

Leveraging Digital Technology on Teaching Basic Science and Technology for The Transformation of Secondary School Education in Rivers State

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Abstract

The research was on leveraging digital technology on teaching basic science and technology for the transformation of secondary school education in Rivers State. The study adopted descriptive survey design and guided by two research questions were answered and one hypothesis tested with a population of 80 secondary school teachers of basic science and technology in Obio/Akpor Local Government Area, Rivers State. A sample size of 80 lecturers was drawn using purposive random sampling technique. The instrument for data collection was a 15-item questionnaire validated by three experts and it gave a reliability coefficient of 0.75 that was obtained using Cronbach Alpha method. The data collected were analyzed with mean and standard deviation, and z-test for the hypothesis. The findings showed that there is low extent of availability of digital technology tools for teaching basic science and technology and that there is low extent of utilization of digital tools in teaching basic science and technology for transformation of secondary school in Rivers State. It was then recommended that education stakeholders at all levels should provide digital technology tools for secondary schools in Rivers state., basic science and technology teachers should be given regular training on how to utilize digital tools for teaching in the present changing world, basic science and technology teachers should seek extra opportunities like symposiums, workshops and conferences to be better at the utilization of digital tools for teaching,

Keywords: *Digital technology, teaching, basic science and technology, transformation*

Introduction

Digital technology is a form of technology that engages media aid in carrying out activities for enhanced productivity and this in any practice is referred to as digitalization of such a practice.

Digitalization is a process of applying digital tools to solving man's problems. It is the application of digital technology in an encoded form using computer software. It can be construed as a process of using digital technology to change how an entity carries out its operations for an enhanced and better experience. Yasar (2023) says digitalization is a process of changing analog information to its digital form. Hence, it is a kind of atmosphere that an establishment can experience and all its activities would change automatically from what it used to be. This is tilted towards creating better value for the entity or enterprise. It aims to convert the processes and practices of an organization or profession for the better.

It is intended to achieving a higher level of efficiency in a process and practice in order to produce more for the organization or the profession. Thus, the above perceives it as representation of the application of technological approaches in every aspect of a practice or process in order to optimize such. Techslang (2024) says the process of digitalization has the potential to improve process or practice, create new opportunities and make better the experiences of practitioners and users. Some of the possible enhancements are automation of tasks, operational streamline, data driven activities and new experiences for clients or even an emergence of new approaches and techniques. This is so perhaps, is seen as optimization as affecting positively work speed, efficiency and value. Hence, there is the guarantee that it can save time and bring new dimensions to what used to be done in an organization as it becomes imperative to keep pace with world happenings since especially because virtually everything done in the world has a digital dimension.

Furthermore, it is said that despite the fact that the world is now a global village because of the technological application of digital tools, its potential is still said not have been fully tapped. Hence, there is room in its optimization. This is so, as it helps to develop roadmaps and increase value encourages network of activities that provide on time transparency, accountability and reaches more population because of its wider coverage. By implication, it conveys that digital technology seem to possess the capacity to increase productivity and reduction of cost which any practice would be encourage and the act of teaching can leverage on this essentially to produce the desired result.

Teaching is a professional practice that is out to have trained personnel who are equipped with fundamental skills needed for the day to day transaction in the classroom and outside the classroom discharge their duties as acceptable by the society. Amadioha (2017) says that teaching is when one person helps another person to learn through an arranged programme of activities. Jeremiah and Alamina (2017) affirmed that teaching is an educational engagement that only those who are trained to practice carry out. The inference that could emerge from here is that the concept of teaching; a polymorphous activity is as dynamic as the society which it is used to serve, since it could be contentual or contextual in nature as it has to do with teaching that may take place both within or outside, hence, it is pertinent to say that the art of teaching becomes meaningful when the behavioural change expected in the learner begins to be observable in the learner and this leads to the development of the society (Akor & Okonny, 2020). However, teaching is not done in a vacuum but it is carried out based on different subjects that the learner is exposed to and one of such in recent times is Basic Science and Technology which has both theoretical and practical inclination, thus, could be perceived to be what would be amenable to leveraging on digital; technology for the best of it to be obtained.

