 Pandemic seems essential for those that use them for a supplementary tools for classroom and laboratory instruction. Highly interactive, collaborative ICT Based Virtual Assistive Teaching Methodology during this pandemic appeals growing interest because of their potentials to supplement constructivist learning. They offer inquiry environments and Learning tools to encourage learning and apply problem-solving skills. ICT Based Virtual Assistive Teaching Methodology are good tools to improve students' hypothesis construction, graphic interpretation and prediction skills for the Intellectual challenged students.

1.2 Clinical description of Learning Disability

According to the report of Intellectual Disability Rights Service Inc. (2009), Intellectual challenge is a disability that occurs within the developmental period of life that is before the age of 18, and it can be seen as below average intellectual functioning. Several people with Learning Challenged are born with the disability. Significantly sub-average general intellectual functioning is characterized as approximately 70 IQ or below as measured by a qualified psychological examiner on individually administered, nationally formed standardized measures of intelligence.

Clinically, and for the purposes of showing that a person has a Learning Challenged, Learning Challenged is best examined by a psychologist as:

  a. An IQ of 70 or under.
  b. deficits in at least 2 areas of adaptive behaviour, that is:

i. Communication
ii. Self-care
iii. Home living
iv. Social skills
v. Self direction
vi. Leisure and work
vii. Learning.

In clinical terms, Learning Challenged is often defined in terms of the severity of the disability.

Table 1 Clinical description of Learning Disability

Level of disability	% of people with Learning Challenge	IQ
BORDERLINE		70-75
MILD (Educable)	75%	55-70
MODERATE (Trainable)	20%	30-55
SEVERE (Totally dependent)	5%	under 30

Source: (IDRS Inc. 2009)

People with learning affected Person have little or no access to education due to reasons as:

a. poor societal perception of persons living with disability
b. poor funding
c. policy instability
d. lack of commitment
e. curriculum development

2.1 LITERATURE REVIEW

Zaagsma et al (2020) worked on the use of online support by people with intellectual disabilities living independently during COVID-19. The global outbreak of the COVID-19 virus and the control measures imposed by

governments focused on containing its spread have a dynamic impact on the provision of social care and support services made available for people with disabilities around the world (Armitage and Nellums 2020). It seems likely that also people living with intellectual challenges are at risk of experiencing a discontinuation of support to some extent. For example, in the Netherlands, while residential care services for people with Intellectual Disabilities (IDs) continued, visits from friends, family and relations were mostly prohibited. The work analysed quantitative data on planned and unplanned contacts between the online support service Digital Contact and its service users. The results generated indicate that the COVID-19 outbreak and the containment measures put in place had a strong impact on online support use, specifically on the unplanned use of online support.

Neece et al. (2020) worked on the COVID-19 pandemic introduced challenges to families with young children with developmental delays. Above the sphere of the widespread concerns surrounding physical challenges, sickness or loss of employment and social isolation, caregivers are responsible for looking after their children's educational and therapeutic programmes at home at times without the much needed support of professionals. The study sought to examine the impact of COVID-19 in 77 socioeconomically, linguistically and ethnically. Different families with young children living with intellectual and developmental disabilities (IDDs) in California and Oregon, who were partaking in bigger intervention studies. The response of parents were taken on five interview questions on the impact of the COVID 19 pandemic, services delivered for their child, positive aspects, coping with the situation and their concerns about the long-term impact of the pandemic. From the study, it was discovered that Parents reported that their biggest challenge was staying home caring for their children without the presence of many essential services. Parents also reported the positive aspects of the pandemic, most especially being together as a family.

