PHYSICS TEACHERS' PERCEPTION AND ATTITUDE TO INNOVATIVE TEACHING STRATEGIES IN SENIOR SECONDARY SCHOOLS OF KWARA STATE

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Abstract
This study investigated physics teachers' perception and attitude to innovative teaching strategies in Senior Secondary Schools in Kwara State. The sample consisted of 141 physics teachers from 80 schools. The instrument used was an adapted questionnaire titled 'Teachers Questionnaire on Physics Innovative Strategies Attitude and Perception' (TQPISAP). Data collected were analysed using basic descriptive methods, t-test and Analysis of Variance. The results showed that physics teachers' attitude and perception of innovative teaching strategies are positive and good respectively. Gender had no influence on perception. Male teachers had more positive attitude towards innovative teaching strategies than their female counterparts. Teachers' experience also had significant influence on attitude to innovative teaching strategies. The study recommended training for physics teachers in the area of innovative teaching strategies. Results obtained on teachers' perception and attitude would form a good platform for further research in physics towards good performance and effective nurture of students' talents for creativity and innovation, the core of capacity building in science and technology.

Keywords: *Physics Teachers, Perception, Attitude, Innovative Teaching Strategies.*

Introduction

Increasing rate of the unemployed population of Nigerians calls for science teachers' innovation and creativity to nurture talents and enhance students' learning for career building and market competitiveness. Science, especially Physics is not a study for its own sake, but for the sake of the contribution to the society (Namrata, Singh and Amrita, 2014). Research has shown that meaningful engagement of Physics translates to technological manpower and national growth (Benneth, 2005: Milićević & Pecić, 2016).

Despite the relevance of physics to scientific, technological and innovative development of a nation, available results show that students' performance is very low in Physics (Aina, 2013; Mekonnen, 2014). According to Barros and Elia (2012), in their separate studies, poor teachers' classroom attitudes as well as teachers' inability to carry out innovations of new curricula and methodologies among others are responsible for students' low performance. It is worthy to note that as teachers in developed countries are evolving new ways of improving educational instructions in Physics, their counterparts in Nigeria are yet to conform to the best global practices in teaching innovations (Samba, Emmanuel & Ogbeba, 2010). Consequently, this has led to a perennially low achievement in Physics in the West African Senior School Certificate Examination (WASSCE) conducted by West African Examinations Council as analysed by Apata (2013). Over the years, the Chief Examiners' reports in May/June WASSCE also revealed that most of the students performed poorly. The weaknesses found in Physics students include: lack of problem solving strategies; inability to express ideas logically in clear terms; inadequate knowledge of fundamentals of physics; and lack of calculative skills among others (WAEC, 2010; 2011; 2012; 2013 and 2014).

Ganyaupfu (2013) asserted that the teacher-centered conventional teaching method currently being employed does not apply activity based learning to encourage students to learn solving real life problems. Therefore, students are deprived of the valid knowledge that is crucial to functioning effectively at the labour market. Similarly, Ogbeba (2009) remarked that science teachers in Nigeria probably do not make use of innovative teaching strategies to be able to cope with some specific difficulties associated with teaching and learning of Physics. Yanfang (2016) opined that students learn too little of what is taught using the conventional teaching method. Therefore, there is need to change the methods of teaching and learning of Physics in line with global best practices in teachers' creativity and innovations.

Innovation is the strategy for redesigning programmes through excellent teaching methods, practices, techniques and technology to motivate students in learning. Many innovative instructional methods that are being used or studied include the Interactive Lecture Demonstrations (ILDs), which integrates experiment into a carefully structured interactive format. It improved learning of Physical concepts in physics topics among students who traditionally had less success in Physics (Thornton, 2017). Also, the Peer Instruction, in which students are given leadership roles in the classroom teaching, have been found beneficial to students' learning (Ogunleye & Bamidele, 2013). Students can also be quizzed to check if they have read but not graded on the emergent understanding. It provides a rich archive of common student difficulties for further teaching (Mazur, 2006). The Just-in-Time Teaching (JiTT), which provides structured opportunities for students to actively construct new knowledge from prior knowledge (Brame, 2013). Additionally, it enables students build connections between the information they know and what they learned (Cox, 2017). The Active Learning Problem Sheets, which involve three stages namely, the overview where students construct a qualitative understanding of material using diagrams and graphs, followed by exposition, when students learn how a problem may be represented with multiple tools like qualitative descriptions and mathematical equations, while the last stage is the case study, which demands students' application of the knowledge acquired in the first two stages (Heuvelen, 1991). The use of these innovative teaching strategies and perhaps other tested strategies, is important to meet the educational needs of students for capacity building in science and technology (Salwa, 2010).

