TEACHERS' TECHNOLOGICAL READINESS FOR INSTRUCTIONAL DELIVERY IN 21ST CENTURY CLASSROOM IN PUBLIC SECONDARY SCHOOLS IN RIVERS STATE

BY
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Abstract
The paper investigated teachers' technological readiness for instructional delivery in 21st century classroom in public secondary schools in Rivers State. Three research questions and three corresponding hypotheses were posed to guide the study. Design used for the study was analytical survey design. Population of the study comprised 12,496 public secondary school teachers which was made up of 6,433 male teachers and 6,060 female teachers in public secondary schools in Rivers State. The sample of the study comprised 752 comprising 377 male and 375 female teachers through proportionate stratified random sampling technique. The instrument used for collection of data was a 15 item questionnaire titled "Teachers Technological Readiness for Instructional Delivery Questionnaire" (TTRIDQ). The face and content validities of the questionnaire was determined by two experts in the Department of Curriculum Studies and Educational Technology, University of Port Harcourt. The reliability of the questionnaire was determined using Pearson Product Moment Correlation co-efficient statistic with an index of 0.88. The questionnaire was administered by the researcher with the aid of three trained Research Assistants. The research questions were answered using mean and standard deviation while the hypotheses were tested using z-test statistic at 0.05 level of significance. The findings of the study showed that teachers are innovatively ready but are not ready in terms of security and optimism for instructional delivery in 21st century classroom in public secondary schools in Rivers State. The study recommended based on the findings of the study that teachers in public secondary schools in Rivers State should be compelled to shift from the use of traditional to modern technological devices for instructional delivery.
Keywords: Teachers, Technological, Readiness, Instructional and Delivery

Introduction
Teaching and learning activities are carried out in a classroom to equip students with the skills, knowledge and attitude needed to be self-reliant and also contribute to the growth and development of the society. Furthermore, in this era of technological development, there is need to make the classroom more technologically inclined so as to expose students to a wider range of educational experience that will make students relevant both locally and internationally. However, the extent to which the classroom is equipped with the right technology for teaching and learning depends on the level of the teachers' technological readiness. Asiroglu and Akran (2018) pointed out that technological readiness reveals the extent to which people are willing and ready to embrace and utilize available technology to meet the goals and objectives of the organization. Furthermore, Geng, Law and Niu (2019) pointed out that technological readiness is a combination of the beliefs and the ability to manage challenges related to technology for the purpose of using this advancement for purposes that will contribute to educational goals and achievement. Teachers like any other employee in other formal organizations must be technologically ready so as to create a 21st century classroom atmosphere where the best educational experiences are being transmitted especially in this era of growth and development in the world of technology (Widodo, SWibowo & Wagiran, 2020).

The teacher needs to be mentally, materially and mutually prepared to embrace and utilize available technological devices for classroom activities which include instructional delivery. Since students learn

lifelong skills and acquire lifelong knowledge during instructional delivery in the classroom, the teacher must be prepared to embrace available technology to make his or her instructional delivery more impactful for the purpose of empowering the students to bring positive change to their immediate environment. Badri, Al-Rashedi, Yang, Mohaidat and Al-Hammadi (2014) as well as Summak, Baglibel and Samancioglu (2010) revealed that there are four major dimensions of technological readiness which includes innovativeness, optimist, insecurity and discomfort. While optimism and innovativeness are enhancers, insecurity and discomfort are challenges that must be dealt with which shows a teacher is ready to embrace technology for the purpose of achieving meaningful teaching and learning in the classroom. The extent to which teachers are ready to manage these variables determine if they are technologically ready to improve the quality of instructional delivery in the classroom.

Technological optimist refers to the belief that technology when used can make help to make a production process deliver better outcome. According to Badri, Al-Rashedi, Yang, Mohaidat and Al-Hammadi (2014:258) teachers optimism refer to a teacher who has a positive view of technology and a belief that it offers students and teachers increased control, flexibility, and efficiency in their lives in the school and at home. Teachers need to be optimistic that available technology when used for instructional delivery can help the teacher achieve her educational outcomes when properly utilized. Teachers must have a strong believe in the process and products of using technology for teaching and learning and this explains the teachers level of technological readiness. Teachers' technological insecurity is the lack of trust in the ability of available technology to work properly for its intended purpose as well as the fear of integrating technology into the education curriculum (Tondeur, Scherer, Siddiq & Baran, 2017). However, technological security is the extent to which teachers are ready to protect and secure information and facilities generated through the use of technology in school. Teachers who are not able to secure the products and services produced through the use of technology depict lack of readiness to use technology for instructional delivery in the classroom. Teachers who are ready to embrace technology for instructional delivery in 21st century classroom must learn to put measures in place to protect the facilities used in the school for actualizing its intended purpose and also to ensure that the information shared in the classroom are protected and used for its particular purpose which will contribute to meaningful teaching and learning in the classroom.