Ojuope, Adetunmbi and Oyinloye (2020) worked on Equipping the Intellectually Challenged Youths with Information Technology (IT) Based Virtual Entrepreneurship Collaboration Skills during the COVID 19 Pandemic for Sustainable Development in Nigeria. From the paper, it was observed that the inception of COVID 19 Corona virus pandemic disease has brought about the challenge of using Information and Communication Technology (ICT) in

teaching and learning systems. The use of ICT in education is no longer a new idea, but the question is where the limit is when the use of ICT does not have the desired effect, most especially on the Intellectually Challenged individuals during the lock down. From the report of World Health Organization (WHO) and World Bank (2011), Intellectually challenged persons consist a significant proportion of the world's population, about 15%, due to the differences in their educational level to the normal individuals, they are not always see as contributor to productive human capital development of the Society. Most of the Intellectually Challenged students have little access to education, this is as a result of difficulties they face in learning and comprehension. During the lock down, most of this category of youth were cut off from society's productivity and this limits the rate of sustainable development. This paper focuses on equipping this Intellectually challenged youth with ICT based virtual entrepreneurship collaboration skills that can promote their productivity ability during the COVID 19 pandemic for sustainable development in Nigeria.

Ojuope, Adetunmbi and Oyinloye (2020) worked on awakening for 21st Century Challenges and Opportunities with the use of ICT Based Virtual Assistive Technology to teach early Childhood Education of Children with Learning Challenges in Pandemic Challenged Society. From the study, they discovered that COVID 19 Corona virus pandemic disease has brought about the challenge of using Information and Communication Technology (ICT) based virtual Technology in teaching and learning systems. From the report of World Health Organization (WHO) and World Bank (2011), Intellectually challenged persons carry a significant proportion of the world's population, about 15%, as a result of differences in educational standard to the normal individuals, they are rarely seen as contributor to productive human capital development of the Society. The study shows that the use of ICT based virtual assistive Technology to teach early childhood education children with learning challenges most especially during this COVID 19 pandemic challenges is highly imperative.

Catalina Devandas (2013), Worked on Supporting the Empowerment of Organizations of Persons with Disabilities: As a strategy to promote poverty eradication, using the Convention on the Rights of Persons with Disabilities (CRPD) The paper aims to give concrete suggestions on how to promote the empowerment of persons with disabilities and their representative communities to promote poverty reduction, using the Convention on the Rights of Persons

with Disabilities (CRPD) as an instrument of sustainable development. The strategy addresses mainly organizations working at national and subnational levels, however mention to experiences at international level will also be made. Oksama (2013), Worked on the peculiar features of training program interface design developing for children with mental retardation. Recent changes in the system of preschool education affected the content of remedial developmental education of children with Learning Challenged. The ability of computer to produce the information simultaneously in the form of text, graphic images, sound, and voice, video to remember and to process data with great speed allows data to be processed with great speed, which will allow the development of multimedia training programs for children with Learning Challenged.

Research Gap

Several related articles were reviewed on this paper, and we discovered that:
- Most of them did not address the area of Learning Challenge in terms of the use of ICT base Virtual Assistive Teaching Methodology by science and Technology Teachers during COVID 19 Pandemic.
- Most of the reviewed works did not solve the problem of Study inclusion of these people for economic growth and sustainable development.

3.0 METHODOLOGY

Learning Challenged persons are vulnerable in the society, they find it difficult to learn and comprehend fast (Radka and Petr, 2016); as a result of this challenges, the need for virtual assistive Teaching Methodology to enhance their learning ability during this Covid-19 Pandemic is imperative. This will help to control them from contacting and spreading this Pandemic disease. The use of ICT in education is nothing new, but the question is where the limit is when the use of ICT does not have the desired effect. Classroom delivery with the use of modern technology is still very low in Nigeria. This brought a draw back in quality teaching and learning production. The use of ICT based Virtual Assistive Technology is a powerful technique for effective teaching of the Learning Challenged persons in different fields including Science and Technology. In the paper we discuss the effective strategies of virtual teaching methodologies and the challenges of quality science and technology teachers of the intellectually challenged in Africa continent in the fast-moving world during

the COVID 19 Lock down challenges. The learner to learner relationships in a classroom with the use of ICT based modern technology is an essential element of sustainable educational development. The success of ICT Based Virtual Assistive Technology use in science and Technology depends on how they incorporated into curriculum and how teacher use it. The most appropriate use of ICT Based Virtual Assistive teaching Methodology most especially for the Intellectually Challenged during this COVID 19 Pandemic seems essential for those that use them for a supplementary tools for classroom and laboratory instruction. Highly interactive, collaborative ICT Based Virtual Assistive Teaching Methodology during this pandemic appeals growing interest because of their potentials to supplement constructivist learning. They offer inquiry environments and Learning tools to encourage learning and apply problem-solving skills. ICT Based Virtual Assistive Teaching Methodology are good tools to improve students' hypothesis construction, graphic interpretation and prediction skills for the Intellectual challenged students.