Capacity building is the process by which individual and organizations obtain, improve, and retain the skills and knowledge needed to do their jobs competently (Wikipedia). Therefore, capacity building is a pre-requisite to functioning well in the labour market. Teachers' proficiency in the selection and usage of the innovative strategies determines the resultant degree of positive learning that takes place, a major contributor to capacity building in science and technology.

Attitude characterizes human beings in intra-personal and social relations. Ulug, Ozden, and Erylimaz (2011) asserted that teachers' positive attitudes had positively influenced students' personality as well as their life performances. Apata (2016) and Abulude (2016) showed that both the teachers and students had a negative attitude to numerical problems while Ogunleye and Oladehin (2012) documented students' poor attitude to Basic Science which is a prerequisite to the study of science subjects including Physics. On awareness and attitudes of science teachers to integrating innovations into their teaching, Apata (2018) had established that this was a serious issue begging for attention in Nigerian schools. From attitude therefore, comes a pattern of behaviour of teachers in their perception towards the innovative strategies in the teaching. Schunk (2000) explained that perception is basically to attach personal meanings to internal and environmental inputs received through the senses and neural impulses. Olafare (2014) highlighted customs, habits, education, motivation, gender and area of

specialization as factors that influenced perception. This means that the perception of an individual is as a result of the influence of all or any of the itemized factors.

Statement of the Problem

Teachers used the same traditional method that make students learn too little for today Physics teaching (Rawatee, 2014; Yanfang, 2016). Consequently, there is a perennially low achievement in Physics. Teachers' attitude and inability to carry out innovations of new curricula and methodologies were linked with students' low achievement (Barros & Elia, 2012). Therefore, this study was initiated to investigate the Physics teachers' perception and attitude to innovative teaching strategies and some underlying factors.

Research Questions

1. How do Physics teachers perceive innovative teaching strategies in classroom instruction?
2. What is the attitude of Physics teachers towards innovative teaching strategies?

Research Hypotheses

Ho_1: There is no significant difference in the perception of innovative strategies between male and female Physics teachers.

Ho_2: There is no significant difference in the attitudes of male and female Physics teachers towards the use of innovative teaching strategies.

Ho_3: There is no significant difference in perception of innovative strategies according to years of teaching experience of the Physics teachers.

Ho_4: There is no significant difference in Physics teachers' attitude towards innovative teaching strategies based on years of teaching experience.

Methodology

The study is a descriptive survey design involving the use of structured questionnaires (Okechukwu, *et al*., 2006). This study was aimed at eliciting teachers' ratings on the Physics teachers' perception and attitude to innovative strategies in the teaching of Physics. The population for this study consists of all Physics teachers in Senior Secondary Schools in Kwara State, Nigeria. The sampling procedure adopted was a purposive sampling technique based on availability of graduate Physics teachers and well-equipped Physics laboratories. 80 schools with 141 Physics teachers that met the criteria for the study were purposively selected.

The instrument used for the research was tagged 'Teachers Questionnaire on Physics Innovative Strategies Attitude and Perception' (TQPISAP) containing 32 items, an adapted questionnaire from Lowenstein and Bradshaw (2004) to determine the teachers' attitude and perception towards innovative teaching strategies in Physics. The questionnaire contains two major sections. The items in both sections were formulated on a four-point rating scale of very great extent (4 points), high extent (3 points), low extent (2 points) and very low extent (1 Point). The teachers' perception of their use of innovative strategies was interpreted using the following real limit numbers 3.50 – 4.00= very great extent, 2.50 – 3.49 = high extent, 1.50 – 2.49 = low extent and 0.50 – 1.49 = very low extent. This is in line with Likert in Kerllinger (1973) and Ogunleye (2008). The instrument was validated by two experts in Physics education and measurement and evaluation. Also, the instrument was trial-tested and the reliability of the instrument was also carried out using the Cronbach method which yielded alpha values of 0.78. Data collected were analyzed using mean and standard deviation to answer the two research questions. The hypotheses were analyzed using t-test and ANOVA.

