

Application of 5G Networks on Educational Development in South-South, Nigeria

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Abstract

This study sought to determine the influence of application of 5G networks on educational development in South-South, Nigeria. In order to carry out this study objectively, two specific objectives, two research questions and two null hypotheses were postulated to guide the study. A descriptive survey design was adopted for the study. The population of the study comprised 108 Post Graduate Computer Science and Education Students in five Federal Universities in South-South, Nigeria. The sample for this study was 85 Post Graduate Computer Science and Education Students drawn from the total population of 108, using stratified sampling technique. The researcher developed sixteen (16) items research instrument. A questionnaire with sixteen (16) structured items designed by the researcher was used for data collection for this study. The questionnaire was face validated by three experts in University of Uyo. Cronbach's Alpha Technique was used in determining the reliability of the instrument and a correlation coefficient of 0.87 was obtained. Means and standard deviation were used in answering the research questions. A one sample t-test statistics was used to test the two null hypotheses respectively at 0.05 level of significance. The finding shows that application of 5G networks downloading speed has a significant influence on educational development in South-South, Nigeria. The finding also shows that application of 5G networks in e-learning have a high influence on educational development in the study area and application of 5G networks in e-learning has a significant influence on education in the study area. Based on the findings, it is concluded that the application of 5G networks will enables a new kind of network that is designed to connect virtually everyone and everything together including machines, objects and devices. 5G wireless technology is meant to deliver multi-Gbps peak data speeds, ultra-low latency, more reliability, massive network capacity, increased availability, and a more uniform user experience to more users.

Keywords: 5G Network, Downloading, Technology, Education, Development, Latency, Data, Bits, E-learning.

Introduction

Fifth-generation wireless (5G) is the latest iteration of cellular technology, engineered to greatly increase the speed and responsiveness of wireless networks. With 5G, data transmitted over wireless broadband connections can travel at multigigabit speeds, with potential peak speeds as high as 20 gigabits per second (Gbps) by some estimates. These speeds exceed wire line network speeds and offer latency of 1 millisecond (ms) or lower, which is useful for applications that require real-time feedback. 5G will enable a sharp increase in the amount of data transmitted over wireless systems due to more available bandwidth and advanced antenna technology (Gillis, A. S. 2021). Wireless networks are composed of cell sites divided into sectors that send data through radio waves. Fourth-generation (4G) Long-Term Evolution (LTE) wireless technology provides the foundation for 5G. Unlike 4G, which requires large, high-power cell towers to radiate signals over longer distances, 5G wireless signals are transmitted through large numbers of small cell stations located in places like light poles or building roofs. The use of multiple small cells is necessary because the millimeter wave (MM wave) spectrum in which the band of spectrum is between 30 and 300 gigahertz (Ghz) that 5G relies on to generate high speeds that can only travel over short distances and is subject to interference from weather and physical obstacles, like buildings or trees. 5G is the fifth generation of wireless communication technologies supporting cellular data networks that is conceived as the next great leap in speed for wireless devices. 5G aims to deliver data rate that are 10 to 100 times faster than the current 4G networks. The significance of this is that mobile devices will be able to send and receive information in less than one-thousandth of seconds, appearing instantaneous to the user (Jagannathan, S. 2021). The main advantage of 5G networks over the previous generation networks is the ability to provide larger or wider connectivity bandwidth and low latency, which leads to faster download speeds of up to 10 gigabits per second

(Gbps) and will not just be used for low bandwidth internet content such as text, images, audio, and light video, but will allow the use of real time applications such as TV broadcasting, gaming, autonomous vehicles, Internet of Things (IoT), Virtual Reality (VR), Artificial Intelligence (AI) etc. With its extremely low latency rate, 5G allows educational delivery to be faster, more reliable, and smoother. For example, when compared to a 4G cell tower, a 5G cell tower can hold and support about 10 times as many devices. This is highly relevant in an educational scenario since lower latency and greater available bandwidth will support superior levels of communication over larger distances.

Revolutions in the communication and information technologies in the 21st century have led to tremendous innovations in educational technologies (Yamin, M. 2019). From the advances in educational technologies, all education programs, such as traditional education, distance education, e-learning, massive open online courses, adult education and lifelong learning, are being positively influenced in our day. In addition to this, emphasized that the next fifth-generation (5G) cellular networks are expected to meet high-end requirements. The 5G networks are broadly characterized by three unique features: ubiquitous connectivity, extremely low latency, and very high-speed data transfer.