This section analysed the need for the science and technology teachers of the intellectually challenged to employ ICT based virtual teaching methodology during the COVID 19 pandemic. Difficulties faced by the Learning Affected persons in participate in class room learning most especially during this COVID 19 pandemic challenges cannot be over emphasized. Despite the ease of COVID-19 lock down in several countries in Africa including Nigeria and schools were opened for normal academic activities, there are still lots of COVID-19 protocols observed to control the spread of this Pandemic disease. There is still tendency for the spreading of this disease by the Intellectually Challenged that may find it difficult to observe the protocols put in place for the control of the spreading of this disease as a result of their level of IQ (Intelligent quotient) World Bank (2020). From the research carried out by the author of this paper in Home School for Handicapped Children, Ibadan, Oyo State 2018, four students of the school were tested with the use of ICT base Assistive Technology to teach Learning impaired students. It was discovered that the students performed better with the use of ICT than normal class room learning. From the interview conducted with the staff of the school, it was discovered that, these people have little or no access to education due to poor curriculum development. The curriculum does not favour these category of students due to their level of IQ. Developing a curriculum that can promote their learning ability

is highly imperative, this will enhance study inclusion of these people and further promote job creation. Learning Impaired is significantly sub-average general intellectual functioning which exists concurrently with deficits in adaptive behaviour that adversely affects educational performance and originates before age 18. Learning Challenged does not include conditions primarily due to a sensory or physical Challenged, Amyotrophic lateral Sclerosis (ALS), traumatic brain injury, autism spectrum disorders, severe multiple Challenges, cultural influences or a history of inconsistent and/or inadequate educational programming (Braithwaite and Mont 2008).

3.1 ICT based virtual teaching methodology and the challenge of teachers during COVID 19 pandemic

From the research carried out by the author of this paper in January 2021 on the level of accessibility of primary / secondary school teachers to ICT based virtual technology, it was discovered that most of these teachers have no adequate access to the Technology.

To establish facts behind access to Internet / virtual devices among Primary / Secondary School teachers in Nigeria, Five hundred (500) teachers were sampled from the response of some randomly selected Primary and Secondary school teachers across Katagum Local Government Area of Bauchi State, tables 2 and 3.

Table2. Do you have access to any of these Internet / Virtual devices?

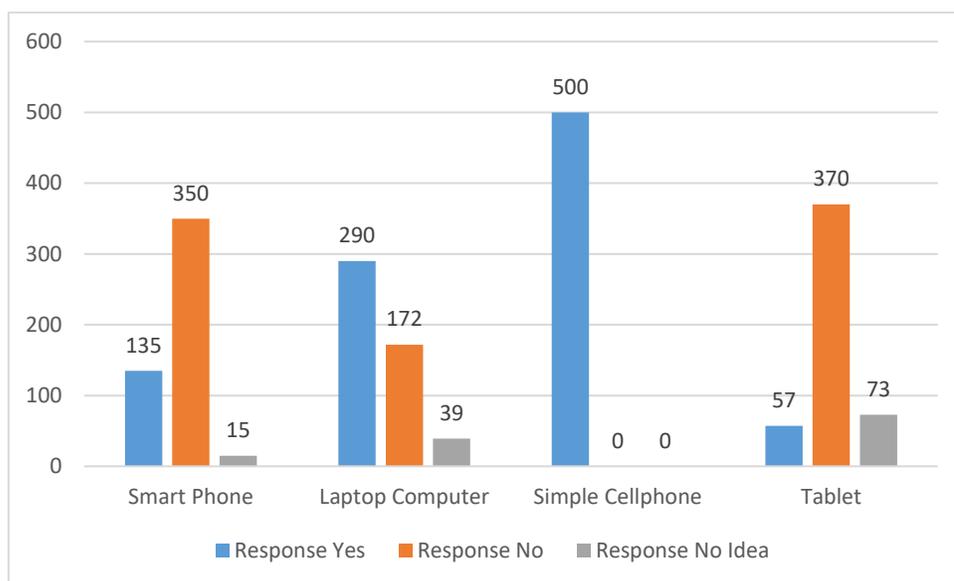| Devices	Response		
	Yes	**No**	**No Idea**
Smartphone	135	350	15
Laptop computer	290	172	39
Simple Cell phone	500	00	00
Tablet	57	370	73