Results

Research Question 1: How do Physics teachers perceive innovative teaching strategies in classroom instruction?

Table 1: Mean Rating and Standard Deviation of Teachers' Perception of Physics Innovative Teaching Strategies.

S/N	Questionnaire Items	Mean	Std. Dev	Decision
1	Knowledge of using innovative strategies would result in student center learning.	2.80	1.16	HE
2	Innovative strategies could establish an innovative climate in the classroom that care for changes students' will face after school.	3.26	0.91	HE
3	The use of innovative strategies could be used to complete technological tasks that were previously not possible for the students.	3.80**	0.49	VGE
4	Peer instruction could foster students interaction and same time refocus their attention on the subject matter.	2.92	0.89	HE
5	Peer instruction could provide a rich archive of common students' difficulties for further developmental work.	2.23	0.86	LE
6	Interactive method could transform the traditional teaching method into an active learning environment.	2.30	0.88	LE
7	Just-in-Time teaching method could provide the teachers a mechanism for tracking what individual students know and think.	2.12	0.89	LE
8	Innovative strategies could reinforce feedback loop.	3.19	1.03	HE
9	Innovative strategies could reinforce rapid response system from the students.	3.34	0.78	HE
10	Interactive Tutorials could help address common misconceptions during instructions	2.80	0.87	HE
11	Activity Based Physics Tutorials could help students create their own innovations for solving problems quantitatively.	2.57	0.84	HE
12	Studio physics could eliminate the time gap between information provided by lecture and its application.	3.72**	1.25	VGE
13	The use of innovative strategies could help to provide diverse information sources in teaching.	4.00***	0.69	VGE
14	Cooperative Problem-Solving could help students solve more complex problems.	2.80	1.16	HE
15	Cooperative Problem –Solving helps students resolve their misconception.	3.80**	0.49	VGE
16	Workshop physics is designed to provide technical training within the classroom.	3.46	1.33	HE
17	Studio Physics helps students perform experiments during instruction.	2.19	1.29	LE
18	Scale–up physics could be used to facilitate interactions between teams of students, while they are deeply involved in the material they are studying.	3.11	1.36	HE
19	Technology Enhanced Active Learning (TEAL) could be used to create rich collaborative learning experience by merging lectures,	3.73**	1.37	VGE

	simulations, and hands-on desk experiments.

Cluster Mean = 3.07

Key: VGE = Very Great Extent. HE = High Extent. LE= Low Extent.

Result presented in Table 1 shows the mean and standard deviations of respondents on the extent of physics teachers' perception of Innovative Teaching Strategies. The result show that items 1,2,3,4,8,9,10,11,12,13,14,15,16,18 and 19 had mean ratings of 2.80, 3.26, 3.80, 2.92, 3.19, 3.34, 2.80, 2.57, 3.72, 4.00, 2.80, 3.80, 3.46, 3.11 and 3.73. Since the mean ratings are above 2.50 on the real limit number set as criterion level for accepting an item as positive i.e high extent, this means that the respondents' perceptions of these items are positive. However, the respondents have negative perception for items 5,6,7 and 17 on innovative teaching strategies

Research Question 2: What is the attitude of Physics teachers towards innovative teaching strategies?

Table 2: Teachers' Response on attitude towards innovative strategies in teaching physics.