The Fifth generation (5G) network support a large amount of data traffic and a massive number of wireless connections. Different data traffic has a different Quality of Service (QoS) requirements (Fizza, M and Ali, S. 2015). 5G mobile network aims to address the limitations of previous cellular standards (i.e., 2G/3G/4G) and be a prospective key enabler for future Internet of Things (IoT). 5G networks support a wide range of applications such as smart home, autonomous driving, drone operations, health and mission-critical applications, Industrial IoT (IIoT), entertainment and multimedia. According to end-users' experience, several 5G services are categorized into

immersive 5G services, intelligent 5G services, omnipresent 5G services, autonomous 5G services, and public 5G services.

5G technology stands for 5th Generation of the Mobile Technology (MT). This MT has evolved from the past four decades starting from 1G (1st Generation), 2G (2nd Generation), 3G (3rd Generation), 4G (4th Generation) and now the expected 5G (5th Generation), (Barate, Haus, Luca, and Pagani 2019). 1G is being used for voice calls, 2G for SMS which was later improved to 2.5 to help support browsing activities on the internet. 3G is for mobile television with Global Positioning System (GPS) and video conferencing which are all in use today. 4G is an improvement on 3G with extra services for higher data exchange. Long Term Evolution (LTE) is the standard for high speed wireless communication and boosted the abilities of 4G with a higher downloading and uploading speed rates.

The 5G MT will bring about a “Network Society” where many network technologies including Millimeter Wave (mmWave), Massive Multiple Input Multiple Output (mMiMo), Full Duplex, Cognitive Radio (CR) Technology, ZigBee, Bluetooth Low Energy (BLE) and Dynamic Spectrum Access (DSA) would be integrated to provide improvement in terms of reliability, availability, flexibility, energy efficiency and low latency. These technologies are important requirements for advancements in Internet of Things (Osseiran, Jose, and Marsch, 2016). The integration of these technologies for 5G also offers support for Augmented and Virtual Reality which are effective technologies applicable to Education. Therefore the imminence arrival and commercialisation of 5G and its technologies must lead to a discussion about its potential benefit to Education.

The rapid integration of Information Communication and Technology (ICTs) tools in education in aiding synchronous and asynchronous lesson delivery and new ways to access information and knowledge are important in the teaching process. Instructors and Learners mostly adopt the YouTube in accessing educational video contents with most institutions integrating web based

educational platforms: (Almond, Winter, and Cameto 2010) uses technology enabled and universal designed assessment in measuring achievement of students with disabilities.

5G is the fifth generation cellular network technology. 5G New Radio (NR) speed in sub-6 GHz bands can be slightly higher than the 4G with a similar amount of spectrum and antennas. Major countries using 5G and their readiness. According to a report by accounting firm Deloitte published in recent days, China is leading the way ahead of U.S. in the global 5G competition. The 5G revolution will cast a much wider net. It's an information conduit being built to connect self-driving cars, VR headsets, delivery drones, and billions of interconnected devices inside the home. 5G will be crazy fast, crazy stable, and crazy versatile. 10 Gbps speeds won't be unheard of. It'll replace home Wi-Fi networks in many cases, offering faster speeds and better coverage.

Javaid, Sher, and Guizani, (2018) focused on the attributes of 5G such as higher data rates, low latency and efficient use of spectrum with coexistence of heterogeneous networks for a successful compatibility of 5G and Internet of Things. The authors proposed the incorporation of Artificial intelligence as a necessity to make competent decisions based on the immense data produced by the activities of users of IoT devices. It addressed the use of Artificial intelligence to help analyze data in order to extract patterns and make sense of it and then prescribe action to the end devices. The authors also recommended the need for Artificial Intelligence in IoT devices for device self-analysis. Patil, and Nasir, (2012) fixated the research on 5G as a compatibility for wireless technology and how 5G network seeks to be a foundation for the development of the World Wide Wireless Web (WWWW) and the Dynamic Ad-hoc Wireless network (DAWN). This research work discussed the reason why the world needs 5G with its use cases for supporting interactive multimedia, internet and other broadband services and have bidirectional accurate traffic statistics. Gomez, Huete and Hoyos (2013) explained the significance of IoT and why IoT is an integral part of the daily learning and teaching methodologies. The article concluded that the effective use of IoT systems will improve personalised and interactive learning. This article again focused on the importance of IoT in the mobility tracking of students using intelligent cameras. Lee (2017) also explained the importance of effective educational applications in leveraging on IoT to transform teaching and learning. Gómez,