Source: Ojuope 2021

fig.1. Access to Internet / Virtual devices.   Source: Ojuope 2021

From Table 2 we observed all the teachers have simple cell phone that may not work with some virtual applications. Several of them have no laptop, Smartphone and Tablet, and these are the useful devices for virtual teaching methodology. This shows we have a long way to go to make virtual teaching methodology realistic in Nigeria and Africa as a whole. This is where government at all level should come in to make these devices available for these teachers in affordable / subsidised price. This will help our Primary / Secondary school teachers to move from traditional method of teaching to virtual system of teaching and learning. It will also help the Intellectually challenged students to stay home and connected to their teachers.

Table 3. Why are you not regularly connected to the Internet?

Device	Response			
	No Data	**Power Supply**	**poor network**	**No Idea**
Smartphone	250	245	300	05
Laptop computer	260	280	255	10
Simple Cell phone	450	490	460	10

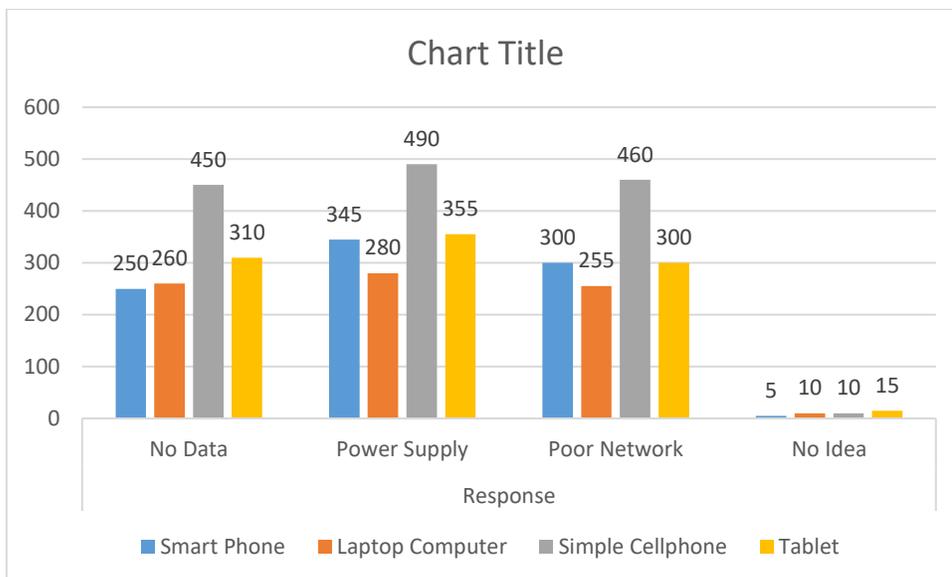| Tablet	310	355	300	15

Source: Ojuope 2021

fig.2. Connection to the Internet / virtual application.   Source: Ojuope 2021

From table 3 we discovered that even those that have the Internet / virtual devices are not regularly connected to the Internet. Over 90% of them complained of lack of data, and lack of adequate power supply and poor network. This shows we have much work to do, both government, service providers, stakeholders and Individuals. For the use of Virtual teaching methodology by science and Technology teachers to be effective for the intellectually challenged students during this COVID-19 pandemic, both parents and teachers must be connected to the devices that will enhance the use of the technology.

