Perception of Physics Teachers' Pedagogical Content Knowledge on Students Academic Achievement in Ankpa Local Government Area of Kogi State.

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Abstract- The research was conducted to explore the perception of the pedagogical content knowledge of physics teachers on the academic performance of the students in Ankpa local government area of Kogi State.. The study population will include sixty five(65) Physics teachers and one thousand two hundred(1200) physics students in the secondary schools within Ankpa Local Government Area. The population used was ten (10) physics teachers and 100 SS I students in ten (10) secondary schools in the Ankpa Local Government Area of Kogi State. To direct the study, four(4) research questions were put. The research design was the Observational Schedule of Physics Teachers Pedagogical Content Knowledge (OSPCK), and Questionnaire on Effect of Physics Teachers Pedagogical Content Knowledge on students academic performance in physics (QEPTPCK) designed by the researcher collected the data. Arithmetic mean (x) and standard deviation (S.D) were used in the analysis of data collected to respond to the research questions. The results of the research showed that pedagogical content knowledge and physics teachers content knowledge had great influence on the academic performance of the students. It was suggested that among others Physics teachers should be motivated to participate in regular professional development programs that improve their pedagogical and content knowledge. The innovative methods and strategies of teaching can be offered to teachers through workshops, seminars, and training.

I. INTRODUCTION

Secondary education has remained a major gateway to higher education and employment for those who may not proceed beyond that level. Most citizens attending schools have thus not considered themselves to have been sufficiently prepared to function in Nigerian society until they have graduated from secondary schools. Successful completion, and particularly having credit passes in Physics are necessary for all science secondary school graduates. Policy on education has made these subjects compulsory to be offered and passed, as well as being required to advance to higher levels of education. There is, however, unsatisfactory performance in certificate examinations at this level as the rate of failure has been considered high by stakeholders. The high rate of students' failure in Senior Secondary Certificate Examinations (SSCE) has become a perennial source of worry to all stakeholders in the education sector in Nigeria. The same is true of its equivalents, such as the General Certificate Examination (GCE), and the University Tertiary Matriculation Examination (UTME). The factors suggested as contributing to the poor performance of students in Physics include inadequate laboratories and laboratory facilities, mathematical nature of Physics students' negative attitudes towards physics, poor teaching strategy among others (Adeyegbe,2015). Physics students encounter difficulties with regard to conceptual understanding of physics topics, and this has been attributed to the teacher's inadequate knowledge and hence the teacher's poor knowledge of relating and connecting Pedagogical Content Knowledge components (Rollnick & Mavhunga, 2014).

Pedagogical content knowledge (PCK) is the blending or amalgamation of pedagogy and subject content knowledge and was introduced by Shulman in the 80's. According to him, PCK was not something new because even as early as in the 1950's, both content and pedagogy were regarded as one indistinguishable body of knowledge whereby content is about what is known and pedagogy is about how to teach it. The reason why Shulman introduced

PCK was that teaching career is often perceived as a non-professional career when compared to careers like lawyer, doctor and engineer. In Malaysia, individuals with no teaching qualification were employed as temporary teachers to overcome the shortage of trained teachers in the schools. Such practice further proves the non-professional status of a teacher. As the saying goes 'those who can, do, those who can't, teach', it means people who are able to do something well can do that for a living, while people who are not able to do anything that well make a living by teaching (McGraw-Hill Dictio The proverb was used to disparage teachers. To exacerbate the status of teachers, it was reported that teachers in Malaysia lack of pedagogical preparation (Lee, 2014).

Studies on PCK in different countries examined its nature, models, measurements, teacher‟s perspective of it, factors affecting it, its components and correlation with other knowledge domains, yet the speculation of many teachers on teaching by relating the components of PCK is limited (Park & Chen, 2012). Locally in Nigeria, the concept of PCK in Physics is still new as very little has been done on it. While the students' poor conceptual understanding of physics concepts persists as is reflected in their performance in external examination results (Chief Examiners Report of WAEC 2015 & 2020). It is obvious that the nature of physics teachers' PCK which is a measure of how they integrate the components in other to transform their content knowledge into forms or ways that facilitates physics student conceptual understanding needs to be visited.