Badri, Al-Rashedi, Yang, Mohaidat and Al-Hammadi (2014:258) saw teachers' innovativeness as a tendency to be a technology pioneer and thought teacher and leader both inside and outside of the classroom. Technological innovativeness on the other hand has to do with the teachers' ability to pioneer new processes and methods of using technology to achieve educational goals and objectives which are set in the classroom. Teachers must be able to develop new measures to which available can be put to use for achieving enhanced educational outcomes. Teachers' technological innovativeness helps the teacher to go beyond the *status quo* to use provided technology to solve instructional delivery problems in the classroom beyond what is known to other stakeholders.

Abuse is inevitable when the purpose of available technology in the classroom is not known. It is expected that teachers should be able to acquire the right knowledge and skills that will enable them use available technology to solve classroom problems to the advantage of both the teachers and the students. It is the level of the teachers' preparedness to use these technological devices that will determine the quality of educational objectives that can be achieved in the classroom during teaching and learning activities. The teacher as well as the students will therefore be at a disadvantage if the teacher is not technologically ready to deal with classroom instructional problems during classroom activities.

Purpose of the Study
The purpose of the study was to investigate teachers' technological readiness for instructional delivery in 21st century classroom in public secondary schools in Rivers State. Specific objectives of the study included to:

1. ascertain the level of teachers technological innovativeness for instructional delivery in 21st century classroom in public secondary schools in Rivers State
2. determine the level of teachers technological security for instructional delivery in 21st century classroom in public secondary schools in Rivers State
3. examine the level of teachers technological optimism for instructional delivery in 21st century classroom in public secondary schools in Rivers State

Research Questions

The following research questions were answered in the study:
1. What is the level of teachers' technological innovativeness for instructional delivery in 21st century classroom in public secondary schools in Rivers State?
2. What is the level of teachers' technological security for instructional delivery in 21st century classroom in public secondary schools in Rivers State?
3. What is the level of teachers' technological optimism for instructional delivery in 21st century classroom in public secondary schools in Rivers State?

Hypotheses

The following hypotheses were tested 0.05 level of significance:

Ho_1: There is no significant difference between the mean ratings of male and female teachers on their level of technological innovativeness for instructional delivery in 21st century classroom in public secondary schools in Rivers State

Ho_2: There is no significant difference between the mean ratings of male and female teachers on their level of technological security for instructional delivery in 21st century classroom in public secondary schools in Rivers State

Ho_3: There is no significant difference between the mean ratings of male and female teachers on their level of technological optimism for instructional delivery in 21st century classroom in public secondary schools in Rivers State

Methodology

Design adopted for the study was analytical survey. The population of the study was 12,496 public secondary school teachers (6,433 male and 6,060 female) in public secondary schools in Rivers State. The sample of the study was 752 comprising 377 male and 375 female teachers in these schools. The sample for the study was selected using proportionate stratified random sampling technique. The instrument used for collection of data was a 15 item questionnaire which was titled "Teachers Technological Readiness for Instructional Delivery Questionnaire" (TTRIDQ). The instrument was validated by two experts in the Department of Curriculum Studies and Educational Technology, University of Port Harcourt. The instruments' reliability was determined using Pearson Product Moment Correlation co-efficient statistic after administering the instrument twice to ten teachers outside the sample of the study within an interval of two weeks. Their responses were correlated and gave an index of 0.88. The instrument was administered by the researcher with the aid of three trained Research Assistants. Research questions raised were answered using mean and standard deviation while the hypotheses at 0.05 level of significance were tested using z-test statistic.

Results

Answer to Research Questions

Research Question One: What is the level of teachers' technological innovativeness for instructional delivery in 21st century classroom in public secondary schools in Rivers State?