Science and technology is an innovative title that the previous two subjects 'Basic Science' and 'Basic Technology' are now known with. Nonetheless, the change of name was rather intended to bring about the fusion of both subjects for better coverage and to remove the problem of

compartmentalization that most subjects in the school suffer from. Daniel (2010) had said that science in the 21st century is aimed at nurturing man's potentials to allow for freedom in the learning process while technology is the application of what has been learnt to solve the problems that man's experience daily brings to him. Basic Science and technology is meant to train learners for advance level of economic production such that would foster retention and quality in the learner through proper engagement, interaction and with classwork and home work that are relevant. It is also meant to birth innovation, creativity and adequate organizational skills for the achievement of set goals (Apkan, 2016).

Armed with the knowledge that science and technology have become important elements for societal and national advancement world over, it is an imperative that the progress of nations are tied to it and because of the global nature of the happenings of this era no nation should be left behind in the scheme of things, hence, basic science and technology with its laudable objectives have a lot to contribute to the nationhood of the society (Apka & Ekanem, 2017). Some of the objective so said may include:

1. Cultivate in the students with foundational scientific knowledge and skills.
2. Foster a positive attitude towards science and technology and
3. Prepare them for further studies and careers in related fields.

In view of the above one would only agree to the fact that the reason to leverage digital technology was already embedded in the policy on education by the Federal Ministry of Education (FME, 2018) in waiting for the unfolding of the learners' potentials that would bring about transformation both in the learners and in the nation.

Transformation is a concept tilted towards social change. This kind of change happens incrementally and takes different forms. It is a deep, sustained and systematic change required to redirect the development of the society in a desired direction. Thus, it is a change process that occurs due to processes put in place. Singha (2024) says it is an extensive and pronounced change seen in arrangement or structure of a society. It is further said that it could take any of these forms-conventional, principle, technological, cultural or political leading to significant and known changes that are quantifiable. Akor and Okonny (2024) say that transformation is an idea aimed at bringing lasting change as a result of exposure to several dimensions of systematic and directed energy towards producing lasting effect through any means possible among which is technology. Therefore, when a society is yearning for adequate change, it must first begin from her basic education practice especially because that is the future of the nation. Being that the level of education acquired here would determine the state of affairs of the nation in being able to compete with other nations in the future, it becomes necessary that the young learners be made to go in the same direction that people in the other nations are taking their young people in other for the desired educational and economic achievements intended to be achieved in agreement with the objectives of secondary education.

Secondary school is the next level of education after education. Akor and Pepple (2020) say it is that stage of education which learners undertake after primary education and before tertiary education. FRN (2016) says it is the education children receive after primary education and before the tertiary stage. This means that it is like the median education level when it comes to practice; such that houses adolescent children who characteristics are getting adequately formed. The broad goals of this level of education are to prepare individuals for:

- i. Useful living in the society; and
- ii. Higher education but specifically, it is meant to in consonance with the direction of this discourse:

1. Inspire students with a desire for self-improvement and achievement of excellence
2. Foster national unity with emphasis on the common ties that unite us in our diversity
3. Raise a generation of people who can think for themselves, respect the views and feelings of others, respect the dignity of labour, appreciate those values specified under our broad national goals and live as good citizens etc.

The foregoing has a lot of potential for the secondary level of education but it requires adequate management process for the best of it to be obtained otherwise it would amount to waste of energy and time as well as other resources. Though, all the objectives are good but number 1 and 3 seem to capture more of the intent for leveraging digital technology on teaching basic science and technology for transformation more. But the question is despite the awareness on how digital technology could transform the nation and the lives of the populace, has it found a resting place in the teaching and learning process? Are the gadgets provided in school? Are finding meaningful usefulness to both the teachers and the learners? These and more questions may need answers. Hence, the need to carry out this study leveraging digital technology on teaching basic science and technology for the transformation of secondary school education in Rivers State.

Specifically, the study sought to achieve the following objectives:

1. Determine the extent digital technology tools are available in the teaching of basic science and technology for the transformation of secondary school education in Rivers State.
2. Determine the extent of utilization of digital tools by male and female teachers in the teaching of basic science and technology for the transformation of secondary school education in Rivers State.

The following are the research questions guiding this study:

1. What are the extent digital technology tools are available in the teaching of basic science and technology for the transformation of secondary school education in Rivers State?
2. What is the extent of utilization of digital tools by male and female teachers in the teaching of basic science and technology for the transformation of secondary school education in Rivers State?

This hypothesis was postulated for this study ($P=0.05$)

1. There is no significant difference between the extent of utilization of digital tools by male and female teachers in the teaching of basic science and technology for the transformation of secondary school education in Rivers State.

