Digital Technology and Pupils' Cognitive Development in Public Primary Schools in Ogun East Senatorial District, Ogun State, Nigeria

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Abstract
This study examined how to improve pupils' cognitive development through the usage of digital technology in public primary schools in Ogun East Senatorial District, Ogun State, Nigeria. Three research questions and one hypothesis guided the study. A descriptive research design of survey type was used. The population of this study comprised four thousand, four hundred and ninety (4,490) public primary school teachers in Ogun East Senatorial District of Ogun State. A total of 520 public primary school teachers were selected as sample size through the use of simple and proportionate sampling techniques. Self-designed questionnaire titled: Digital Technology and Pupils' Cognitive Development Questionnaire (DTPCDQ) was used for data collection with r = .91 as coefficient of reliability. Mean, standard deviation and bar-chart were used for analysing and presenting results of 1, 2 and 3. Hypothesis was tested using Pearson Product Moment Correlation (PPMC). The findings of the study revealed that there was moderate level of pupils' cognitive development (mean = 2.54 > 2.50). Digital technology tools are not available (mean = 2.40 < 2.50) and not utilized (mean = 2.26 < 2.50) by teachers in public primary schools. It was also found that if all things being equal, teachers perceived digital technology as viable tools for teaching aid that can promote pupils' cognitive development (mean = 2.707). There was significant relationship between pupils' cognitive development and digital technology tools utilization (r = .338, p < .05) in public primary schools in Ogun East senatorial district, Ogun State. Government should increase the resources to public primary schools most especially in buying and supplying needed digital technology tools such as Kahoot, Quizlet and EDpuzzle for teaching and learning.

Keywords: Pupils' cognitive development, Digital technology, Public primary school

Introduction

Primary education is the early stage of human capital development and at this level, cognitive skills development must receive significant attention. Cognitive development encompasses capability in terms of mental

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development drive which is important for dilution of data in form of information and quick learning that comprises direct activities relating to how to speak, pass information around, simple logic, growth in memory as well as clarity of focus that assist and enhance future sustainability for decision-making. In short, cognitive skills are categories of skills that can predict and enhance intellectual capability growth which children need to fulfil their educational development. Cognitive development refers to the extent to which pupils can acquire and find out the information around them for a purpose at a specific time. It also means the growth of ability and capability skills in terms of dispositions and knowledge to solve a particular problem which definitely assist them to mentally develop and acknowledge the information around their environment. It can also be deduced that development of the brain at an early stage in the lives of children promote their cognitive skills development.

Cognitive development according to Chinatu and Kalu (2019) means the growth that takes place mentally from the day the child was born to this world to the last day of death. Development in mental stages of children is associated with some psychological responsibilities that are driving their skills accumulation, leading to cognitive development. The rate of children's level of intelligence and thinking to diffused information towards decision making, according to Okoro and Ekpo (2016), is called cognitive development. These authors also argue that every child possesses inbuilt ability to receive rapid intelligence development during infancy, which definitely promotes their intellectual ability growth for cognitive development. Early identification of objects could be said to aid in developing high cognitive development, and such early behavious might further help categories of such children to develop mentally, helping their academic activities in future. Furthermore, one factor that seems to be driving the children concept is the beauty of early language development which directly helps in speech development, and memory keeping, and all these are composite indicators of cognitive development (Abdullahi & Abubakar, 2022).

Adewusi, et al. (2024) and Okocha, James and Agaku (2022) argued that the performances of children or pupils in public primary schools nowadays are low, which is not so good for nation building. Ogara and Ezema (2024) reiterated that the poor performance of pupils in primary school could lead to low level of human capital development in the country if something urgent is not done by the collective authority and other stakeholders in the sector, while Maheshkumar and Arpan (2024) in their

study conducted in the United States of America said the integration of digital technology into the curriculum of primary school children helped in developing skills needed for their future and education sustainability. Thus, the implications of this low performance of primary school pupils is that the method adopted by the teacher is not producing the desired results, thus, the need for change. Olajide, Afolabi and Ajayi (2019) said that Nigeria government and stakeholders in primary education must consistently clamor for the effective introduction of digital technology into the classroom of public primary school, because the present children could be referred to as digital-age children based on what is going on at the global educational level for children, and with these, a multiplier effect could result from cognitive development for future academic needs and sustainability.