Table 1: Mean and standard deviation scores on the level of teachers' technological innovativeness for instructional delivery in 21st century classroom in public secondary schools in Rivers State

S/No	Item	Male Teachers n=377			Female n=375		Teachers
		Mean	SD	Remark	Mean	SD	Remark
1	Teachers use virtual presentation for instructional delivery	2.67	0.99	High Level	2.69	0.99	High Level
2	Classroom records are electronically stored for ease of access	2.72	0.95	High Level	2.75	0.75	High Level
3	Teachers develop electronic schedules for classroom management	2.83	0.86	High Level	2.81	0.79	High Level
4	Teachers provide opportunity for students to provide electronic feedback	2.61	1.03	High Level	2.56	1.05	High Level
5	Classroom lessons are uploaded online for students to access	2.48	1.06	Low Level	2.12	1.01	Low Level
	Grand Mean	**2.66**	**0.97**	**High Level**	**2.57**	**0.92**	**High Level**

In table 1, the mean scores of the male teachers sampled for the study for items 1, 2, 3, 4 and 5 produced mean scores of 2.67, 2.72, 2.83, 2.61 and 2.48. All of the items implied high level in respect to the question items raised since their mean scores were above the criterion mean score of 2.50 used for decision making except for item 5 with mean score of 2.48 which was below the criterion mean and suggests a low level in respect to the item raised. On the part of the female teachers, the same questionnaire items showed mean scores of 2.69, 2.75, 2.81, 2.56 and 2.12. Items 1, 2, 3 and 4 equally showed high level since the mean scores were above the criterion mean score of 2.50 used for decision making while item 5 with mean score of 2.12 showed a low level in respect to the questionnaire item. Summarily, the average mean scores of 2.66 from the male teachers and 2.57 from the female teachers showed that they both believed there is a high level of teachers' technological innovativeness for instructional delivery in 21st century classroom in public secondary schools in Rivers State.

Research Question Two: What is the level of teachers' technological security for instructional delivery in 21st century classroom in public secondary schools in Rivers State?

Table 2: Mean and standard deviation scores on the level of teachers' technological security for instructional delivery in 21st century classroom in public secondary schools in Rivers State

S/No	Item	Male Teachers n=377			Female n=375		Teachers
		Mean	SD	Remark	Mean	SD	Remark
6	Digital devices assigned to teachers are safeguarded from being abused	2.19	1.03	Low Level	2.03	1.09	Low Level
7	Teachers use available software to protect classroom records from external attack	2.40	1.06	Low Level	2.69	1.03	High Level
8	Information supplied to teachers online are technically protected	1.99	0.98	Low Level	1.69	0.92	Low Level
9	Suspicious online messages are carefully blocked and discarded	2.02	0.95	Low Level	1.99	0.93	Low Level
10	Classroom applications used by the teacher are modified to fit teachers need	2.48	0.90	Low Level	2.74	0.87	High Level
	Grand Mean	**2.22**	**0.98**	**Low Level**	**2.23**	**0.97**	**Low Level**

In table 2, items 6, 7, 8, 9 and 10 were responded to by the male teachers with mean scores of 2.19, 2.40, 1.99, 2.02 and 2.48. All of the items were below the criterion mean score of 2.50 used for decision making and were adjudged to be of low level in respect to the questionnaire items raised in the study. The

responses of the female teachers to the same set of items also showed mean values of 2.03, 2.69, 1.69, 1.99 and 2.74. Items 7 and 10 with mean scores of 2.69 and 2.74 showed high level while items 6, 8 and 9 with mean values of 2.03, 1.69 and 1.99 were below the criterion mean score of 2.50 and implied a low level to the items raised. Summarily, the average mean scores of 2.22 and 2.23 from the male and female teachers sampled for the study showed that they both believed there is a low level of teachers technological security for instructional delivery in 21st century classroom in public secondary schools in Rivers State.

Research Question Three: What is the level of teachers' technological optimism for instructional delivery in 21st century classroom in public secondary schools in Rivers State?

Table 3: Mean and standard deviation scores on the level of teachers' technological optimism for instructional delivery in 21st century classroom in public secondary schools in Rivers State

S/No	Item	Male Teachers n=377			Female Teachers n=375		
		Mean	**SD**	**Remark**	**Mean**	**SD**	**Remark**
11	Teachers give students assignment that will be solve using modern technology	2.84	0.83	High Level	2.75	0.86	High Level
12	Classroom instructions are sometimes delivered using virtual devices	1.62	0.79	Low Level	2.71	0.73	High Level
13	Teachers share their digital devices with other school personnel	2.43	1.07	Low Level	2.62	0.87	High Level
14	Modern technological devices are used intermittently for classroom activities	2.66	1.02	High Level	2.52	0.98	High Level
15	Technology inclined instructional materials are used for teaching and learning	2.78	0.96	High Level	2.53	1.03	High Level
	Grand Mean	**2.47**	**0.93**	**Low Level**	**2.63**	**0.89**	**High Level**