Research Method

The study was carried out in public secondary schools in Rivers State, Nigeria, particularly, in eighty (80) junior secondary schools in Obio/Akpor. The study adopted descriptive survey design. The population for the study was made up of 80 Basic Science and Technology teachers of public secondary schools in Obio/Akpor Local Government Area, Rivers State. The sample size for the study was made up of 80 teachers of Basic Science and Technology in public secondary schools in Obio/Akpor which was drawn using the purposive sampling technique. The instrument used by the researchers for data collection was a questionnaire titled: Questionnaire on Digital Tools for Teaching Basic Science and Technology in Secondary School for Transformation (QDTTBSTST) which was constructed by the researchers. It consists of 15 items which were arranged in two sections A and B. Section A contains the biodata, while

section B consists of two subgroups on extent of digital tools availability for teaching and extent of utilization of digital tools by teachers. The questionnaire was built on a modified four-point Likert Scale, namely: Very High Extent (VHE), High Extent (HE), Low Extent (LE) and Very Low Extent (VLE) and the levels of responses are weighted as 4, 3, 2, 1 respectively.

The instrument was face validated by three experts, two from Measurement and Evaluation Unit of the Department of Educational Foundations of Rivers State University, Nkpolu Port Harcourt, Rivers State and one from Educational Technology Unit of Educational Foundations Department, Faculty of Education, Rivers State University Port Harcourt. The suggestions given were used in producing the final copy of the instrument. Cronbach alpha was used in calculating the reliability to determine the internal consistency which gave an alpha value of 0.75 which was considered high. The instrument was administered and collected by the researchers on the spot. The data obtained were analyzed using, mean and standard deviation for answering the research questions. Hence, $4+3+2+1=10/4=2.5$. Therefore, items whose mean were less than 2.5 were seen as Low Extent (LE) responses while those whose mean were 2.5 and above were seen as High Extent (HE) responses. The decision rule on the null hypotheses was to reject the hypothesis with calculated Z-value greater than the critical Z-value but otherwise accept.

Result

Research Question 1: What are the extent digital technology tools are available in the teaching of basic science and technology for the transformation of secondary school education in Rivers State?

1: Mean and Standard deviation on the Extent Digital Technology Tools are Available in the Teaching of Basic Science and Technology for the Transformation of Secondary Schools Education in Rivers State

S/N	Items	Mean	SD	N	Remark
1.	Hardware tools are available for teaching	3.62	0.33	HE	80
2.	Software tools are available for teaching	1.92	0.14	LE	80
3.	Communications tools are available for teaching	2.13	0.17	LE	80
4.	Collaboration tools are available for teaching	1.87	0.14	LE	80
5.	Educational tools are available for teaching	3.07	0.28	HE	80

6.	Blackboard tools are available for teaching	1.03	0.1	LE	80
7.	Google classroom is available for teaching	1.07	0.1	LE	80
Grand Mean and S D		2.10	0.18		

Source: Field Survey, 2025

The results on table 1 above showed that the extent digital tools are available in the teaching of basic science and technology in secondary school education for transformation in Rivers State with a grand mean (2.10). The most available of the digital tools were hardware and educational tools for teaching otherwise every pother item fell below the benchmark. It was poorest with blackboards, Google classrooms, collaboration tools and communications tools for teaching followed in that order. The implication is that not too many digital tools are available for the teaching of basic science and technology in secondary school education in Rivers State, thus, an imperative that educational stakeholders at all levels should do well to support the schools to acquire the tools for enhanced teaching of basic science and technology aimed towards transformation.

Research Question 2: What is the extent of utilization of digital tools by male and female teachers' in the teaching of basic science and technology for the transformation of secondary school education in Rivers State?

Table 2: Mean and Standard Deviation on the Extent of Utilization of Digital Tools by Male and Female Teacher's in the Teaching of Basic Science and Technology for the Transformation of Secondary Education in Rivers State

S/N	Items	Male Lecturers			Female Lecturers			N
		Mea n	SD	Remar k	Mean	SD	Remar k	
1.	Teachers hardware utilize for teaching	3.36	0.32	HE	3.38	0.32	HE	80
2	Teachers communication tools utilize for teaching	2.17	0.17	LE	2.14	0.17	LE	80
3	Teachers collaboration tools utilize for teaching	1.41	0.01	LE	1.90	0.14	LE	80
4	Teachers blackboard utilize for teaching	1.05	0.01	LE	1.85	0.15	LE	80

5	Teachers utilize google classroom for teaching	1.02	0.01	LE	1.04	0.1	LE	80
Grand Mean and Standard Deviation		1.80	0.10		2.06	0.17		

