

Awareness and Application of Novel Pedagogical Strategies among Senior Secondary School Science Teachers in Suleja Local Government Area, Niger State, Nigeria

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Abstract

This study examined the awareness and application of novel pedagogical strategies among Senior Secondary School Science teachers in Suleja Local Government Area, Niger State, Nigeria. A survey research design was adopted. A sample of 268 male and female science teachers was randomly selected from public and private secondary schools in Suleja Local Government Area in the 2025/2026 academic session. Data were collected using a researcher-developed questionnaire and the internal consistency of the instrument was established using Cronbach's alpha, which produced a reliability coefficient of 0.86. Mean scores, percentages, standard deviation, and t-test were used for data analysis. Hypotheses were tested at the .05 level of significance. Findings revealed that many science teachers in Suleja Local Government Area are aware of and apply novel pedagogical strategies for content delivery, though challenges such as overcrowding and limited professional development persist. There was a significant influence of gender ($t_{(75.06)} = 9.361$; $p = .00$) and school type ($t_{(114.925)} = 2.759$; $p = .001$) on the level of science teachers' awareness and application of the strategies. It was recommended that school administrators should admit students in proportion to available infrastructure and staffing, in line with the student-teacher ratio stipulated by the National Policy on Education.

Keyword: Awareness, Application, Novel Pedagogical Strategies, Science Teachers

Introduction

Science, as a systematic study of nature acquired through the utilization of the scientific method (Nwuba, et al., 2023), is fundamental to every aspect of human endeavor, and its relevance cannot be overemphasized. It serves as a crucial tool for national growth and development, particularly in relation to civilization and technological advancement (Anaekwe, 2019). There is no gainsaying that without the proper application of scientific knowledge, it would be very difficult for humankind to understand and interact with the physical environment (Nwuba, 2021). This significance underscores why the National Policy on Education (FRN, 2013) mandates that science be taught and prioritized at all levels of education in Nigeria. At the senior secondary school level, Biology, Physics, and Chemistry constitute the core science subjects offered to science students. Regrettably, a significant number of students exhibit aversion toward science (Anaekwe, 2019), which no doubt leads to low enrollment rates in science classes. Among students who enroll in science, only a small proportion achieve credit-level passes in external examinations, including the ones conducted by West African Examinations Council and the National Examinations Council (Gengle, 2017). In Nigeria, credit passes are the minimum requirements for admission into science-related programs at the university level. Continued reliance on conventional teaching methods in science classrooms is a key factor underlying students' low interest and poor academic performance (Gambari, et al., 2015). Most secondary school science teachers lack awareness of effective pedagogical strategies and frequently relay on conventional strategies (Aina, & Langenhoven, 2015). This approach has been widely criticized for limiting student engagement and contributing to declining achievement in science (Nwaeze, 2016). In response to these challenges, scholars worldwide have increasingly advocated for the adoption of novel pedagogical strategies to facilitate effective content delivery, especially at the senior secondary school level of education (Udeani, & Okafor, 2012), as it has been found to improve students' learning outcomes (Tufail, & Mahmood., 2020). Novel pedagogical strategies entail using new instructional methods that prioritize learners' participation and are different from the usual talk-and-chalk lecture methods (Nwuba et al., 2022). These strategies make lessons more interesting and engaging, facilitate learning, improve retention and understanding, and by extension improve students' enrollment and academic performance. For instance, the Vee-map teaching strategy helps students better understand the nature and purpose of laboratory activities; that is, it helps students understand how new knowledge is attained in an experimental situation (Tufail & Mahmood, 2020). Similarly, inquiry-based learning develops students' critical thinking skills because it helps students develop interpreting, analyzing, evaluating, inferring, explaining, and self-regulation skills, which are the core critical thinking skills (Santos et al., 2023). The application of these strategies