Teaching any subject is a highly complex cognitive activity in which the teacher must apply knowledge from multiple domains. Teachers with differentiated and integrated knowledge may have a greater ability than those whose knowledge is limited and fragmented. Teaching is a process of delivering knowledge between teachers and students. This process involves planning, implementation, evaluation, and feedback (Shahabuddin, Rohizani & Mohd-Zohar, 2013). It requires thorough planning to produce effective teaching which will consequently lead to effective learning in the classroom. In any profession, there is specialized professional knowledge that makes it unique and distinct with striking features entirely different from other professions. One of the characteristics of good teachers is that they possess a substantial amount of specialized knowledge for teachers known as pedagogical content knowledge.

According to Jacob (2020), pedagogy has been the focus of most teaching research 1960s and 1980s; which consists of general knowledge, beliefs, and skills related to teaching. It includes knowledge of the principle of instruction, and knowledge and skills related to classroom management. Teaching is a multifaceted human endeavor, involving a complex, moment-by-moment interplay of different categories of knowledge. Teachers' knowledge, pedagogical competence, and reasoning are keys to improving student learning achievement.

The success or failure in the process of teaching a particular concept lies in the pedagogical approach adopted by the teacher, without which the teaching would appear to the students as what Hiebert (2013) had noted—the deficiencies of the traditional approach which is a contrast to the pedagogical knowledge. Actual teaching should not only contain the teacher's skillful demonstration of his/her knowledge but should also include the ability to guide the students to understand meaningfully the content of the knowledge. This shows the importance of PCK in instruction in any classroom. Recent research in science subjects pointed toward teachers' pedagogical content knowledge (PCK) as one of the most influential factors contributing to students' learning and achievement (Gess-Newsome, 2013). It can be assumed that higher levels of PCK allow teachers to devise learning environments that challenge and at the same time support students' learning processes, with highly knowledgeable teachers being able to anticipate students' difficulties and adaptively respond when students encounter problems.

According to Shulman(cited by Jacob,2020), "PCK is the blending of content and pedagogy into an understanding of how particular topics, problems, and issues are organized, represented, and adapted to the diverse interests and abilities of students and presented for instruction." Since Shulman‟ discovery of the concept of PCK, scholars have worked on the concept and consequently, the concept has been interpreted in multiple ways according to different scholars and research agenda, each pointing to a different quality, characteristic, context, attribute, behavior, etc. (Park & Oliver, 2018). As varied as the works of scholars and their construct of PCK, so are their views on the components of PCK. In spite of the varied construct and components, the blending of components in the context of facilitating student learning is the key to conceptualizing PCK (Park & Oliver, 2018). They also agreed that effective teaching takes place when PCK components are integrated in a coherent way because they interact in a highly complex way (Laughran, Berry & Mulhall, 2016; Van Driel, et al, 2012; Park & Oliver, 2008). Given the importance of the coherence among the components, many researchers have explored how the components interact with one another to shape the whole structure of PCK However, those studies have focused on only one or two components, examining how a particular component is related to another component (e.g., Cohen & Yarden, 2009; Veal & Kubasko, 2003), or how the development of one component influences a teacher"s whole PCK and practice (e.g., Kamen, 1996; Matese, 2005).

Physics which is one of the core sciences is crucial to understand the world around, world inside and world beyond us. Physics is the bedrock of science and technology because many of the tools on which the scientific and technological advancement depends, are the direct products of physics. The principles of physics have been widely used for various scientific and technological advancement such as in information Technology, which has reduced the world to a global village through the use of satellite and computers. Despite the importance of Physics to the scientific and technological development of our nation, understanding of the subject had dwindled over the years and performance of the enrolled students has not been encouraging. It is based on this that, this study attempted to investigate the perception of physics teachers' pedagogical content knowledge on students academic achievement in Ankpa local government area of Kogi state.

II. STATEMENT OF THE PROBLEM

The poor performance of students in physics in Nigeria has been a cause for concern. Physics is a core science subject and a prerequisite for admission into many science-based courses at the tertiary level. Despite the importance of the subject, the performance of students in physics has been consistently poor over the years, especially in national examinations. This has resulted in a decline in the number of students taking physics in senior secondary schools, and a low enrolment in physics-related courses in tertiary institutions. The factors responsible for the poor performance of students in physics are multifaceted, ranging from inadequate teaching materials, inadequate infrastructure, poor teaching methods, students' negative attitude towards the subject, and a lack of qualified and experienced physics teachers. . It is due to this that this study is proposed to determine the image of the pedagogical content knowledge of physics teachers on the student academic performance in Ankpa local government area of Kogi state.