3.2 Availability of ICT based virtual resources for home learning during COVID 19 Pandemic

The emergence of COVID 19 pandemic makes access to online class imperative for Teachers, Parents and students. Apart from having access to appropriate ICT resources, students need to be in a home environment that is conducive to learning (Di et al, 2020). But, this might not be the case for a good number of students from less advantaged families, who have little or no access to the

Internet Technology and often have to do their work in a limited space shared with other family members. Children with physical challenges are among the most vulnerable, having little or no access to education, health, gender equity, and social inclusion. Poverty is a critical dimension that further widens the gap. The schooling and learning challenges experienced by children with disabilities can become the most challenging obstacles to earning an income as adults and contribute to the economic power of the society. This impacts on individuals, households, and communities contributes significantly to a country's human capital development gap. These categories of Children are less likely to attend school, most often to be out of school, less likely to finish primary school, and, therefore, less likely to acquire basic literacy skills that make them part of economic driven power of the society. The emergence of COVID-19 pandemic increase the systemic inequalities that exist in the inclusion and protection of children with disabilities as they have little or no access to the resources that make them relevant in the society (Di et al, 2020).

Despite the relaxed of the lock down in several countries, yet is not easy for the intellectually challenged students to go to school and adhere strictly to the COVID 19 protocols as a result of the level of their IQ. It is highly imperative the teachers of these categories of students adopt virtual teaching methodology for these students until this pandemic is put under check. This among other things will control their ability to contact this disease and also to spread it. Access to the internet becomes big challenge to several students and parents/guardians as they have little or no access to the technology. There is no consistent access to the same technologies between or within countries most especially several African countries have low access World Bank (2020). Figure 2 shows the level of accessibility of parents to digital and broad band devices and their usefulness World Bank (2020).

Usefulness of Digital and Broadcast Devices Reported by Parents
Respondents: Parents/caregivers (n=1628)

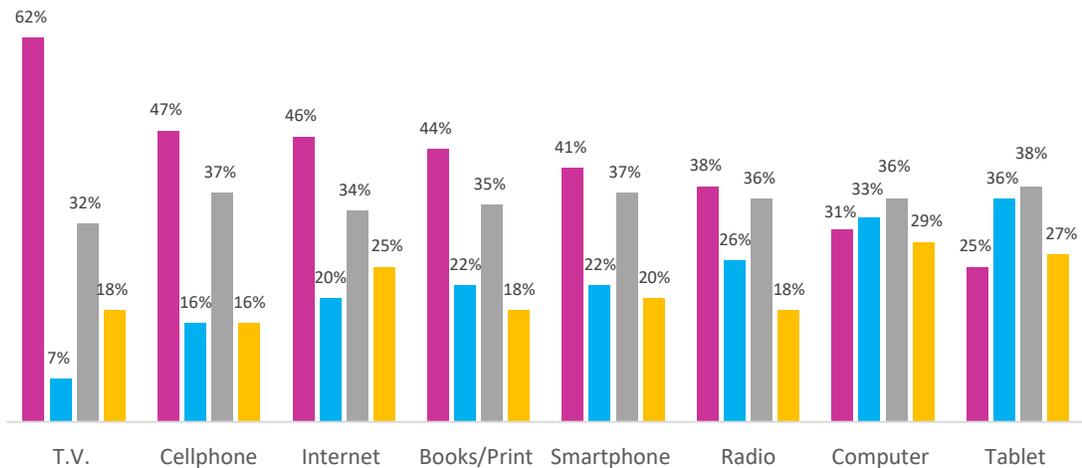■ Yes ■ ■ No Missing Usefulness

Figure 3- Access to Digital and Broadcast Devices and their usefulness Reported by Parents

Source: IEI COVID-19 Survey on Children with Disabilities

Results from the IEI COVID-19 Survey on Children with Learning Challenges on access to a variety of assets in the household by parents shows that 62 percent of parents had access to television, while 25 percent had access to tablets and 31 percent had access to computers (Figure 3). In terms of accessibility and usability of a device, parents put a higher interest on computers (29 percent) and tablets (25 percent). Only 16 percent believe mobile phones are useful and accessible for their children with learning challenges.