The male teachers in table 3 responded to items 11, 12, 13, 14 and 15 with mean scores of 2.84, 1.62, 2.43, 2.66 and 2.78 while the female teachers responded to the same set of items with mean scores of 2.75, 2.71, 2.62, 2.52 and 2.53. On the part of the male teachers, items 11, 14 and 15 with mean scores above 2.50 revealed a high level while items 12 and 13 showed low level while the entire mean scores for items 11, 12, 13, 14 and 15 from the female teachers were above the criterion mean score of 2.50 used for decision making and depicted a high level. In summary, the average mean scores of 2.47 and 2.63 showed that male teachers believed there is a low level while the female teachers believed there is a high level respectively of teachers' technological optimism for instructional delivery in 21st century classroom in public secondary schools in Rivers State.

Test of Hypotheses

Hypothesis One: There is no significant difference between the mean ratings of male and female teachers on their level of technological innovativeness for instructional delivery in 21st century classroom in public secondary schools in Rivers State

Table 4: z-test analysis of no significant difference between the mean ratings of male and female teachers on their level of technological innovativeness for instructional delivery in 21st century classroom in public secondary schools in Rivers State

Variable	N	df	Mean	SD	z-cal.	z-crit.	Level of Significance	Remark
Male Teachers	377	750	2.66	0.97	1.31	1.96	0.05	H_o was not rejected
Female Teachers	375		2.57	0.92				

Table 4 indicated that the value of z-cal. of 1.31 was less than the value of z-crit. of 1.96 at 750 degree of freedom and at 0.05 level of significance. Therefore, the null hypothesis was not rejected indicating that there was no significant difference between the mean ratings of male and female teachers on their level of technological innovativeness for instructional delivery in 21st century classroom in public secondary schools in Rivers State.

Hypothesis Two: There is no significant difference between the mean ratings of male and female teachers on their level of technological security for instructional delivery in 21st century classroom in public secondary schools in Rivers State

Table 5: z-test analysis of no significant difference between the mean ratings of male and female teachers on their level of technological security for instructional delivery in 21st century classroom in public secondary schools in Rivers State

Variable	N	df	Mean	SD	z-cal.	z-crit.	Level of Significance	Remark
Male Teachers	377		2.22	0.98				H$_o$ was not rejected
		750			0.14	1.96	0.05	
Female Teachers	375		2.23	0.97				

Table 5 revealed that the value of z-cal. of 0.14 was less than the value of z-crit. of 1.96 at 750 degree of freedom and at 0.05 level of significance. For this purpose, the null hypothesis was not rejected revealing that there was no significant difference between the mean ratings of male and female teachers on their level of technological security for instructional delivery in 21st century classroom in public secondary schools in Rivers State.

Hypothesis Three: There is no significant difference between the mean ratings of male and female teachers on their level of technological optimism for instructional delivery in 21st century classroom in public secondary schools in Rivers State

Table 6: z-test analysis of no significant difference between the mean ratings of male and female teachers on their level of technological optimism for instructional delivery in 21st century classroom in public secondary schools in Rivers State

Variable	N	df	Mean	SD	z-cal.	z-crit.	Level of Significance	Remark
Male Teachers	377		2.47	0.93				H$_o$ was rejected
		750			2.41	1.96	0.05	
Female Teachers	375		2.63	0.89				

Table 6 showed that the value of z-cal. of 2.41 was more than the value of z-crit. of 1.96 at 750 degree of freedom and at 0.05 level of significance. Hence, the null hypothesis was rejected showing that there was a significant difference between the mean ratings of male and female teachers on their level of technological optimism for instructional delivery in 21st century classroom in public secondary schools in Rivers State.

Discussion of Findings
Level of Teachers Technological Innovativeness for Instructional Delivery in 21st century Classroom in Public Secondary Schools in Rivers State
The extent to which teachers can utilize the gain of technology within and outside the classroom is based on their level of innovativeness. Teachers who are ready to adopt available technology for classroom management related issues but show some level of innovation in the use of available technologies. They must be ready to manipulate existing technology for diverse classroom activities especially those that relate to instructional delivery which is fundamental to all activities carried out in the classroom. It was

revealed from the responses of the teachers sampled for the study that available technology are often used for virtual presentation of lessons, storing classroom records and scheduling classroom activities at a high level. Teachers therefore have a lot they can do when they manipulate existing technologies in the school to execute diverse instructional delivery related activities within and outside the classroom. Pisanu (2014) asserted in a related study that the integration of technology promotes innovativeness among teachers. Teachers who are technologically ready will develop new ways of applying available technology in the school for different academic and administrative purposes in the school.