III. PURPOSE OF THE STUDY

This study will attempt to research the Perception of pedagogical content knowledge by physics teachers on students academic achievement in the Ankpa local government area of Kogi state.The particular objectives of the research will be to:
1. Identify the amount of pedagogical content knowledge of physics teachers in the Ankpa Local Government Area in Nigeria.
2. Research the impact of discussion method of teaching on performance of students in physics?
3. Discuss the implication of demonstration method of teaching on academic performance of students in physics?
4. What is the impact of lecture method of teaching on the academic performance of students in physics?

IV. RESEARCH QUESTIONS

The questions that the research would attempt to answer are;
I. How knowledgeable are Physics teachers regarding the use of innovative teaching strategies to teach physics?
II. How does the discussion method of teaching impact the performance of physics students?
III. What are the impacts of demonstration method of teaching on the performance of students in physics?
IV. How does lecture method of teaching affect academic performance of learners in physics?

V. SCOPE OF THE STUDY

The researcher sampled 10 physics teachers and 100 SS I students of 10 secondary schools in the Ankpa Local Government Area in Kogi State. The schools sampled are:
i. Elite Foundation College, Ankpa
ii. Excellent Glory Secondary School, Ankpa

iii. Government Day Secondary School, Inye
iv. Demonstration Secondary School
v. Joseph Akagwu Memorial International College
vi. Enjema Community Secondary School, Ofugo
vii. Inye Community Secondary School, Inye
viii. Community Secondary School, Ejinya-Efofe
ix. Ika Community Secondary School, Ika
x. Comprehensive High School College, Odogomu

SIGNIFICANCE OF THE STUDY

The study will introduce teachers to innovative teaching strategies that can improve the teaching and learning of physics in secondary school. The study will also help in improving learning and academic achievement of the students. The innovative pedagogy will also help in making physics more interesting than before. The study will also help government and relevant professional agencies to organise workshop, seminars and conferences to address the innovative techniques of physics teaching. The study will also add to the existing research and theories on pedagogical content knowledge.

DELIMITATION OF THE STUDY

The study is delimited to Perception of physics teachers' pedagogical content knowledge on students academic achievement. The study is limited to secondary schools in within Ankpa Local Government Area.

DEFINITION OF TERMS

Pedagogical Content Knowledge (PCK): Pedagogical Content Knowledge refers to the specialized knowledge and skills that teachers possess to effectively teach a specific subject or content area.

Physics: Physics is a branch of science that focuses on the study of matter, energy, and the fundamental principles that govern the physical universe.

Teacher: A teacher is an individual who imparts knowledge, skills, and values to students through instruction and educational activities.
Teaching: Teaching is the process of conveying information, concepts, skills, and values to others, typically in an educational setting.

Academic Performance: Academic performance refers to a student's achievements and success in an educational setting, typically measured by their grades, test scores, and overall accomplishments in coursework or academic activities.

RESEARCH DESIGN

This research employed a descriptive survey research design. The design employed the use of observation by using a four-point rating scale on pedagogical content knowledge and skills of physics teachers during interaction with students.

A descriptive survey design is an approach of descriptive research that blends quantitative and qualitative data to provide relevant and accurate information (Voxco.com).

AREA OF THE STUDY

The study was carried out in Ankpa Local Government Area of Kogi State. Ankpa is a Local Government Area in Kogi State, North Central Nigeria. Its headquarters are in the town of Ankpa the north of the area at 7°22’ 14”N 7°3’31′E. It has an area of 1,200 km^2 and a population of 267,353 at the 2006 census. As of 2016, the population grew to 359,300. Most locals are predominantly Igala speaking people. The LGA also hosts a number of markets where a plethora of commodities are bought and sold. Farming also thrives in the LGA with the area having fertile lands on which a number of crops such as yam, cassava, and maize are cultivated.