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means accepting and making use of them in delivering science content. It simply implies implementing new creative ideas (Okpala, et al., 2022). In Benue State, Achor, et al., (2013) observed that teachers demonstrated a high level of awareness of innovative teaching strategies while only a limited number of the strategies examined were actually utilized effectively in content delivery. Similarly, Gbadamosi (2015) found that biology teachers in the Oyo South Senatorial District exhibited considerable awareness of the selected innovative approaches. In contrast, science teachers in Kebbi State demonstrated a low level of awareness of innovative instructional strategies (Usman, et al., 2020). Gender encompasses physical, biological, psychological, and behavioral traits that distinguish masculinity and femininity (Mainhood, 2020). Differences in educational outcomes between genders have been widely researched and debated (Uzezi, 2020). One particularly contentious issue involves the possible role played by biological differences between males and females. With respect to pedagogical strategies, Oyelekan et al. (2017) found that male teachers perceive the application of novel instructional strategies more positively than their female counterparts. In contrast, Khurshid, & Zahur, (2018) reported that female teachers demonstrate greater awareness and more frequently apply innovative teaching strategies than males. However, Mohammed, & Dajal, (2024) found no significant gender difference in the awareness of novel methods among science teachers in the North-East. On school type, Khurshid, & Zahur, (2018), observed that both awareness and application of innovative pedagogical strategies were higher among teachers in private schools than in public schools. Similarly, Waqas (2020) noted significant variations in the use of innovative teaching styles between public and private school teachers in Pakistan. Against this background, the present study assessed the awareness and application of novel pedagogical strategies among senior secondary school science teachers in Suleja Local Government Area, Niger State, Nigeria.

Statement of the Research Problem

Despite science's critical role in national and technological development, teaching and learning remain ineffective, as reflected in students' poor performance in external examinations conducted by Joint Admission and Matriculation Board, West African Examinations Council and the National Examinations Council examinations among others. In Suleja Local Government Area of Niger State, many science teachers still rely on conventional, teacher-centered teaching strategies, which students find dull, boring and which contribute to low learning outcomes. Scholars including Gambari, et al., (2015) and Aina & Langenhoven (2015) have criticized these instructional strategies and among others advocated for student-centered, novel strategies. While studies by Apochi & Okpaje (2022), Khurshid & Zahur (2018), and Gbadamosi (2013) have examined awareness and use of some of these strategies in relation to school type and gender, research tailored to Suleja Local Government Area is lacking. This study therefore examined the awareness and application of novel pedagogical strategies among senior secondary school science teachers in Suleja Local Government Area, Niger State, Nigeria.

Objectives of the study

The purpose of this study was to examine the awareness and application of novel pedagogical strategies among senior secondary school science teachers in Suleja Local Government Area, Niger State, Nigeria, Specifically, the study sought to determine the:

1. Level of science teachers' awareness and application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State.
2. Perception of science teachers towards the application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State.
3. Problems militating against science teachers' awareness and application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State.

Research Questions

1. What is the level of science teachers' awareness and application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State?
2. What is the perception of science teachers towards the application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State?
3. What are the problems militating against science teachers awareness and application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State?

Hypotheses

1. There is no significant difference in the mean rating of male and female science teachers on the level of awareness and application of novel pedagogical strategies in senior secondary school in Suleja Local Government Area, Niger State.
2. There is no significant difference in the mean rating of private and public school science teachers' perceptions on application of novel pedagogical strategies in senior secondary School in Suleja Local Government Area, Niger State.

Methodology

This study adopted a survey research design. The population consisted of all male and female science teachers in both public and private senior secondary schools in Suleja Local Government Area, Niger State, Nigeria. A sample of 268 science teachers was randomly selected from 10 public and 60 private senior secondary schools using the simple random sampling technique for the 2025/2026 academic session. The sample comprised 195 females and 73 males. Data were collected using a researcher-developed questionnaire titled "Awareness and Application of Novel Pedagogical Strategies Questionnaire [AANPSQ]." The questionnaire contained four sections with 33 items rated on a three-point Likert scale: Disagree = 3, Agree = 2, and Strongly Agree = 1. Face and content validity of the instrument were established by three experts in Science Education and Measurement and Evaluation. The internal consistency reliability of the instrument was determined using Cronbach's alpha coefficient on data from a pilot test of 20 science teachers who were not part of the main study. Cronbach's alpha yielded a reliability coefficient of .86, which was considered acceptable for the study. Cronbach's alpha was appropriate because the Likert-type items were scored using multiple response categories. Data obtained were analyzed using descriptive statistics, including means, percentages, and standard deviations, and inferential statistics, specifically independent samples t-tests. Hypotheses were tested at the .05 level of significance. A criterion mean of 2.50 was adopted. Thus, items with mean ratings of 2.50 and above were accepted, while those below 2.50 were not accepted.