3.3 The challenge ICT in Restoring Quality Teaching and Learning in Education

According to the results of the findings, it is evident that almost all (92 %) of students were fairly positive or very positive (see Figure 4). Thus, it could be said that this students had a relatively positive attitude towards using ICT in their teaching.
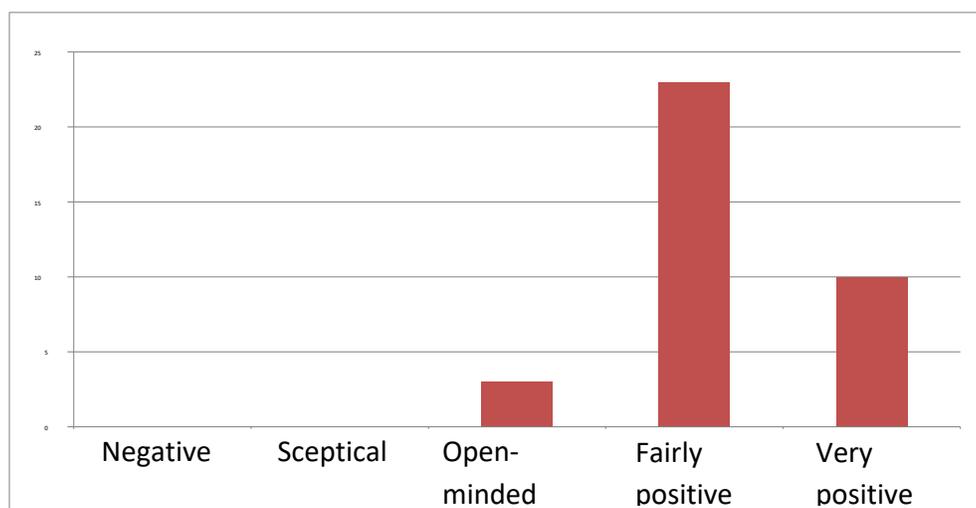
Figure 4 Attitudes to use of ICT in mathematics. Source: Bozkurt, G. (2016)

Of the 92% detailed above, five participants agreed to be interviewed. They all expressed efficiency in the usefulness of ICT in mathematics classrooms. Particular emphasis was made towards the dynamic use of visual elements of ICT. For example:

> I think it has made a big difference because you can see how it gives kids more visual elements and it also increases the pace of their learning abilities and the fact they can see what is going on, and also interact with things as well.

The study suggests that the key factor encouraging student teachers" use of ICT in mathematics teaching was the fact that such use would change the way in which pupils learn (see Figure 5) and develop the pupils interest (see Figure 6). This also can be seen from the interview comments. That is:

> I think some students might not learn and comprehend or be interested in unless it delivered in a way which to them is not just book work. There are some students most especially the Learning impaired whom watching a graph being drawn or something that is moving, something that is more animated…

Furthermore, majority (92%) of the student teachers expressed their belief in the value of ICT in helping pupils to learn. Also, 80% of the student teachers responded that ICT is a priority to them.
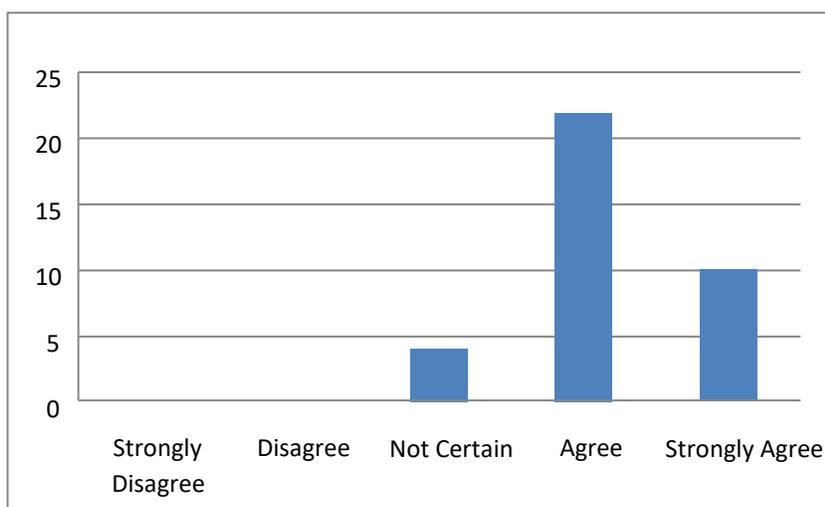