Huete, and Hoyos (2013) fixated on the educational field where critical learning spaces are prepared to utilize Internet of things. A system was proposed that enables and understudies interfaces with physical objects virtually connected with a subject of learning. The result of their experiment proved that their model improves outcomes in teaching and learning. Sharma, Husain, and Ali, (2017) research paper recommended cloud computing as a solution to cater for the rapid growth of data. There are many benefits of 5G network.

Connectivity to more devices: While 4G technology can only support a couple of thousand devices at once with a few minor delays, 5G has the ability to support a million devices without any delays. This is very important for a college or university that has multiple campuses within close proximity to each other. This means the students and tutors can use virtual reality (VR) and augmented reality (AR) without any problems at all.

High-quality lessons in virtual reality (VR) and augmented reality (AR): In order to get the best out of these two forms, a university or college needs to have a good connection. 4G internet is known to struggle when using VR and AR which can affect students' learning experience. By using 5G instead of 4G technology, students will have a seamless experience while they are learning. Tutors can give students to visit other planets or even take a tour of the human torso thanks to VR. When it comes to AR, it can be used by students to explore certain concepts they are learning through zooming, pinching and even touching.

Immersive Lessons with Augmented Reality (AR) and Virtual Reality (VR): Mixed-reality content and video require high bandwidth and low latency to perform optimally. Similarly, Ever and Rajan (2018), focuses that 5G is aimed to reduce latency to a few milliseconds (ms) than 4G that latency interval is recorded as 50 to 80 milliseconds (ms). The low latency will enable new services such as VR/AR, tele-medicine and tele-surgery; in some cases, latency not more than 1 ms is critical. Thus with 5G, experiences will be seamless. Students may tour the human body or visit

other planets in VR. With AR, they can explore concepts through touch, pinching and zooming through the Earth's layers as fast as they think it. This technology could improve the concept of interactive classrooms by the use of high-performance AR and VR technologies. They allow the user to see and touch any kind of 3D design.

Application of 5G AR/VR in Music Education: Music implies the exchange of multimedia information, at least in form of high-quality audio streams, in order to support professional applications; moreover, other data types are relevant in a music education context, including symbolic information (score, metadata, lyrics, etc.) and video streams, that are demanding in terms of bandwidth and latency requirements Baratè, Haus, and Ludovico (2019). All the mentioned data should be supported in order to provide a comprehensive environment for distance learning and distributed music performance. Music education over the net intrinsically poses a number of constraints to network characteristics, and, on top of that, AR/VR approaches add other information layers.

5G helps tutors save time when they are teaching: Every tutor knows just how challenging it is to set up classes and get feedback from students. It is a time-consuming process even for the most experienced and well-prepared tutors. With the help of 5G technology and IoT (internet of things) tutors have the ability to log in with ease as soon as they enter their respective classrooms. Small administrative jobs can be automated to be done via 5G and students can receive feedback from their tutor digitally. Good quality connection means a better signal throughout presentations and lectures without any dips.

Videos can be downloaded quicker: Tutors who use YouTube to teach their students will definitely benefit a lot from the strength of 5G technology because videos will be downloaded in seconds not minutes or hours. Downloading Videos in Seconds makes sense when YouTube is also their preferred educational resource. Downloading a high-definition video on 4G can take minutes

to an hour. With 5G, downloading a feature-length movie will take seconds, maybe less. 5G supports network speeds at around 20 Gbps or higher, enabling a user to download, for example, a full High Definition (HD) movie in seconds, and streaming high resolution (8K) videos. Also having a latency in millisecond levels; this is essential for future technologies like AR, driverless vehicles, and tactile Internet to work effectively (Ulema, 2018).

Students with special needs can learn better with 5G: Learning can be challenging for a student with learning difficulties or special needs. They need to be assisted more than other students and thanks to 5G, robot apps can be implemented in the classroom to aid them to deal with various problems. Instead of being slowed down by poor network or connection, 5G allows these robots to be very responsive and helps students with special needs have a good learning experience. Children with special needs may require more frequent or full-time assistance from teachers. There are robot applications to help with problem-solving, but they aren't as responsive as the children they're designed to help. 5G will enable robots to be full-time assistants and support teachers by responding immediately to help with learning exercises (Almond, Winter, Cameto and Rusell 2010).