Presentation of Results

Research Question 1

What is the Level of science teachers' awareness and application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State?

Table 1: Descriptive analysis of science Teachers' level of awareness and application

SN	Items	Not Aware	Aware but not Utilized	Aware and Utilized	Mean	SD
1	Icebreakers grap bag	12 (4.5)	39 (14.6)	217 (81.0)	2.76	.520
2	Individualize teaching strategy	15 (5.6)	39 (14.6)	214 (79.9)	2.74	.552
3	Twinning	13 (4.9)	41 (15.3)	214 (79.9)	2.75	.534
4	Vee-map teaching strategy	14 (5.2)	40 (14.9)	214 (79.9)	2.75	.543
5	Industrial Simulation strategy	14 (5.2)	42 (15.7)	212 (79.1)	2.74	.546
6	Crawford Slip method	12 (4.5)	39 (14.6)	217 (81.0)	2.76	.520
7	Flipped classroom strategy	13 (4.9)	42 (15.7)	213 (79.5)	2.75	.536
8	Adaptive Teaching strategy	15 (5.6)	39 (14.6)	214 (79.9)	2.74	.552
9	Demo kits teaching strategy	14 (5.2)	37 (13.8)	217 (81.0)	2.76	.538
10	Creative teaching	13 (4.9)	43 (16.0)	212 (79.1)	2.74	.538
11	Inquiry-based learning	14 (5.2)	41 (15.3)	213 (79.5)	2.74	.545
12	Self-discovery learning strategy	14 (5.2)	42 (15.7)	212 (79.1)	2.74	.546
13	Jigsaws Strategy	14 (5.2)	39 (14.6)	215 (80.2)	2.75	.541

Criterion mean = 2.50; weighted mean = 2.75; N = 268

Table 1 shows that the weighted mean score (2.75) is greater than the criterion mean score (2.50), indicating that most science teachers are aware and apply novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State.

Research Question 2: What is the perception of science teachers towards the application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State?

Table 2: Descriptive analysis of Science teachers' response

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SN	Items	Disagree	Agree	Strongly Agree	Mean	SD
1	Icebreakers grap bag could be a great way to develop trust in the classroom and help to spur participation from all students. Also, encourages students to speak and participate on a regular basis.	28 (10.4)	106 (39.6)	134 (50.0)	3.40	.671
2	The use of Individualize teaching strategy could caters for individual difference in science classrooms and allows every learner to learn at his own pace.	28 (10.4)	106 (39.6)	134 (50.0)	3.40	.671
3	Twinning could enhance the possibility of fostering students' cooperation and learning.	27 (10.1)	106 (39.6)	135 (50.4)	3.40	.666
4	The Vee-map teaching strategy could promote students better understanding of the nature and purpose of science laboratory activities.	28 (10.4)	106 (39.6)	134 (50.0)	3.40	.671
5	Industrial Simulation strategy could be used to transpose the normal classroom into an authentic setting where skills can be evaluated under more realistic conditions and prepares students to be able to face the complexity in the real world.	28 (10.4)	106 (39.6)	134 (50.0)	3.40	.671
6	Using Crawford Slip method could minimize time and equipment in science classrooms. It levels the playing field between quieter learner and more outspoken students.	28 (10.4)	107 (39.9)	133 (49.6)	3.39	.670
7	With flipped classroom strategy, the teacher does not give direct instruction. He act as a facilitator who sets up the content, maps out homework, and provides a welcoming learning space that students can explore in.	28 (10.4)	106 (39.6)	134 (50.0)	3.40	.671
8	Adaptive Teaching strategy could use data about a learner's previous and current learning to create a personalized path through educational content.	30 (11.2)	105 (39.2)	133 (49.6)	3.38	.680
9	Demo kits teaching strategy could be used in classrooms to promote physical observation of the concepts being discussed by the teachers. It compensates the impossibility of demonstrating the objects due to their size or lack of availability.	28 (10.4)	105 (39.2)	135 (50.4)	3.40	.671
10	In the process of creative teaching, the teacher could inspire learners' interests in learning material, and then presents specific problems and asks learners to apply all sorts of available resources to find the best satisfying solution creatively.	29 (10.8)	106 (39.6)	133 (49.6)	3.39	.675