Chinatu and Kalu (2019) reiterated that the strategic introduction of digital technology into the instruction delivery by teachers in primary schools is germane towards improving the pupils' performance and cognitive development. Digital technology in this study refers to the set of technological tools applicable for teaching and learning at the primary school level. These digital technological tools could either be soft or hard in nature which encompasses kahoot, quizlet, padlet, among others. Adaption and integration of these digital technology tools into the classroom could result in seamless learning engagement. Abdullahi and Abubakar (2022) buttressed this point by saying that digital technology tool such as assistive technology is specifically designed to promote inclusive learning with peers. That is, assistive technological tool is not meant for all children instruction delivery but is specifically designed for children with disability to fully engage in classroom, not to be left out of the process, but, effective engagement. Ogara and Ezema (2023) reiterated that the integration of digital technology into the primary school classroom should be guided by some ingredients such as availability of the tools, effective utilization by the teacher for instruction delivery as well as equipping teacher with necessary training to efficiently utilized digital tools for pupils' cognitive development.

In the words of Khan, et al. (2023), if not for the essential values and functions of digital technology, during the outbreak and emergency of Covid-19, no child could have received any form of education and training. But, integration of digital technological tools during this ugly period enhanced training of pupils and consequently promoted their cognitive development, at home or in the school. Thus, the integration of technology into primary schools and familiarization with the process is germane

towards goal achievement of the education (Khan et al., 2023). Olajide, Afolabi and Ajayi (2019) were of the opinion that early introduction of digital technology in teaching and learning in the primary school depends on the availability of the digital tools in such schools and capability of teachers to utilize them for teaching. However, effective usage of these tools could as a matter of fact improve children cognitive development and promotion of their future academic endeavors.

Theoretical Framework

The theoretical framework for this study is Technological Acceptance Model (TAM). The theory was postulated by Davis in 1989. The theory postulated that before seeing the benefits of using digital technology or digitalization in school, the first step is to determine the level of acceptance of such technology by the stakeholders in the school, that is, the teacher and the students. The theory further stated that technology usage and its acceptance move in same direction. That is, the level of acceptance drives the level of its usage. The theory further talks about the perception and availability of the digital tools in organization. It indicated that nothing can be done if such tools are not available and employees are having wrong perception towards its usage. The implications of this theory to the study is that integration of digital technology into primary school is a welcome decision, but the first task ahead is to make those tools available, teachers should use them for instruction delivery which strongly depends on their level of acceptance and perception. According to the theory, technology integration in any organization, promotes and enhances engagement and seamless activities.

Statement of the Problem

Pupils' cognitive development in public primary schools have been a source of concern to the stakeholders in the sector. Evidence abound that there was a high rate of pupils' poor performance in public primary school, a situation whereby graduates of these schools find it difficult to freely express themselves and read correctly, which are not a good foundation for educational development and nation building in Nigeria. Personal observations by the researchers revealed that poor infrastructure, lack of teacher commitment, poor welfare package for the teacher, and poor school climate was seemed to be among the factors that might be affecting pupils' performance at primary school level. It is also noticed that children's poor cognitive development might result to low academic performances and vice

versa. However, government and other stakeholders in this sector have taken some steps towards improving cognitive development of pupils for better performance. This study was an attempt to examine how to improve pupils' cognitive development through the usage of digital technology in public primary school in Ogun East senatorial district, Ogun State, Nigeria.

Objectives of the Study

The main objective of the study was to examine how to improve pupils' cognitive development through the usage of digital technology in public primary schools in Ogun East senatorial district, Ogun State, Nigeria. Specifically, the study sought:

1. to ascertain level of pupils' cognitive development in public primary schools in Ogun East senatorial district, Ogun State;
2. to ascertain level of digital technology tools availability in public primary schools in Ogun East senatorial district, Ogun State;
3. to find out the level of digital technology tools utilization by teachers for instruction delivery in public primary schools in Ogun East senatorial district, Ogun State;
4. to identify the perceptions of teachers on the benefits of digital technology tools utilization for pupils' cognitive development in public primary schools in Ogun East senatorial district, Ogun State;
5. to determine, if, any relationship exists between pupils' cognitive development and digital technology tools utilization in public primary schools in Ogun East senatorial district, Ogun State.