Opens the door to make lessons more flexible: Students come from different walks of life and their learning abilities will differ from person to person. Students can carry on learning even when they are outside the classroom thanks to 5G technology because they will be able to get the same responsiveness as well as speed on their tablets, PCs, and smartphones. It doesn't matter where a student is on the college or university campus, they can access modules, notes, essays and other information as other students studying the same course. Every student's learning style and ability is different. 5G will help students continue their education outside the classroom, delivering the same data speeds and responsiveness in the classroom to their phone or laptop. Regardless of distance or location, 5G empowers students to access the same information and exercises as their peers.

5G technology makes learning fun: 5G technology will allow students to download apps that can make studying more engaging and fun. If a student has problems understanding a particular topic, there are so many learning apps they can use to research the topic. It is not just students who benefit from 5G. Essay writing companies do it as well to deliver professional service to students and make their lessons fun.

Smart Classroom IoT Saves Teachers Time: Setting up devices and gathering feedback in class takes time, even when everything works perfectly. With the Internet of Things (IoT) on 5G, teachers can automatically log in as soon as they enter the classroom. Manual administrative tasks will be automated, and students can deliver feedback digitally. Higher bandwidth will help signals remain strong throughout entire lectures and presentations, preventing occasional dropped connections and derailing focus.

Enhanced Mobile Broadband (eMBB): Enhanced Mobile Broadband (eMBB) is one of the three primary 5G use cases defined by the 3GPP as part of its SMARTER (Study on New Services and Markets Technology Enablers) project. eMBB is a natural evolution to existing 4G networks that will provide faster data rates and a better user experience than current 4G mobile broadband services. It will go beyond faster downloads to provide an increasingly seamless user experience that will eclipse the quality of service in 4G network. 5G mobile network will be available everywhere, deliver well in a densely populated areas like stadiums or conference centres. It will equally enable services in moving vehicles.

Security of 5G networks: 5G networks in comparison to the existing networks and generations of the communications technology are fundamentally different. While all the previous generations mostly relied on hardware components which often get outdated very quickly, the 5G technology largely relies on the software and cloud infrastructure to "virtualize" network functions. Cloud services will play very critical roles in the 5G technology, and both the virtualization and

'cloudification' of network functions will unlock a myriad of new possibilities for managing and securing networks. The increasing relevance of software in 5G is a key reason why the security of 5G will be very critical.

Applications that demand low latency and faster information processing: In addition to this, the research Conde-Zhingre and Quezada-Sarmiento (2018) discusses that the use of 5G technology in education will allow you to create applications that demand low latency and faster information processing. Thus, the Software Engineer with the use of ICT may develop all their areas of knowledge into different context and without limitations.

Low latency tactile Internet: Low latency tactile Internet will facilitate remote learning and education by haptic overlay of teacher and students. For these identical multi-modal human-machine interfaces, round trip latency of 5-10 ms is allowed for perceivable visual, auditory, and haptic interaction, tactile Internet will allow to play musical instruments from remote locations (Parvez, and Rahmati, 2018). Thus, drastic changes in multiple network domains need to be addressed to achieve this low latency.

Rapid technological developments give a big impact to the field of education. Thus, changes in educational field as the flow of globalization changes. The downloading speed and e-learning is a phenomenon that strikes the country's educational world such as 5G networks. However, it has long been an application in developed countries because it is believed to be able to provide various benefits in teaching and learning sessions. This study is aimed to determine the extents to which application of 5G networks will influence educational development in South-South, Nigeria.

Research Questions

This research work sought to find answers to the following research questions:

1. What is the influence of application of 5G networks downloading speed on educational development in South-South, Nigeria?
2. What is the influence of application of 5G networks in e-learning on educational development in the study area?

Research Hypothesis

H₀₁: there is no significant influence of 5G networks on downloading speed and educational development in South-South, Nigeria.

H₀₂: there is no significant influence of 5G networks in e-learning and educational development in the study area.