POPULATION OF STUDY

The population for the study comprise of sixty five (65)Physics teachers and one thousand two hundred(1200) physics students in secondary schools in Ankpa Local Government Area. At the period of this research, there were forty one (41) senior secondary schools (23 public schools and 18 private schools) in the area under study(https://kogistate.gov.ng)

SAMPLE AND SAMPLING TECHNIQUE

A simple random sampling technique was used to select the schools that formed the population of the study. Simple random sampling is a type of probability sampling in which the researcher randomly selects a subset of participants from a population.(Thomas & David,2017). The sample comprised 10 physics teachers and 100 SS I students from ten (10) secondary schools in Ankpa Local Government Area of Kogi State. The schools sampled are:

xi. Elite Foundation College, Ankpa
xii. Excellent Glory Secondary School, Ankpa
xiii. Government Day Secondary School, Inye
xiv. Demonstration Secondary School
xv. Joseph Akagwu Memorial International College
xvi. Enjema Community Secondary School, Ofugo
xvii. Inye Community Secondary School, Inye
xviii. Community Secondary School, Ejinya-Efofe
xix. Ika Community Secondary School, Ika
xx. Comprehensive High School College, Odogumu

INSTRUMENT FOR DATA COLLECTION

Observational Schedule of Physics Teachers' Pedagogical Content Knowledge (OSPTPCK) and Questionnaire on Effect of Physics Teachers Pedagogical Content Knowledge on Students Academic Performance in Physics (QIPTPCK) developed by the researcher were used for data collection. OSPTPCK was used to determine the pedagogical content knowledge of the physics teachers. The Observational Schedule of Physics Teachers' Pedagogical Content Knowledge (OSPTPCK) consists of several statements related to the indicators of pedagogical content knowledge and students' academic performance in Physics.

Furthermore, the OSPTPCK consist of statements about the knowledge of the content materials, utilization of learning media, implementation of learning strategy, the way to understand student's characters and background, and the knowledge of how to manage the classroom.

The QIPTPCK contains twenty four (24) items to elicit responses on the effect of PCK of teachers on students performance in Physics. The questionnaire is a 4-point rating scale with the following options:

Strongly Agreed(SA) - 4 points
Agreed (A) - 3 points
Disagreed (D) - 2 points
Strongly Disagreed(SD) - 1 point

The respondents are to tick or mark the option that best suit their opinion for each item.

VALIDITY OF INSTRUMENT

The Observational Schedule of Physics Teachers' Pedagogical Content Knowledge (OSPTPCK) and Questionnaire on Effect of Physics Teachers Pedagogical Content Knowledge on Students Academic Performance in Physics (QEPTPCK) were content and face validated by three(3) Physics lecturers from Kogi State College Of Education, Ankpa. On the basis of their comments and correction, modified OSPTPCK and QIPTPCK were used for the study.

RELIABILITY OF INSTRUMENT

The Observational Schedule of Physics Teachers' Pedagogical Content Knowledge (OSPTPCK) and Questionnaire on Effect of Physics Teachers Pedagogical Content Knowledge on Students Academic Performance in Physics (QIPTPCK) were pilot tested in Evergreen International College, Okpo. The scores generated from their responses were used to establish the reliability of the questionnaire items. The OSPTPCK yielded a Spearman' rho reliabilty coefficient of 0.77, while the QIPTPCK produced a reliability coefficient of 0.81.

METHOD OF ADMINISTRATION OF INSTRUMENT

The Questionnaire on Effect of Physics Teachers Pedagogical Content Knowledge on Students Academic Performance in Physics (QIPTPCK) was administered to the sampled students to elicit their responses on the effect of Physics Teachers PCK on their performance and interest in Physics. The Observational Schedule of Physics Teachers' Pedagogical Content Knowledge (OSPTPCK) was administered to the sampled physics teachers to determine their pedagogical content knowledge.

METHOD OF DATA ANALYSIS

The data collected were analysed by using arithmetic mean (x) and standard deviation (S.D) to answer the research questions posed.

For decision rule, mean of 2.50 served as a baseline for accepting or not accepting an item in research question Any score that is above 2.50 mean value was accepted as agreed and anyone that is below 2.50 was accepted as disagree.

VI. DATA PRESENTATION, ANALYSIS AND DISCUSSION

In this chapter, the data obtained during the study from the Questionnaire and Classroom Observation Checklist administered were analyzed using mean(x) and standard deviation(Sd.) to answer the research questions posed.

Research Questions

Research Question 1: What is the level of Physics teachers' knowledge about innovative teaching strategies for teaching physics?

Table 1: Level of Physics Teachers knowledge about innovative teaching strategies for Teaching Physics.