S/N	Questionnaire items	X	Std. Dev.	Decision
1	I enjoy teaching physics with innovative strategies.	3.00	1.07	HE
2	I would work harder if I could use innovative strategies more often to teach physics students.	2.95	0.79	HE
3	I believe that innovative strategies will enable me teach from simple to complex.	3.27	1.08	HE
4	I think innovative strategies are very easy to use in teaching the physics students.	2.95	1.36	HE
5	Innovative strategies would assist me keep pace with the changing milieu.	2.40	1.53	LE
6	Innovative strategies are user friendly in teaching physics students.	2.68	1.59	HE
7	Innovative strategies would enable student center learning	2.77	1.44	HE
8	I want to learn more about innovative strategies so as to make my students be more comfortable with the learning of physics.	3.27	1.20	HE
9	Knowing how to use innovative strategies to teach physics students is a worthwhile skill.	2.68	1.39	HE
10	I feel innovative strategies will increase my knowledge about practice and technology.	3.38	0.97	HE
11	The challenge of learning about innovative strategies to teach physics students is exciting.	3.05	1.36	HE
12	Innovative strategies would increase my productivity and help me address the needs of students.	3.38	0.97	HE
13	Innovative strategies would enable me focus more on entrepreneurship that prepare students to work in large organizations	2.19	1.29	LE

Cluster Mean = 2.92

Key: VGE = Very Great Extent. HE = High Extent. LE= Low Extent.

Result in table 2 shows the mean and standard deviations of respondents on attitude to innovative strategies in teaching Physics. Result showed that items 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, and 12 had mean ratings of 3.00, 2.95, 3.37, 2.95, 2.68, 2.77, 3.27, 2.68, 3.38, 3.05, and 3.38. Since the mean ratings are above 2.50 on the real limit numbers of set criterion level for accepting an item as positive i.e high extent, this implies that the respondents have positive attitude. However, the respondents showed negative attitude to items 5 and 13. The clusters mean of 2.29 indicated that the respondents generally have positive attitude.

Research Hypothesis 1: There is no significant difference in the perception of innovative strategies between male and female Physics teachers.

Table 3: t-test of male and female physics teachers' perception of innovative strategies in physics

Variable	N	Mean	SD	SE	DF	t-cal	P
Male	83	14.59	5.194	0.570	139	-1.463	0.146
Female	58	15.72	3.349	0.439			

Significant at 0.05 alpha levels

Table 3 shows that female physics teachers obtained marginally high mean score in perceived use of innovative strategies (Mean = 15.72; SD = 5.194) than their male counterparts (mean = 14.59; SD = 3.349). However, t-test indicated there is no significant difference (t = -1.463; df = 139; P>0.05). The null hypothesis, which states that there is no significant difference between male and female Physics teacher in their perceived use of innovative strategies is upheld.

Research Hypothesis 2: There is no significant difference in the attitudes of male and female Physics teachers towards the use of innovative teaching strategies.

Table 4: t-test of attitudes of male and female teachers towards innovative strategies

Variable	N	Mean	SD	SE	DF	t-cal	P
Male	83	48.18	4.055	0.445	139	13.194	0.00
Female	58	38.16	4.941	0.649			

Significant at 0.05 alpha levels

From the data shown in Table 4, the mean score of male physics teachers is higher in attitude (mean = 48.18; SD = 4.055) than the female Physics teachers (mean = 38.16; SD = 4.941). This difference is significant (t = 13.194; df = 139; P<0.05). The null hypothesis, which states that there is no significant difference between the attitudes of male and female Physics teachers towards the use of innovative teaching strategies, is therefore rejected.

Research Hypothesis 3: There is no significant difference in perception of innovative strategies according to years of teaching experience of the Physics teachers.

Table 5: Descriptive of perception of Innovative Strategies by Physics Teachers and Experience

Experience	N	Mean	Std. Deviation	Error
0 – 4years	30	14.83	3.67736	0.67139
5 – 9years	43	17.23	2.32827	0.35506
10years and above	68	13.78 5.	40825	0.65585

Table 5 shows that teachers with 5-9 years of experience had highest score in perception, followed by those with 0-4 years while the most experienced teachers had poorest perception on innovative strategies.

Table 6: ANOVA Table of Perception by Years of Teaching Experience

Source	Sum of Squares	df	Mean Square	F	P
Between Groups	316.014	2	158.007	8.453	0.00

Within Groups	2579.532	138	18.692
Total	2895.546	140	

Results on Table 6 revealed that the calculated F value of 8.453 represents a significant difference because .000 significance level is less than 0.05 alpha levels. This shows that there is a significant difference according to years of experience, in perceptions of teachers to innovative teaching strategies. Therefore, the null hypothesis is rejected.