Research Methods

The descriptive survey design was adopted for the study. Ojo (2011) stated that descriptive survey design is a design technique for obtaining data from people through the use of questionnaire, observation and interviews. According to Osuala (2010), the descriptive survey design is the design suitable for collection of data based on the opinion of the people. The researcher collected data from a sample of respondents in federal universities in South-South, Nigeria on application of 5G Networks on education development. Therefore, the design is considered suitable since information on application of 5G networks on educational development was based on their opinions, observation and preferences. This study was conducted in South-South geo-political zone of Nigeria. This zone is popularly known as oil rich zone of Nigeria. It is made of six states in the Federal Republic of Nigeria namely: Akwa Ibom, Bayelsa, Cross River, Delta, Edo and Rivers. The South-South zone of Nigeria is of great interest to the country, because of their natural resources, which includes crude oil, Nigeria's highest foreign exchange earner. It is a sensitive area in many ways including infrastructural and educational prospective. The Federal University in the zone includes: University of Uyo; University of Calabar; Federal University of Petroleum Resources, Effurum; University of Benin and University of Port-Harcourt. The choice of South-South Nigeria

for this study is based on the impact the application of 5G networks will bring to education development in the zone. The population of the study comprised 108 Post Graduate Computer Science and Education Students in five Federal Universities in South-South, Nigeria between the period of 2020/2021 academic session. The states are; Akwa Ibom, Bayelsa, Cross River, Delta, Edo and Rivers. The population distribution of Post Graduate Computer Science and Education Students per federal university making up the zone showed that University of Uyo has a total of 21 Post Graduate Computer Science and Education Students, University of Calabar has 25, Federal University of Petroleum Resources, Effurun has 15, University of Benin has 24 and University of Port-Harcourt has 23. The sample for this study was 85 Post Graduate Computer Science and Education Students drawn from the total population of 108, using stratified sampling technique. The researcher developed sixteen (16) items research instrument tagged: “Application of 5G Network on Educational Development in South-South, Nigeria Questionnaires” (A5GNEDSSNQ) were used for data collection for this study. The instrument was designed according to the independent and dependent variables of this study. The questionnaire was divided into sections A and B. Section ‘A’ contain the personal data of the respondents. Section ‘B’ contains the statements on the variables grouped in eight clusters (1-8) namely; downloading speed and e-learning.

The response options were:

Very Great Extent	(VGE)	-	5 points
Great Extent	(GE)	-	4 points
Moderate Extent	(ME)	-	3 points
Little Extent	(LE)	-	2 points
Very Little Extent	(VLE)	-	1 point

The instrument was subjected to face validation and the content was validated by three education experts. These experts were made from University of Uyo, Uyo. The experts were requested to examine the questionnaire items based on their clarity, appropriateness of language and ability to

elicit accurate information in relation to the objectives of the study, research questions and hypotheses. The comments, necessary corrections, modifications and amendments were made and thereafter, the instrument were deemed to be valid enough to measure what it is expected to measure. The reliability coefficient of the instrument was determined using Cronbach alpha. The items were trial-tested on 15 Post Graduate Computer Science and Education Students in one of the schools in the study area but not part of the population. The scores obtained from the trial test were subjected to item analysis to determine the reliability indices of the instrument. The result showed reliability coefficient of 0.87. This coefficient justified that the instrument is reliable enough for the study. The use of Cronbach alpha formula is appropriate in determining internal consistency of the instrument. The questionnaire was administered on the respondents by the researcher together with five research assistants. The research assistants were briefed on the procedures for administration and collection of the instrument from the respondents. Mean and standard deviation were used to answer the two research questions while the one sample test analysis was used to test null hypotheses at 0.5 level of significant. Real limit of mean vales was used as decision rule for the research questions as indicate below:

Response Options	Values	Real Limit	
Very Great Extent	(VGE)	5	4.50-5.00
Great Extent	(GE)	4	3.50-4.49
Moderate Extent	(ME)	3	2.50- 3.49
Little Extent	(LE)	2	1.50-2.49
Very Little Extent	(VLE)	1	1.00-1.49

In deciding the result of the research hypotheses, the calculated t-value were compared with Table value. If the calculated t-value was greater than or equal to the critical value at 0.05 level of significance, the research hypothesis was rejected and alternative accepted whereas when the calculated t-value is less than the critical value at 0.05 level of significance the research hypotheses was retained.

Results

Research Question One

What is the influence of application of 5G networks downloading speed on educational development in South-South, Nigeria?