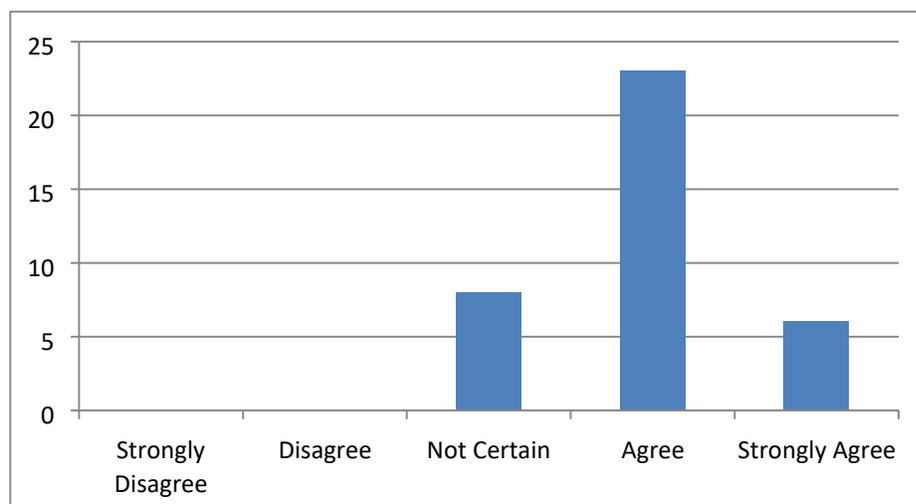Figure 5   ICT changes the way pupils learn. Source: Bozkurt, G. (2016)

Figure 6   Pupils feel motivated when they use ICT. Source: Bozkurt, G. (2016)

In this study, the majority of the students (74%) reported that they were confident in using computers in teaching, and only 5% said they were not confident. As a result of this, it is important to note that student teachers

interviewed expressed that they felt very confident in using technology in teaching and learning as well as in their personal use of ICT.

Discussion of finding

The purpose of this research was to ascertain the This paper focuses on the effective strategies of virtual teaching methodologies and the challenges of quality science and technology teachers of the Intellectually challenged in Africa continent in the fast-moving world during the COVID 19 Lock down challenges. Purposely to control the spread of the disease and encourage their access to quality education during this pandemic. From figure 4, It was found that pre-service science and technology teachers appeared to think that ICT was important for teaching and learning. It was clearly demonstrated that the student teachers were trying to use ICT where it improves their pupils" learning.

The student and teachers were also convinced of the value of ICT in helping pupils to learn, and they believed that ICT use changed the *way* pupils learn. From the research, it was concluded that teacher commitment to integrating technology was connected with appreciating the value of Education and have confidence in the transformative power of the technology.

CONCLUSION

Virtual teaching methodology for the Intellectual challenged students seems to be an embraced option during this COVID 19 pandemic. It has been wide widespread across continents. The online method of learning is the best option during this COVID 19 challenge and best suited for everyone depending on their availability and comfort. This will help this category of students to access updated content anytime they need it. As a result of wide set of opportunities it provides to students, Virtual teaching methodology has become very useful among the students across the countries particularly during the COVID 19 pandemic lockdown.

To achieve a sustainable educational development goals in African Continent in the fast moving world during this COVID 19 pandemic challenge, the use of Virtual teaching methodology by science and technology teacher to teach the intellectually challenged must be taken as New Strategy and Approaches. Prompt attention must be given to the empowering of persons with Intellectual

challenges. Multiple interventions should be put in place to support the structural lack of capacity to achieve this by teachers and parents.

4.2 RECOMMENDATIONS

a. The society should see persons living with physical challenges as functioning part of it.
b. There should be proper funding of the agency / commission in charge of these category of people.
c. The policy guiding the physically challenged should be dynamic and stable.
d. Government should be more committed in tackling issues concerning this category of people.
e. Special curriculum should be developed to take care of the physically challenged.
f. Government, service providers, stakeholders and Individuals must wake up to this challenge.

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