Research Hypothesis 4: There is no significant difference in Physics teachers' attitude towards innovative teaching strategies based on years of teaching experience.

Table 7: Descriptive of Physics Teachers' Attitude towards innovative strategies by teaching experience

Experience	N	Mean	Std Dev.	Std Error
0 – 4years	30	51.133	2.44573	0.44653
5 – 9years	43	46.465	2.27145	0.34639
10years and above	68	39.411	6.18432	0.74996

Table 7 shows the result of the descriptive statistics which revealed difference between teachers' years of experience and their attitude towards innovative teaching strategies. It is shown that the teachers' attitude on the basis of their teacher's years of experiences were 0 – 4years (51.13), 5 – 9years (46.47), and 10years & above (39.41). This implies that the lower the teachers' years of experience the higher their attitude towards the innovative teaching strategies.

Table 8: ANOVA of Physics Teachers' Attitude towards innovative strategies by teaching Experience

Source	Sum of Squares	df	Mean Square	F	P
Between Groups	3218.911	2	1609.456	76.223	0.000
Within Groups	2952.635	138	21.392		
Total	6171.546	140			

The ANOVA results in the table reveals that there is significant difference in Physics teachers' attitude towards innovative teaching strategies considering the years of teaching experience ($F_{(2,138)}=76.223$, $P<0.05$); the hypothesis is rejected.

Discussion of Findings

Results from the study indicated that physics teachers are positive in perception of innovative teaching strategies. Reasons might stem from being in the era of mobile technology, where information can be sourced through internet at any time. Also, teachers might have realize the importance of the strategies in motivating and engaging students for learning as claimed by Thom (2013), who asserted that innovative teaching makes teaching exciting and fun, engages students, and mostly help students find the passion and resources necessary to design a life for themselves and others.

It was found that Physics teachers' shows positive attitude to innovative strategies. The perennially poor performance in Physics' external examinations has left teachers with no choice but to migrate from the teacher - centered methods of teaching, to students - centered methods that will enhance learning in all dimensions for capacity building.

Also, there is no significant difference between male and female teachers perceived use of innovative teaching strategies. This is in agreement with Isah, Olorukooba and Usman (2013) who found no significant relationship between male and female in terms of pedagogical skills in teaching the subject. Findings show that the male teachers had a more positive attitude than their female counterparts. This result corroborated the report of Tearle (2004), who observed that gender may influence individual attitude towards their voluntary participation in the use of technology.

The study found that the lower the year of experience, the higher the attitude towards the use of innovative strategies. This finding is in line with the report of Ruthven, Hennessy, & Brindly (2004) who opined that the older felt more intimidated by the new technology than the younger generation. Additionally, the less experience are usually within the youth age bracket that fall within the generation of computer literate that can explore the internet, for more knowledge in innovation teaching strategies. However, the present findings is in contrast to the report of Gbadamosi (2013), who found that teachers experience have no effect on the attitude towards the usage of innovative strategies.

It was also found that experience had significant influence on perceived use of innovative teaching strategies, in favour of 5 – 9years. This might be because, the 0 – 4year experience, being junior staff might not be privileged to enjoy seminars, workshop, symposium and in-service training that are innovative teaching oriented. While the senior staff in the category of 10years and above, might be overwhelm with administrative functions, and therefore delegates the 5 – 9years to always represent them in such pedagogical educative meetings, which consequently give this category edge in perceived use of technology.

Conclusion

It can be concluded that, no significant difference exists between male teachers and female teachers' perception of innovative teaching strategies. However, attitude towards innovative strategies revealed significant difference in favour of male Physics teachers. Also, experience influenced both the perceived use of and attitude to innovative teaching strategies.

Recommendations

Based on the findings and conclusions of the study, the following recommendations are made:

i. In-service training, seminars and workshop, symposium that are innovative teaching strategies oriented should be organised for physics teachers to promote their perception, attitude for good performance needed for capacity building in science and technology.
ii. Teachers of Physics should update their knowledge of pedagogical practice through science educational research in contemporary issues and visit sites on the internet to be abreast with the world best practices that breeds future career in science and technology.

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