Table 1: Mean ratings of respondents on the influence of application of 5G Networks downloading speed on educational development in South-South, Nigeria.

n= 85

S/N	What is the influence of application of 5G Networks Downloading Speed on:	$\bar{X}$	SD	Remark
1.	Can 5G network helps student to downloading videos more quicker	3.94	0.80	HI
2.	Can student with special needs learn better with 5G	3.73	0.90	HI
3.	Can 5G provide faster content to User's with low latency application	4.07	0.79	HI
4.	Can 5G provide students with a faster loading speed of 25mbps to a peak of 100mbps	3.75	0.81	HI
5.	Can more students simultaneously connect to the 5G network with high throughput	4.11	0.80	HI
6	Can 5G use Multiple Input, Multiple Output (MIMO) antenna that either send or receive more data?	3.91	0.96	HI
7	Can 5G provide greater speed in transmission	3.91	0.92	HI
8	5G provide greater number of connected device.	4.04	0.72	HI
	Cluster Mean	3.93	0.83	HI

HI = High Influence

Source: Field Survey, 2021

Table 1 shows the mean ratings of the respondents on the influence of application of 5G networks downloading speed on educational development in the study area. All the items were rated high by

the respondents. The item on Can more students simultaneously connect to the 5G network with high throughput was rated highest with a mean rating of 4.11 while item on: student with special needs learn better with 5G was rated 3.73 having the lowest mean rating. On the whole, the cluster mean of 3.93 indicating that influence of application of 5G networks downloading speed on educational development in the study area is high. The standard deviation range is low showing that the respondents were convergence in their opinions.

Research Question Two

What is the influence of application of 5G networks in e-learning on educational development in South-South, Nigeria?

Table 2: Mean ratings on the influence of application of 5G networks in e-learning on educational development in South-South, Nigeria. n= 85

S/N	What is the influence of application of 5G network in e-learning on:	$\bar{X}$	SD	Remark
1.	With low latency rate, 5G allows educational delivery to be faster.	3.60	0.88	HI
2.	5G improved interaction between teachers and learners.	3.88	0.79	HI
3.	Educators who teach skill-based classes could leverage Virtual Reality (VR) capabilities more efficiently.	4.24	0.80	HI
4.	It can be used to connect hundreds of student in real time.	3.86	0.87	HI
5.	5G affect the achievement of Sustainable Development Goals (SDGs)	4.21	0.76	HI
6	5G make it easier for students to access classes.	4.01	0.93	HI
7	5G improve personalization by creating intelligent systems to understand the unique needs of each student.	4.41	0.71	HI
8	Increased flexibility to busy students who want to learn outside the classroom.	4.12	0.89	HI
	Cluster mean	4.04	0.83	HI

HI = High Influence

Source: Field Survey, 2021

Table 2 shows the mean ratings of the respondents on the influence of application of 5G networks in e-learning on educational development in the study area. All the items were rated high by the respondents. The item on 5G improve personalization by creating intelligent systems to understand

the unique needs of each student, was rated highest with a mean rating of 4.41 while item on: with low latency rate, 5G allows educational delivery to be faster was rated 3.60 having the lowest mean rating. On the whole, the cluster mean of 4.04 indicating that the influence of application of 5G networks in e-learning on educational development in the study area is high. The standard deviation range is low showing that the respondents were convergence in their opinions.

Hypothesis One

The application of 5G networks downloading speed has no significant influence on educational development in South-South, Nigeria.

Table 3: One sample test analysis of the influence of application of 5G networks downloading speed has no significant influence on educational development in South-South, Nigeria.
n = 85

S/N	What is the influence of application of 5G network downloading speed	$\bar{X}$	SD	df	t-cal	P-sig	Decision
1.	Can 5G network helps student to downloading videos more quicker.	3.94	0.80	84	57.74	.000	Sig.
2.	Can student with special needs learn better with 5G.	3.73	0.90	84	48.40	.000	Sig.
3.	Can 5G provide faster content to User's with low latency application.	4.07	0.79	84	59.78	.000	Sig.
4.	Can 5G provide students with a faster uploading speed of 25mbps to a peak of 100 mbps.	3.75	0.81	84	53.71	.000	Sig.
5.	Can more students simultaneously connect to the 5G network with high throughput?	4.11	0.80	84	59.59	.000	Sig.
6	Can 5G use Multiple Output (MO) antenna that receive more data simultaneously?	3.91	0.96	84	47.42	.000	Sig.
7	Can 5G provide greater speed in transmission	3.91	0.92	84	49.44	.000	Sig.
8	5G provide greater number of connected device.	4.04	0.72	84	65.00	.000	Sig.
	Cluster Mean	3.93	0.83	135	56.69	.000	Sig.