Source: Field Survey, 2025

The result on table 2 showed that the responses on the extent to which digital are being utilized by teachers in secondary school education in Rivers State. The result indicated that the male teachers utilized hardware the most as well as their female counterpart. It is clear from the result presented that google classroom by both genders. As for communication tools, the result obtained by the male and female teachers are almost the same. Nonetheless, it is important to point out that the extent of the utilization of communication tools, collaboration tools, blackboard tools and goolge classroom tools was at low extent. The implication from the foregoing is that while there is paucity tools for use in secondary schools, even the utilization of the one available was at low extent, thus, would not be able to produce the level of transformation desired in secondary education in Rivers State.

Hypothesis

1. There is no significant difference between the extent of utilization of digital tools by male and female teachers in the teaching of basic science and technology for the transformation of secondary school education in Rivers State.

Table 3: Z-test on the Extent of Utilization of Digital Tools by Male and Female Teachers in the Teaching of Basic Science and Technology for the Transformation of Secondary Schools in Rivers State

Group	Mean	SD	N	df	Z _{calculated}	Z _{critical}	Decision
Male	1.80	0.1	38	78	0.93	1.96	Accepted
Female	2.06	0.17	42				

Source: Field data, 2024.

The result of table 3 shows that Z-calculated of 0.93 is lesser than the Z-critical 1.96 at 0.05 level of significance at 78 degree of freedom indicating that there is no significant difference on the extent of utilization of digital tools by male and female basic science and technology teachers in secondary education for transformation in Rivers State. Therefore, the null hypothesis of no significant difference is accepted.

Discussion of the Findings

The result on table 1 revealed the extent of availability of digital tools on the teaching o basic science and technology for the transformation of secondary school in Rivers State. The result showed that there is low extent of availability of digitals tools. Here, only hardware was adequately available while software tools, communication tools, collaboration tools, educational tools, blacjboard and google classroom tools were not adequately available. It simple connotes that the tols were not provided I the first instances or that where they are available the teachers are not able to maximize the potentials of the said tools. This finding are confirmed by the findings of the study by Eggon, Allu and Ameh (2024) who found that digital technology tools were more available in private schools than in public secondary and even in urban schools in

Nasarawa State than in rural schools. Again, Atomatofa (2025) did a study that revealed that there was inadequate supply of digital tools in secondary schools in Delta State despite the type of school and the location. Furthermore, Okai (2024) had found that internet connectivity was a challenge for the availability of digital tools in Rivers State. This implies that education stakeholders need to work round the clock to nip these challenges in the bud in order to ensure that digital tools find usefulness in the teaching of basic science and technology for transformation in Rivers State and in Nigeria for emphasis.

Next, the result on table 2 indicated that the extent of utilization of digital tools in teaching basic science and technology in Rivers State. It was discovered from the study that both the male and female teachers utilized the digital tools sparingly; situation that would make one doubt the effectiveness of even the one being utilized. Though, hardware was the most utilized followed by communication tools which was This was confirmed by the hypothesis result on table 3 which should that there is no significant difference between the extent of utilization of digital tools by male and female teachers. However, the utilization of collaboration tools, blackboard and googl classroom were at low extent. This was confirmed by the study carried out by (Nwandu, 2024) who found that even teachers sometime lack the training required for the utilization of digital tools and this could be a problem. Moreso, (Okai, 2024; Atomatofa, 2025) found that lack of internet connectivity and teachers' lack of training could be a challenge to the utilization of digital tools on teaching in secondary schools. Hence, it implies that teachers would require skills, familiarity with and training for them to be able to utilize digital tools effectively. So, while it important to for government to provide digital tools, they should also train teachers on how to use them for the desired transformation in teaching basic science and technology in Rivers State.

Conclusion

The conclusion that could be drawn from the findings of this would be that there is limited availability of digital tools in secondary school in teaching basic science and technology for the transformation of education in Rivers State. Thus, provision of such tools needs to be made for teachers. Again, it seems that the extent of training teachers has may not be adequate to teach basic science and technology, therefore, they may require training on digital tools utilization.

Recommendations

The following are the recommendations supporting this study based on the findings:

1. Education stakeholders at all levels should provide digital technology tools for secondary schools in Rivers state.
2. Basic science and technology teachers should be given regular training on how to utilize digital tools for teaching in the present changing world
3. Basic science and technology teachers should seek extra opportunities like symposiums, workshops and conferences to be better at the utilization of digital tools for teaching.

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