Criterion mean = 2.50; weighted mean = 3.39; N = 268

Table 2 shows that over 70% of the science teachers strongly agreed to have possessed the perceived knowledge required to apply novel strategies for effective teaching and learning of science.

Research Question 3: What are the problems militating against science teachers awareness and application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State?

Table 3: Descriptive analysis of Science teachers' response

SN	Items	Disagree	Agree	Strongly Agree	mean	SD
1	Low commitment of science teachers for improvement due to low remuneration.		133 (49.6)	135 (50.4)	3.50	.501

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2	Over populated classroom due to insufficient infrastructure and manpower.	0 (0)	268 (100)	4.00	.000
3	Lack of seminar, workshop and in service training for science teachers.	0 (0)	268 (100)	4.00	.000
4	Lack of availability of instructional materials and unwillingness of the teachers to improvise.	135 (50.4)	133 (49.6)	3.50	.501
5	Lack of professional/teaching qualification by science teachers.	133 (49.6)	135 (50.4)	3.50	.501
6	Insufficient periods allotted for science instructions on school time table.	135 (50.4)	133 (49.6)	3.50	.501
7	Too much workload on science teachers as a result of shortage of teachers in schools.	2 (0.7)	266 (99.3)	3.99	.086
8	Science teachers teach outside their discipline due to shortage of teachers.	133 (49.6)	135 (50.4)	3.50	.501
9	None approval of study leave and grant by employers.	135 (50.4)	133 (49.6)	3.50	.501
10	Insufficient training from teachers' training institutions.	133 (49.6)	133 (49.6)	2 (0.7)	2.51 .516

Criterion mean = 2.50; weighted mean = 3.55; N = 268

Table 3 shows that the weighted mean score (3.55) is greater than the criterion mean score (2.50), implying that the problems militate against science teachers' level of awareness and application of novel pedagogical strategies in senior secondary schools in Suleja Local Government Area, Niger State.

Hypothesis 1: There is no significant difference in the mean rating of male and female science teachers on level of awareness and application of novel pedagogical strategies in Suleja Local Government Area, Niger State.

Table 4: t-test analysis of Science teachers' response based on gender

Gender	N	Mean	SD	df	t	F	Sig. (2-tailed)	Decision
Male	73	28.41	9.08	75.060	-9.361	239.059	0.000	Significant (H ₀₁ not accepted)
Female	195	38.47	2.16					

Table 4 reveals a significant difference in the mean scores between science teachers' level of awareness and application of novel pedagogical strategies based on gender ($t_{(75.06)} = -9.361$; $p = 0.001$) and hence leading to non-acceptance of hypothesis 1. This means that female senior secondary school science teachers in Suleja Local Government Area demonstrate higher awareness and application of novel pedagogical strategies than their male counterparts.

Hypothesis 2: There is no significant difference in the mean rating of private and public school science teachers' perceptions on application of novel pedagogical strategies in Suleja Local Government Area, Niger State.

Table 5: t-test analysis of Science teachers' response based on school type

School Type	N	Mean	SD	df	t	F	Sig. (2-tailed)	Decision
Private	63	41.68	7.80	114.925	-2.759	8.420	0.007	Significant (H ₀₂ not accepted)
Public	205	44.88	8.82					

Table 5 reveals a significant difference in the mean scores between science teachers' perception towards application of novel pedagogical strategies across school types ($t_{(114.925)} = -2.759$; $p = 0.001$) and hence resulting in non-acceptance of hypothesis 2. This implies that public school science teachers in Suleja Local Government Area hold more favorable perceptions toward application of novel pedagogical strategies than their private school counterparts.