Research Questions

1. What is the level of pupils' cognitive development in public primary schools in Ogun East senatorial district, Ogun State?
2. At what level is digital technology tools availability in public primary schools in Ogun East senatorial district, Ogun State?
3. To what level are digital technology tools utilized by teachers for instruction delivery in public primary schools in Ogun East senatorial district, Ogun State?
4. What are the perceptions of teachers on the benefits of digital technology tools utilization for pupils' cognitive development in public primary schools in Ogun East senatorial district, Ogun State?

Hypothesis

$H_0$1: There is no significant relationship between pupils' cognitive development and digital technology tools utilization in public primary schools in Ogun East senatorial district, Ogun State.

Methodology

A descriptive research design of survey type was used in this study. The reasons for using this type of design was that it facilitated collection of data needed from the respondents towards achieving the objectives of the study. The population of this study comprised four thousand, four hundred and ninety (4,490) public primary school teachers in Ogun East Senatorial District of Ogun State (Source: Department of Planning and Research Statistics, Ministry of Education, Science and Technology, Abeokuta, Ogun State, 2024). A total of 520 public primary school teachers were selected as sample size of the study. However, simple random sampling technique was used to selected 4 local governments out of the 9 in Ogun East, namely; Ijebu East, Ogun Waterside, Ijebu North and Ijebu North East local governments respectively. From each selected local government, proportionate sampling technique was adopted in selecting a total of 130 teachers, making a total of 520 teachers as sample size. A self-developed questionnaire titled: Digital Technology and Pupils' Cognitive Development Questionnaire (DTPCDQ) was used for data collection. The questionnaire was divided into four segments. Section A focused on the demographic characteristics of the respondents; sections B, C and D comprised items detailed on the levels of cognitive development of pupils, levels of digital technology tools availability and utilization in public primary schools, as well as the perceptions of teachers on the benefits of digital technology tools utilization for pupils' cognitive development respectively. The questionnaire was based on 4-scale which was modified from 5-Likert Scale. The questionnaire was given to three experts in the Department of Childhood Education, Tai Solarin University of Education, Ijagun for face and contents validations. All the corrections done were amended before final administration on the respondents. The questionnaire was first pilot tested among 15 primary school teachers in Abeokuta South Local Government Area, and this was done once.

The data collected were subjected to Cronbach Alpha formula to determine the reliability coefficient of the questionnaire which yielded 0.91. Permission was taken from the authority of the selected public primary schools to administer copies of the questionnaire on their teachers. Five

trained research assistants participated in the questionnaire administration. A total of 520 copies of the questionnaire were administered and only 500 were retrieved and used for analysis. Retrieval rate was 96.15%. Mean, standard deviation and bar-chart were used for analysing and presenting research questions 1, 2, 3 and 4. Hypothesis was tested using Pearson Product Moment Correlation (PPMC).

Results

Research Question 1: What is the level of pupils' cognitive development in public primary schools in Ogun East senatorial district, Ogun State?

Table 1: Descriptive Statistics on the Level of Pupils' Cognitive Development in Public Primary Schools in Ogun East Senatorial District, Ogun State

Items	Mean	SD	Remarks
High memory	2.51	.949	Moderate level
High assimilation	2.49	.822	Low level
Attention in classroom	2.55	.955	Moderate level
High reasoning level	2.59	.908	Moderate level
Relate effectively with peers	2.50	.916	Moderate level
High sensory motor	2.58	.987	Moderate level
Cluster Mean	2.54		Moderate level