S/N	ASPECT	INDICATOR	SA (4)	A (3)	D (2)	SD (1)	X	Sd.	$x_{avr.}$	Sd. $_{avr}$	Decision
1	Knowledge about students and their characteristics	a) Identification of students' learning characteristic	3	4	2	1	2.9	3.2			Agree
		b) Ensre that students get the same chances in the learning process	2	5	1	2	2.7	3.30			
		c) Manage the class situation to give the same learning chances in all students	3	4	3	0	3.0	3.24	2.82	3.15	
		d) Identify the causes of a bad habit	2	6	1	1	2.9	3.12			
		e) Assist the students' abilities	3	3	2	2	2.7	3.2			
		f) Focus on the students' physical weaknesses during the learning process	2	4	3	1	2.7	2.82			
2	Knowledge about learning materials and principles	a) Analyze learning materials to determine the difficulties	3	3	3	1	2.8	3.11			
		b) Ensure the comprehension level of students on such topics	4	2	3	1	2.9	3.02			Agree
		c) Explain the factors of the learning process	3	4	2	1	3.3	2.78			
		d) Use many techniques to motivate the	3	5	2	0	3.1	3.21			

		students' learning									
		e) Plan the learning process related to each other by focusing on the learning process	2	5	3	0	2.9	2.96	2.91	3.08	
		f) Focus on the students' responses toward the learning process objectives	1	6	2	1	2.7	3.12			
		h)Using the local environment as teaching resources	3	5	1	1	3.0	3.24			
		i) Makes use of the locally available materials in teaching	2	4	2	2	2.6	3.21			
3	Knowledge about curricula development	a) Capable of arranging the syllabus related to the curricula	3	4	1	2	2.8	3.16			Agree
		b) Arrange the learning plans related to the syllabus	2	5	2	1	2.8	3.13			
		c) Follow the orders of learning materials and focus on the learning aims	3	3	2	2	2.7	3.12	2.78	3.06	
		d) Choose the relevant learning materials with the situations	2	4	3	1	2.7	2.99			
		e) Relates curriculum content to pupils' needs and experiences	3	4	2	1	2.9	2.89			
4	Knowledge about	a) Conduct the learning process	2	3	2	3	2.4	3.02			Agree

	innovative learning strategies	related to the plans									
		b) Conduct the learning activities to assist the students' learning process	2	3	3	2	2.5	3.12			
		c) Communicate the new information related to the level of students' abilities	3	2	3	2	2.6	3.11			
		d) Consider the students' mistakes as parts of the learning process	3	4	2	1	2.9	3.18	2.69	3.55	
		e) Conduct the learning activities related to curricula and connect it with daily life	2	5	2	1	2.8	2.94			
		f) Conduct various learning activities	1	3	4	2	2.8	3.20			
		g) Manage class effectively	3	2	3	2	2.6	2.99			
		h) Phasing teaching from known to unknown	3	4	2	1	2.9	3.71			
5.	Knowledge about students' skill development	a) Analyze learning achievements	2	4	2	2	2.6	3.13			
		b) Support students to learn based on their learning styles	4	3	1	2	2.9	2.78			
		c) Enhance the students' critical and creative thinking skill	3	3	2	2	2.4	2.76			Agree
		d) Assist every student during the learning process	2	1	5	2	2.3	3.62	2.57	3.02	

		e) Identify the potency and difficulty of every student	3	2	4	1	2.7	2.54			
		f) Give learning chances to students based on their learning styles	2	3	2	3	2.4	3.10			
		g) Interact with students and support them to comprehend the topic more	3	3	2	2	2.7	3.23			
6	Knowledge about communication with students	a) Use various questions to know the student's participation and comprehension	2	3	2	3	2.4	3.3			
		b) Give attention to students' questions and responses	3	4	1	2	2.8	3.01			
		c) Respond to students well related to curricula	2	4	2	2	2.6	3.20			Agree
		d) Give learning activities that are capable of developing the cooperative skill between every student	3	3	2	2	2.7	2.79	2.62	2.46	
		e) Pay attention to students and respond to them	2	4	2	2	2.6	2.90			
7	Knowledge about assessment and evaluation	a) Arrange the assessment related to learning aims	4	2	3	1	2.9	3.10			Agree
		b) Evaluate the learning process using several techniques	3	3	3	1	2.8	3.11	2.66	2.96	
		c) Analyze the assessment to identify the standard competence	3	2	4	1	2.7	3.21			
		d) Utilize the	2	4	1	3	2.5	2.6			

	students' response toward the learning process and do reflection						
	e) Utilize the evaluation result as the plan on the next activities	2	3	2	3	2.4	2.8

Table 1 presents the level of Physics teachers' knowledge about innovative teaching strategies for teaching physics. The table includes several aspects and corresponding indicators. The "x" column represents the scores given by the respondents, and "xaverage" shows the average scores for each aspect. The "Decision" column indicates the decision based on the average scores. The findings revealed that Physics teachers have a fair level of knowledge of students and their characteristics, with scores ranging from 1.80 to 2.55. The teachers also have a fair level of knowledge about learning materials and principles, with scores ranging from 1.33 to 2.43. The teachers' knowledge in curricula development is rated as fair, with scores ranging from 1.30 to 2.45.