Discussion of Findings

Table 1 shows that over 70% of the teachers surveyed are both aware of and apply novel pedagogical strategies considered in the study for content delivery. However, 16% reported awareness without actual use in the classroom, while 5% were neither aware of nor apply the novel strategies. The weighted mean score of 2.75 exceeded the criterion mean of 2.5, suggesting that, overall, science teachers in senior secondary schools in Suleja Local Government Area, Niger State are aware of and apply the listed novel pedagogical strategies. This finding aligns with Gbadamosi (2015), who reported high awareness and a high level of application among Biology teachers in Oyo South Senatorial District while contrasting Usman, et al., (2020), who found that in Kebbi State, science teachers low awareness and no application. Similarly, Table 2 indicated that the weighted mean score (3.39) is greater than the criterion mean score (2.50), this implies that most science teachers had positive perception towards application of novel pedagogical strategies in senior secondary schools in Suleja and it is consistent with Oyelekan, et al., (2017) view. Table 3 indicates several barriers hindering awareness and application and all respondents (100%) cited overcrowded classrooms due to inadequate infrastructure and staffing, and absence of seminars, workshops, and in-service training. The weighted mean score of 3.55, above the criterion mean of 2.50, confirms that teachers strongly agree these challenges impede their level of awareness and application of novel strategies in senior secondary School in Suleja Local Government Area. The t-test results on Table 4 shows that female science teachers recorded a higher mean score ($M = 38.47$, $SD = 2.16$) compared to male teachers ($M = 28.41$, $SD = 9.08$). The difference was statistically significant, $t(75.06) = -9.361$, $p = 0.001$, leading to non-acceptance of hypothesis 1. This means that female senior secondary school science teachers in Suleja demonstrate higher awareness and application of novel pedagogical strategies than their male counterparts. This outcome supports Khurshid and Zahur (2018) but differs from Oyelekan, et al., (2017) who found that male teachers perceive the application of novel instructional strategies more positively than their female counterparts, it also contrasts Mohammed, et al. (2024), who found no significant gender difference in the awareness and use of novel strategies among science teachers in the North-East. Table 5 reveals that senior secondary School science teachers in public schools had a higher mean score ($M = 44.88$, $SD = 8.82$) than those in private schools ($M = 41.68$, $SD = 7.80$). The difference was statistically significant, $t(114.925) = -2.759$, $p = 0.001$, resulting in non-acceptance of hypothesis 2. This implies that public school science teachers in Suleja Local Government Area hold more favorable perceptions toward application of novel pedagogical strategies than their private school counterparts. This finding corroborates Waqas (2020), who reported significant differences in the application of innovative teaching strategies between public and private school teachers.

Conclusion

The study examined the awareness and application of novel pedagogical strategies among senior secondary school science teachers in Suleja Local Government Area, Niger State and revealed that most science teachers in the area are aware of and applies novel pedagogical strategies; however, challenges such as overcrowding and limited professional development persist. Female science teachers and those in public schools showed significantly higher levels of awareness, application, and positive perception than male and private school science teachers. These results underscore the need for targeted interventions, including reduced class sizes, regular training programs, and curriculum updates, to strengthen the adoption of novel practices across all school types.

Recommendations

Based on the findings of this study, the following recommendations are posed:

1. Schools in Suleja Local Government Area of Niger State should adhere to the student-teacher ratio prescribed by the National Policy on Education and provide sufficient periods for science instructions.
2. Since female teachers showed significantly higher awareness and application, targeted mentorship and support programs should be developed to encourage male science teachers to adopt and effectively use innovative strategies.
3. Public schools in Suleja Local Government Area, which showed more favorable perceptions, should partner with private schools to share best practices, resources, and training opportunities.

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