Source: Field Survey, 2024

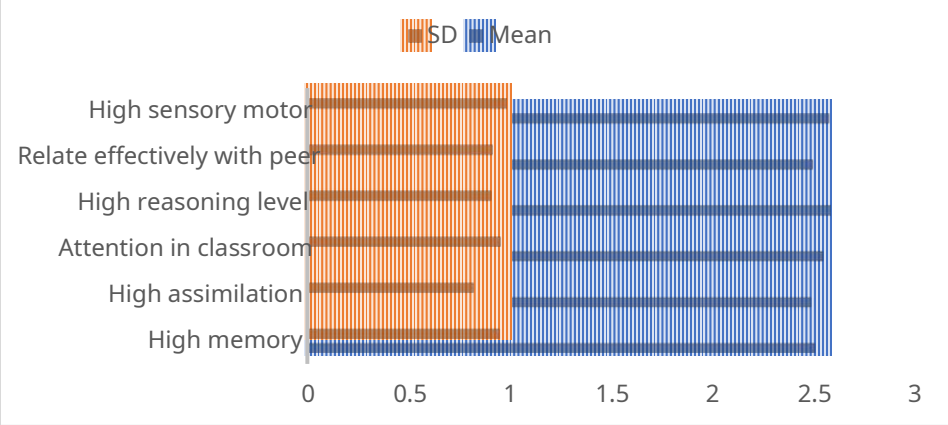

Fig. 1: Bar-chart showing level of pupils' cognitive development in public primary schools in Ogun East senatorial district, Ogun State.

In table 1, cluster mean was 2.54 which was greater than the bench mark mean value of 2.50 (2.54 > 2.50). The implications of this was that there was moderate level of pupils' cognitive development.

Research Question 2: At what level is digital technology tools availability in public primary schools in Ogun East senatorial district, Ogun State?

Table 2: Descriptive Statistics on the Level of Digital Technology Tools Availability in Public Primary Schools in Ogun East Senatorial District, Ogun State

Items	Mean	SD	Remarks
Kahoot	2.19	.977	Not available
Quizlet	2.24	.906	Not available
EDpuzzle	2.51	.994	Available
Padlet	2.54	.900	Available
Quizizz	2.43	.856	Not available
Story bird	2.28	1.03	Not available
Socrative	2.34	.888	Not available
Flipgrid	2.63	.902	Available
Pear Grid	2.83	.995	Available
Piazza	1.98	.895	Not available
Cluster Mean	2.40		Not available

Source: Field Survey, 2024

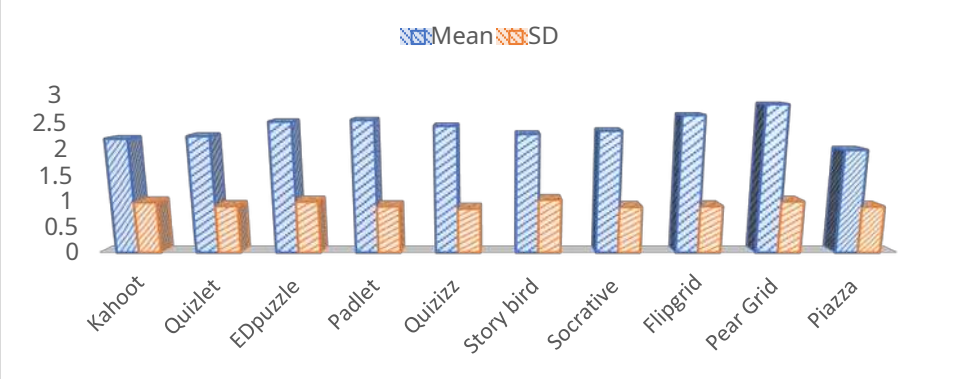

Fig. 2: Bar-chart showing level of digital technology tools availability in public primary schools in Ogun East senatorial district, Ogun State.

In table 2, cluster mean was 2.40 which was less than the bench mark of 2.50. The implications of these results were that digital technology tools are not available (2.40 < 2.50). The results further depicted that out of 100%

items raised as digital technology tools, only 40% were available and 60% not available.

Research Question 3: To what level are digital technology tools utilized by teachers for instruction delivery in public primary schools in Ogun East senatorial district, Ogun State?