The Physics teachers also have poor knowledge of innovative learning strategies with scores ranging from 1.34 to 2.40. The teachers' knowledge of students in skill development is fair with scores ranging from 1.15 to 2.31. The Physics teachers' have a fair knowledge about assessment and evaluation with scores ranging from 1.01 to 1.99.

Overall, the results implied that the Physics teachers' knowledge about innovative teaching strategies for teaching physics varies across different aspects, with some aspects rated as fair and others as poor.

Research Question 2: What is the effect of discussion method of teaching on the academic performance of students in physics?

Table 2: Effect of discussion method of teaching on academic performance of students in Physics

SN	Effect Of Discussion Method of Teaching	SA (4)	A (3)	D (2)	SD (1)	X	Sd.	$x_{average}$	$Sd._{average}$	Decision
1	My physics teachers frequently use the discussion method of teaching during class	28	70	1	1	3.25	3.48			
2	The discussion method helps me understand physics concepts better than other teaching methods	32	68	0	0	3.32	4.31			
3	I often actively participate in discussions during physics class	28	68	4	0	3.24	4.11			
4	I feel comfortable expressing my ideas and asking questions during physics discussions	30	38	24	8	2.90	3.21	3.13	3.79	Agreed
5	Discussion method prepares me for exams and assessments in physics	28	42	24	6	2.92	3.32			

6	I have seen an improvement in my overall academic performance in physics since the introduction of the discussion method	34	45	20	1	3.12	4.28

Table 2 presents the effect of the discussion method of teaching on the academic performance of students in physics. The findings suggest that the discussion method of teaching has a positive effect on the academic performance of students in physics. Most of the statements received scores indicating agreement, with an average score of 3.13 and an average standard deviation ($Sd._{average}$) of 3.79. The students agreed that the discussion method helped them understand physics concepts better, actively participate in discussions, express their ideas and questions comfortably, and prepare them for exams and assessments. They also noted an improvement in their overall academic performance since the introduction of the discussion method.

Research Question 3 : What is the effect of demonstration method of teaching on the academic performance of students in physics?

Table 3: Effect of demonstration method of teaching on academic performance of students in Physics

S/N	Effect of Demonstration Method of Teaching	SA (4)	A (3)	D (2)	SD (1)	X	Sd.	$x_{average}$	$Sd._{average}$	Decision
1	My physics teachers use the demonstration method of teaching during class	32	42	14	12	2.94	1.89			
2	Demonstration method helps me understand physics concepts better than other teaching methods	29	52	18	1	3.09	2.79			
3	The demonstration method of teaching has significantly improved my understanding of physics concepts.	25	58	14	3	3.05	1.99			
4	I find the demonstration method of teaching in physics highly engaging and interactive.	39	43	10	8	3.13	2.77			Agreed
5	The demonstration method makes the learning experience in physics much more enjoyable.	27	59	12	2	3.11	1.86			
6	The demonstration method has	45	50	4	1	3.39	2.12		2.19	

	significantly increased my interest in physics.							2.66		
7	The demonstration method is highly effective in helping me remember and retain physics knowledge.	23	64	10	3	3.07	1.90			

Table 3 presents the effect of the demonstration method of teaching on the academic performance of students in physics. The findings gave an average mean score of 2.66 and average of standard deviation ($Sd_{.average}$) of 2.19. This implied that the demonstration method of teaching has a positive effect on the academic performance of students in physics. The students agreed that the demonstration method helped them understand physics concepts better, improved their understanding of physics concepts significantly, engaged them in an interactive learning experience, made physics learning more enjoyable, increased their interest in physics, and helped them remember and retain physics knowledge effectively.

Research Question 4 : What is the Effect of lecture method of teaching on the academic performance of students in physics?