Sig = Significance

Source: Field Survey, 2021

The result presented in Table 3 shows that at 84 degree of freedom, the p-sig of 0.000 is less than the alpha level of 0.05. With this result, the null hypothesis which stated that the application of 5G networks downloading speed has no significant influence on educational development in the study area is therefore rejected. This means that the application of 5G networks downloading speed would have a significant influence on educational development in South-South, Nigeria.

Hypothesis Two

The application of 5G networks in e-learning has no significant influence on educational development in South-South, Nigeria.

Table 4: One sample test analysis of the influence of application of 5G networks in e-learning has no significant influence on educational development in South-South, Nigeria. n = 85

S/N	What is the influence of application of 5G network in e-learning on:	$\bar{X}$	SD	df	t-cal	P-sig	Decision
1.	With low latency rate, 5G allows educational delivery to be faster.	3.60	0.88	84	47.74	.000	Sig.
2.	5G improved interaction between teachers and learners.	3.88	0.79	84	57.36	.000	Sig.
3.	Educators who teach skill-based classes could leverage Virtual Reality (VR) capabilities more efficiently.	4.24	0.80	84	61.64	.000	Sig.
4.	It can be used to connect hundreds of student in real time	3.86	0.87	84	51.70	.000	Sig.
5.	5G affect the achievement of Sustainable Development Goals (SDGs).	4.21	0.76	84	64.43	.000	Sig.
6	5G make it easier for students to access classes.	4.01	0.93	84	50.52	.000	Sig.
7	5G improve personalization by creating intelligent systems to understand the unique needs of each student.	4.41	0.71	84	72.00	.000	Sig.
8	Increased flexibility to busy students who want to learn outside the classroom.	4.12	0.89	84	53.66	.000	Sig.

Cluster mean	4.04	0.83	56.98	.000	Sig.
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Sig = Significance

Source: Field Survey, 2021

The result presented in Table 4 reveals that at 84 degree of freedom, the p-sig of 0.000 is less than the alpha level of 0.05. With this result, the null hypothesis which stated that the application of 5G networks in e-learning has no significant influence on educational development in South-South, Nigeria is therefore rejected. This mean that the application of 5G networks in e-learning would has a significant influence on educational development in the study area.

Discussion of Findings

The finding shows that application of 5G networks downloading speed has a very high influence on educational development in South-South, Nigeria and application of 5G networks downloading speed has a significant influence on educational development in the study area. The finding also shows that application of 5G networks in e-learning have a high influence on educational development in the study area and application of 5G networks in e-learning has a significant influence on education in the study area.

Conclusion

5G is a new global wireless standard after 1G, 2G, 3G, and 4G networks. 5G enables a new kind of network that is designed to connect virtually everyone and everything together including machines, objects and devices. 5G wireless technology is meant to deliver multi-Gbps peak data speeds, ultra-low latency, more reliability, massive network capacity, increased availability, and a more uniform user experience to more users.

Today the rapid advances in technology are reshaping our society, social institutions and schools. Modern technologies have fastly increased our capacity to know and do things and to communicate and collaborate with others. They allow us to transmit information quickly and widely, linking

distant places and diverse areas of endeavour in productive new ways. The students have a wide range of new technology open and available to them.

On the basis of findings and conclusions, the following recommendations are made:

1. The Federal Ministry of Education in Nigeria should prepared to upgrade from the current 4G to 5G, as 5G network comes with extremely low latency rate which means the sending and receiving of information goes from 200 milliseconds for 4G down to 1 millisecond with 5G.
2. The Federal Ministry of Education need to integrate from the current network to 5G network because it will enables learners to have similar experiences from being present in real classrooms at any time through VR and AR technology with high-quality audio and video streams with low latency.
3. The Vice Chancellor, Deans and Head of Department should be prepare to use 5G because it will assist students with special needs to learn better, since they need to be assisted more than other students, robot apps can be implemented in the classroom to aid them to deal with various problems. Instead of being slowed down by poor network or connection, 5G allows these robots to be very responsive and helps students with special needs have a good learning experience.

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