Table 3: Descriptive Statistics on the Level of Digital Technology Tools Utilization in Public Primary Schools in Ogun East Senatorial District, Ogun State

Items	Mean	SD	Remarks
Kahoot	1.67	.999	Not Utilized
Quizlet	2.03	.773	Not Utilized
EDpuzzle	2.66	.986	Utilized
Padlet	2.57	.674	Utilized
Quizizz	2.01	.598	Not Utilized
Story bird	2.14	.933	Not Utilized
Socrative	2.26	.988	Not Utilized
Flipgrid	2.75	.852	Utilized
Pear Grid	2.63	.911	Utilized
Piazza	1.90	.794	Not Utilized
Cluster Mean	2.26		Not Utilized

Source: Field Survey, 2024

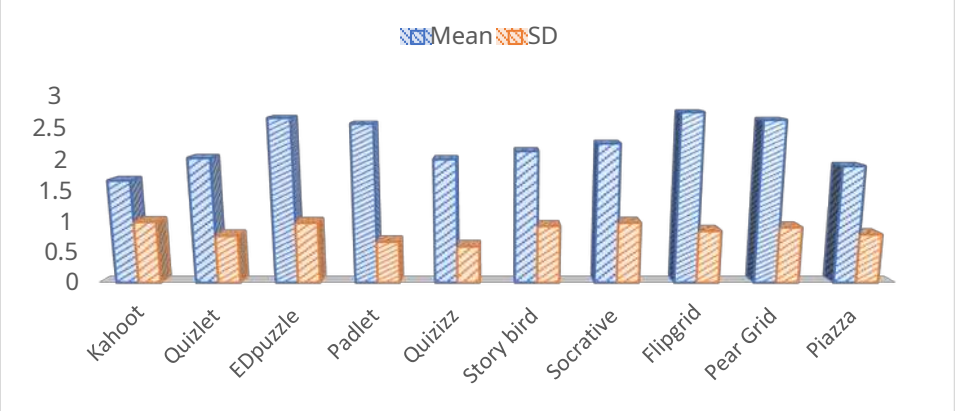

Fig. 3: Bar-chart showing level does digital technology tools utilized by teachers for instruction delivery in public primary schools in Ogun East senatorial district, Ogun State.

In table 3, cluster mean was 2.26 which was less than less than the bench mark of 2.50. This implied that digital technology tools are not utilized. It

was further showed that only 40% of the listed digital tools were utilized and 60% not utilized.

Research Question 4: What are the perceptions of teachers on the benefits of digital technology tools utilization for pupils' cognitive development in public primary schools in Ogun East senatorial district, Ogun State?

Table 4: Descriptive Statistics on the Perceptions of Teachers on the Benefits of Digital Technology Tools Utilization for Pupils' Cognitive Development in Public Primary Schools in Ogun East Senatorial District, Ogun State

Items	Mean	SD	Remarks
Digital technology enhanced pupils and teacher engagement in instruction delivery.	2.74	.725	Agreed
Enhanced personalized learning.	2.57	.803	Agreed
Digital technology enhanced collaboration learning.	2.78	.666	Agreed
Promoted assessment feedback.	2.81	.765	Agreed
Improvement in needed teaching aid.	2.72	.599	Agreed
Enhanced integration of teaching and learning.	2.94	.903	Agreed
It is fun and engagement teaching.	2.63	.883	Agreed
Promotes pupils' empowerment in learning.	2.79	.837	Agreed
Improved active learning among pupils.	2.85	.773	Agreed
Brings out learning experience among the pupils.	2.87	.675	Agreed
Cluster Mean	2.77		Agreed

Source: Field Survey, 2024

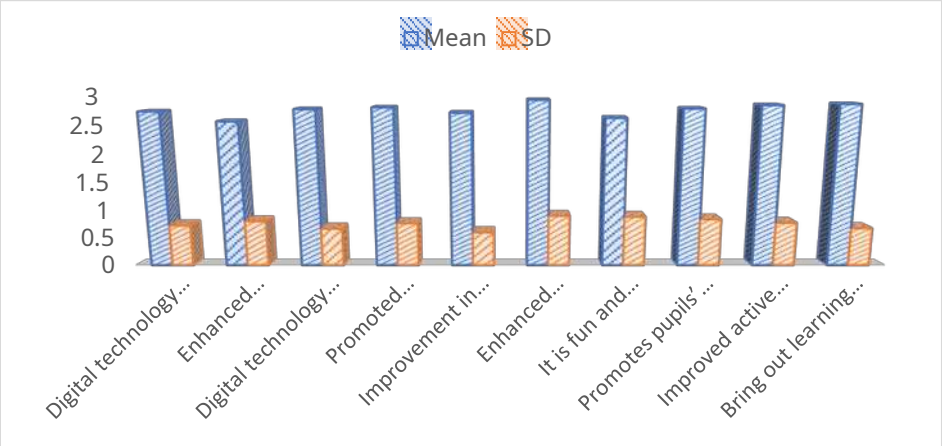

Fig. 4: Bar-chart showing the perceptions of teachers on the benefits of digital technology tools utilization for pupils' cognitive development in public primary schools in Ogun East senatorial district, Ogun State.