Furthermore, it was revealed in the findings of the study that there is still a low level to which classroom lessons are uploaded for students to access. This no doubt deprives the teacher and the students the opportunity of sharing knowledge when necessary outside the school environment. However, Davis (2010) revealed in their study that pre-service teacher had pessimistic attitude about technology and innovation in education. It is therefore possible for some of these teachers to fail to adopt existing technology as a result of their personnel orientation and values. Such teachers will not make any attempt to improvise new measures of using existing technology to solve classroom related issues. This requires regular training and orientation in order to deal with this issue.

Level of Teachers Technological Security for Instructional Delivery in 21st century Classroom in Public Secondary Schools in Rivers State

The security of information and technological devices in schools is important for the sustainable utilization of technology at any level of education. Teachers must thereof be ready to device strategies for the protection of existing technological devices as well as the information generated and managed through them as a sign of their technological readiness. Teachers who are not ready and cannot secure available technological devices and information are by implication displaying a lack of readiness to use technology for classroom activities. Unfortunately, the responses of the teachers sampled for the study showed a low level of technological security readiness which is evident in their inability to protect digital devices and records from damage and compromise. This affects the effectiveness of the teacher in providing a 21st century quality of education through instructional delivery. Rowe, Lunt and Ekstrom (2014) revealed in their study that employees who engage in technological security provide more reliable information for school administration. Teachers who cannot imbibe the culture of technological security are therefore not technologically ready as technology is the driver of future of the education system starting from the system of instructional delivery to other educational activities within and outside the school.

The respondents of the study further revealed that they have not been able to modify existing technology to fit into their classroom need. This does not only pose a danger to the teacher but the students as well. The inability of the teacher to use available technology securely is a sign of their lack of readiness to use this vital scientific discovery for managing classroom activities. The low level of teachers' technological security among teachers is further understood from the findings of the study conducted by Simandi (2015) which showed that teachers embrace technology in a safe way but their reasons differ significantly. It is therefore important for school administrators as well as ICT experts to develop measures of using technology securely in the classroom as this will be more advantageous for instructional delivery in the classroom in today's changing society.

Level of Teachers Technological Optimism for Instructional Delivery in 21st century Classroom in Public Secondary Schools in Rivers State

Teachers who are ready to embrace technology to solve the different problems in the educational sector are those who are technologically optimistic and also technologically ready. Technological optimism refers to the willingness of the teacher to use available technology to solve educational problems. This is a sign of a teacher who is ready and willing to embrace existing technology. From the findings of the study, teachers display their technological optimism by giving students assignment in technology related areas as well as using technology based instructional materials for teaching and learning. The importance of this

practice was highlighted from the findings of the study by Fejová and Uhláriková (2018) which revealed that teachers optimist explained 30% of the variations in students' academic achievement. Teachers who are optimistic about the use of technology which is a sign of their readiness can use this device to influence the performance of their students positively during the process of instructional delivery.

However, the male teachers in their responses showed that there was a low level to which they share their technological devices with other teachers while the female teachers responded otherwise. It is therefore yet to be understood if these teachers share their devices as a way of encouraging others to adopt existing technology or fail to share this devices as a result of the importance they attach to this important teaching and learning devices. However, Badri, Al-Rashedi, Yang, Mohaidat and Al-Hammadi (2014) provided a bit of clarity when they asserted in the findings of their study that teachers demographic factors such as age, gender and experiences has some effects on their technological optimism. This implies that the teachers' personal characteristics play an important role in their technological optimism vis-à-vis technological readiness which must be positively harnessed for the achievement of the goals and objectives of education in the long run.

Conclusion
Based on the findings of the study, it was concluded that there exited a low level of teachers technological security and optimist for instructional delivery in 21st century classroom in public secondary schools in Rivers State. There was a however, a high level of teachers technological innovativeness in these schools.

Recommendations
It was recommended based on the findings of the study that:
1. Principals should institutionalize school rules and regulations that will compel teachers to shift from the traditional approach of instructional delivery to the use of modern technology for the achievement of the goals and objectives of education in this 21st century.
2. The government should collaborate with school principals to provide safety hardware, software and people ware that will be used by teachers to protect school personnel and other educational resources from damage and hard during instructional delivery for the achievement of the goals and objectives of education in the school.
3. Teachers need to be trained to be innovative and open to the use of technology for the management of classroom activities and instructional delivery in their various classrooms in especially in public secondary schools in Rivers State.

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