Table 4: Effect of Lecture method of teaching on academic performance of students in Physics

SN	Effect of Lecture Method of Teaching	SA (4)	A (3)	D (2)	SD (1)	X	Sd.	$x_{average}$	$Sd_{.average}$	Decision
1	The lecture method effectively clarifies complex physics concepts.	12	2	48	38	1.88	2.80			
2	I am very confident in applying the knowledge gained through the lecture method to solve physics problems.	15	9	49	27	1.86	3.40			Disagreed
3	The lecture method has significantly increased my interest in physics.	8	3	47	42	1.77	2.61	1.71	2.81	
4	The lecture method makes the learning experience in physics enjoyable.	1	1	46	52	1.51	2.48			
5	The lecture method effectively helps me visualize and understand abstract physics concepts.	0	3	49	48	1.55	2.78			

Table 4 presents the effect of the lecture method of teaching on the academic performance of students in physics. The findings gave an average mean score of 1.71 and an average standard deviation ($Sd_{.average}$) of 2.81. This suggests that the lecture method of teaching has a low effect on the academic performance of students in physics. The students disagreed that the lecture method effectively clarifies complex physics concepts and helps them visualize and understand abstract physics concepts, stimulating interest and confidence in Physics among others.

VII. SUMMARY OF FINDINGS

The research findings address four main research questions related to Physics teaching strategies and their effect on students' academic performance. The findings from the study revealed that :

1. Some physics teachers posses knowledge about innovative teaching strategies. However, some of the teachers needs to improve in their knowledge and implementation of innovative teaching strategies in the classroom.

2. Discussion method helped students to understand physics concepts better, actively participate in discussions, express their ideas comfortably, and prepare for exams.
3. The use of demonstration method by physics teachers improved students understanding of physics concepts, engagement in interactive learning experience, increased their interest in physics, and enhanced their retention of knowledge.
4. Lecture method of teaching used by physics teachers clarified some physics concepts but did not significantly increase students' interest or contribute to an enjoyable learning experience.

VIII. DISCUSSION OF FINDINGS

Research Question 1 focused on the level of Physics teachers' knowledge about innovative teaching strategies. The data in Table 1 reveal that the teachers' knowledge varies across different aspects. The aspects related to students' characteristics, learning materials and principles, and curricula development are rated as fair, while the knowledge about innovative learning strategies is poor. This indicates that there is room for improvement in the teachers' knowledge and implementation of innovative teaching strategies in the classroom.

Research Question 2 examined the effect of the discussion method of teaching on the academic performance of students in physics. The data in Table 2 indicate that the discussion method has a positive effect on student's academic performance. The students agreed that the discussion method helped them understand physics concepts better, actively participate in discussions, express their ideas and questions comfortably, and prepare for exams and assessments. They also noted an improvement in their overall academic performance since the introduction of the discussion method.

Research Question 3 explored the effect of the demonstration method of teaching on the academic performance of students in physics. The findings presented in Table 3 suggest that the demonstration method has a positive effect on student's academic performance. The students agreed that the demonstration method helped them understand physics concepts better, improved their understanding of physics significantly, engaged them in an interactive learning experience, made physics learning more enjoyable, increased their interest in physics, and helped them remember and retain physics knowledge effectively.

Research Question 4 investigated the effect of the lecture method of teaching on the academic performance of students in physics. The findings in Table 4 indicate that the lecture method has a low effect on student's academic performance. While the lecture method clarifies some physics concepts, it may not significantly increase students' interest in physics or make the learning experience enjoyable.

In conclusion, the analysis of the data suggests that the discussion method and the demonstration method of teaching have a positive effect on the academic performance of students in physics. On the other hand, the lecture method shows mixed results. These findings highlight the importance of adopting innovative teaching strategies, such as discussions and demonstrations, to enhance students' understanding and performance in physics.

This finding is consistent with the findings of the research conducted by Bawann & Udo (2019), which revealed that there is significant difference in the academic performance of students in Physics taught with innovative strategy and lecture-based strategy in Cross river State. These findings emphasize the need for Physics teachers to continuously improve their knowledge and implementation of innovative teaching strategies, such as discussions and demonstrations, to enhance students' academic performance. It is crucial for teachers to create engaging and interactive learning experiences that help students understand complex concepts, improve their interest in the subject, and effectively prepare them for exams and assessments.