In table 4, cluster mean was 2.77 which is greater than the bench mark mean value of 2.50. This further implied that teachers perceived digital technology as viable tools for teaching aid that can promote pupils' cognitive development (2.77 > 2.50).

$H_0$1: There is no significant relationship between pupils' cognitive development and digital technology tools utilization in public primary schools in Ogun East senatorial district, Ogun State.

Table 5: PPMC Results on the Relationship between Pupils' Cognitive Development and Digital Technology Tools Utilization

Variables	N	Mean	Std. Dev	df	r_{value}	p_{value}
Digital technology tools utilization		21.28	3.10			
Pupils' cognitive development	500	16.50	3.06	498	.338	.001

Source: Field Survey, 2024

From table 5 it was observed that there was significant relationship between the independent variable and the dependent variable in the order of ($r = .338$, $p < .05$). On that note, null hypothesis was rejected and the researcher concluded that there was significant relationship between pupils' cognitive development and digital technology tools utilization in public primary schools in Ogun East senatorial district, Ogun State.

Discussion of Findings

Based on research question 1, the findings of the study revealed that there was moderate level of pupils' cognitive development. These findings were in tandem with the results of Adewusi et al. (2024) who found that children in government primary schools performed lower than their counterparts in private schools while Chinatu and Kalu (2019) concluded that there was moderate level of pupils' cognitive growth in public school. Khan, et al. (2023) argued that the current education of children that does not adopt digital information technology to teach are playing with the future sustainability of such pupils, and they therefore concluded that digital technology tools are the foundation for children's human capital development in this information age.

Based on research question 2, the findings of the study indicated that digital technology tools are not available in public primary schools. These

findings correlate with Ogara and Ezema (2024) who concluded that digital technology tools are not available in public schools particularly in primary schools, that most of the public primary schools in Nigeria do not have enough digital tools to enhance pupils' cognitive development.

Furthermore, the findings of the study based on research question 3, showed that digital technology tools are not utilized in public primary schools. These findings correlate with Ogara and Ezema (2024) who found that most public primary schools do not use digital tools for instruction delivery, as well as Maheshkumar and Arpan (2024) findings showing that digital tools were not utilized as a result of non-availability in schools.

Based on research question 4, the findings revealed that teachers perceived digital technology as viable tools for teaching aid that can promote pupils' cognitive development. These findings correlate with Maheshkumar and Arpan (2024) who perceived that digital technology tools can help in teaching children and enhance cognitive development and performance in school for future academic sustainability.

The hypothesis revealed that there was significant relationship between pupils' cognitive development and digital technology tools utilization in public primary schools in Ogun East senatorial district, Ogun State. These findings were in tandem with findings of Olajide et al. (2019) who found that, digital technology equipment are not readily available in schools, despite that the authors concluded that digital technology gadgets have potential to increase the performance of pupils as well as their cognitive development.

Conclusion

Primary education is the foundation for sustainable education of any country. However, the issues confronting cognitive development of pupils at this level of education need quick attention because other levels of education build upon this level. This study concluded based on the findings that digital technology tools are moderately available and utilized by teachers in public primary schools. It was also concluded that teachers perceived digital technology as viable tools for teaching aid that can promote pupils' cognitive development. There was significant relationship between pupils' cognitive development and digital technology tools utilization in public primary schools in Ogun East Senatorial District, Ogun State.

Recommendations

The following recommendations are provided in line with the findings of the study:

1. Government should increase the size of resources to public primary schools most especially in buying and supplying needed digital technology tools for teaching and learning.
2. Stakeholders and NGOs should as a matter of urgency, address the need of public primary schools by equipping the schools with modern digital technology tools, and offer training opportunities for teachers and pupils on how best to use and maintain the tools for cognitive development.

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