CONCLUSION

The data clearly demonstrates that a strong level of Pedagogical Content Knowledge among physics teachers positively influences students' academic performance. When teachers effectively combine their subject matter expertise with teaching strategies tailored to student's needs, it enhances students' comprehension and engagement. Students appreciate and respond positively when teachers possess a deep understanding of the subject matter and can effectively convey complex concepts in an understandable manner. This leads to increased student engagement and a better grasp of physics concepts. Also, Teachers with strong PCK often employ active learning strategies, discussions, and interactive methods, which enable students to explore and apply physics concepts actively. This dynamic approach contributes to better academic outcomes.

Furthermore, a high level of PCK fosters a positive student-teacher interaction environment. Students feel comfortable asking questions, participating in discussions, and expressing their ideas. This interaction contributes to a deeper understanding of the subject and improved academic performance. Students' perceived improvement in overall academic performance suggests that effective PCK not only enhances subject-specific knowledge but also has a broader effect on their academic achievements.

EDUCATIONAL IMPLICATIONS

1. Teacher Training Programs: PCK development should be integrated into pre-service and in-service teacher training programs for physics teachers. The importance of not only mastering content but also understanding effective ways to teach it should be emphasized.
2. Professional Development: The government through the Ministry of Education and relevant stakeholders should offer ongoing professional development opportunities for physics teachers to enhance their PCK. Workshops, seminars, and collaborative learning experiences can contribute to continuous improvement.
3. Curriculum Design: PCK principles should be incorporated into the development of physics curricula. Instructional materials and activities needs to align with the PCK framework to enhance student engagement and understanding.
4. Peer Collaboration: Collaboration should be encouraged among physics teachers to share best practices and exchange insights related to PCK. Establishing a supportive community can foster a culture of continuous improvement.
5. Assessment Strategies: The Ministry of Education should develop assessment tools that not only measure students' content knowledge but also assess the application of PCK in teaching. This could include evaluating instructional methods, use of analogies, and addressing common misconceptions.

Recommendations:
Based on the conclusions drawn from the analysis, the following recommendations are proposed :

1. Physics teachers should be encouraged to engage in ongoing professional development programs that enhance their pedagogical skills and content knowledge. Workshops, seminars, and training sessions can provide teachers with innovative teaching methods and strategies.
2. Relevant stakeholders in education should establish a platform for physics teachers to collaborate and share best practices. Peer-to-peer learning and discussions can help teachers exchange effective teaching strategies and approaches, enriching their pedagogical content knowledge.
3. Physics Teachers should recognize the diversity in students' learning styles and abilities. Physics teachers should tailor their teaching methods to accommodate various learning preferences and provide additional support where needed.
4. Physics teachers should be encouraged to integrate technology and multimedia resources into physics teaching. This can help illustrate complex concepts, facilitate interactive learning, and engage students on multiple levels.
5. Physics teachers should be encouraged to implement active learning strategies, group discussions, case studies, and problem-solving tasks. These methods foster a participatory learning environment and deepen students' understanding.
6. The government should encourage teachers to engage in educational research and experimentation with innovative teaching approaches. Sharing findings can contribute to the broader pedagogical community.
7. The government and relevant stakeholders in education should sponsor physics teachers to attend conferences and workshops to learn more about innovative strategies of teaching physics.

IX. LIMITATION OF THE STUDY

The study was conducted within a short time frame, and the observation of the long-term effect of teaching methods on students' academic performance may be constrained. A more extended study period could provide a more comprehensive understanding of the sustained effects over time. Also, external factors, such as socio-economic conditions or individual student learning styles, were not extensively explored. These factors may contribute to variations in academic performance and could be considered in future research.

X. SUGGESTIONS FOR FURTHER STUDIES

The following suggestions are made for further studies;

1. Longitudinal Studies: Conducting longitudinal studies to explore the long-term effect of PCK development on students' academic performance in physics. This could provide insights into the sustainability of improved teaching practices.
2. Comparative Analysis: Comparing the academic performance of students taught by teachers with strong PCK to those taught by teachers with less developed PCK. This could help identify specific aspects of PCK that have the most significant effect.
3. Cultural Context: Investigating how cultural factors may influence the effectiveness of PCK in different educational settings. Understanding the cultural nuances can guide the customization of PCK development strategies.
4. Technology Integration: Exploring the integration of technology in teaching physics with a focus on how it enhances PCK. This could involve studying the effectiveness of virtual simulations, online resources, and interactive platforms.
5. Student Perspectives: Including the perspectives of students in further studies to gather insights into their experiences with teachers possessing strong PCK. This qualitative approach can provide a more comprehensive understanding of the effect.

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