

Effect of Enhanced Explicit Teaching Strategy on Pupils Learning Outcomes in Primary Science in Benue State

¹ Eriba, Eunice Owere
eribaeunice@gmail.com

² Bernard Ochovechi
bernardochovechi@gmail.com

^{1,2} Department of Primary Education Studies, Federal College of Education, Odugbo Benue State

Article Info

Article History:

Received: 01, Mar., 2026

Revised: 01 Apr., 2026

Accepted: 20 Apr., 2026

Published: 21 Apr., 2026

Keywords:

Activity-based,

Explicit teaching,

Sciences achievement,

Scientific attitude

Abstract

The major focus of this research is to find out the effect of enhanced explicit teaching on pupils learning outcomes in primary schools in Benue state. This has become imperative due the recent implementation of base 1-9 educational program in Benue state. The research addressed issues on selection of appropriate teaching methods that will facilitate the teaching of science in primary schools in Benue state. Despite the usage of several teaching methods such as individualized lecturing and demonstration methods in primary schools science in Benue state, comprehension of science concepts by the pupils in the state remain at the lowest ebb and the teachings of primary science have not taken it rightful place in our primary schools in the state. To achieve the aim of the study, enhanced explicit teaching strategy was used in the teaching primary science in our primary schools in Benue state. The study investigate the effect of enhanced explicit teaching strategy (EETS) on pupils' achievement in primary science and their scientific attitude. A pre-test control group quasi-experimental design was adopted. One hundred and forty-eight (148) primary pupils from two public schools selected for Benue participate in the study two instruments: Science achievement test (SAT) and scientific attitude questionnaire (SAQ) was used. Data was collected and analyses using analysis of covariance (ANCOVA). While the hypothesis was tested at 0.05 level of significance. EETS enhanced pupil's achievement in science and scientific attitude significantly more than the conventional method. It is therefore recommended that teachers should adopt the EETS in order to improve pupil's achievement as well as scientific attitude.

How to Cite:

Eriba E. O. & Ochovechi, B. (2026). Effect of Enhanced Explicit Teaching Strategy on Pupils Learning Outcomes in Primary Science in Benue State. *International Journal of Contemporary Education and Management*, 1(1), 61–74
<https://ijcepublishations.com/wp-content/uploads/2026/04/article5.pdf>

INTRODUCTION

One of the goals of primary school education in Nigeria today as stated in the national policy on education (FRN, 2013) is the laying of a sound basis for scientific and reflective thinking. This implies that whether pupils proceed for the secondary school or not, the learning of science ought to inculcate in them the scientific attitude which will be beneficial to the throughout life. Such attitudes as objectivity which demand for verification and adequate supporting data are important leading tools that the young ones need to be equipped with as they prepare to take up the leadership of this Nation in the future. These attitudes which could also free them from baseless fetish and superstitious beliefs are meant to be inculcated right from the primary school through qualitative science education. There is therefore the need to take a closer look at how science could be taught in our primary schools in a way that could enchain the development of sound scientific attitudes in Benue state.

Explicit teaching according to instructional strategies online (2024) is a strategy where topics and contents are broken down in small parts and taught individually. It involves explanation, demonstration, and practice directed by the teacher. The teacher thinks out loud when working through problems and demonstrating processes for pupils while sustaining student responses and feedback from the teacher. Essential components of this strategy include frequent pupils' response providing immediate feedback, modelling as well as guided and independence practice (Instructional strategies online, 2024; Math's VIDS, 2023; Hall, 2002) in this study, the explicit teaching strategy will enhance with hands-on science activities during which learners carry out in-depth investigation with objects and materials drawing meaning and understanding from such experiences. These will be the activities which will enable learners manipulate the things they will study (Plants, rocks, water) and handle scientific instruments in order to gain knowledge and understanding.

Statement of The Problem

The problem of effective teaching and learning of science in Benue state is a sensitive issue that need urgent attention. It has been observed that the issue is affecting academic achievement of people at primary school adversely. It has been discovered that the poor academic performance of pupils is related to the conventional teaching methods used to teach them by the teachers at this level of education. Deep understanding of scientific concepts is utmost importance, particularly at primary school level, because misconception as well as negative attitude acquired at this level could lead to poor performance and create negative disposition toward learning the science. This probably explain why Benue pupils are exhibiting a dwindling interest in the sciences (Esiobu, 2005). With the new implementation of basic 1-9 program in Benue state, it is evident that selecting a teaching strategy such as the enhanced explicit teaching strategy in primary schools will facilitate pupils understanding of science concepts. This study therefore investigated the effect of enhanced explicit teaching strategy on pupils' achievement in primary science and scientific attitude.

Objective of the study:

This research aims to examine how the use of enhanced explicit strategy facilitated academic achievement of pupils in area of primary science in Benue state. This will assist the ministry of education in Benue state in the implementation of basic 1-9 programs. The aims of the research were achieved through the following objectives, to;

1. Examine teacher preparedness to use enhanced explicit strategy in primary school science teaching.
2. To investigate the effectiveness of using enhanced explicit strategy in teaching science subjects over traditional method.

Hypotheses:

The following hypothesis was tested at 0.05 level of significance.

H₀1: there is no significant effect of enhanced explicit teaching strategy on pupil's achievement in primary science.

H₀2: there is no significant effect of enhanced explicit teaching strategy on pupils' scientific attitude scores.

REVIEW OF RELATED LITERATURE

Science constitutes the foundation in which industrialization and true economic development hinge. It is generally recognized as an indispensable tool for rapid development which nations can hardly develop (Lane, 2012, Alebiosu, 2023). Teaching science in our institutions of learning right from primary, secondary to tertiary institution requires appropriate selection of a teaching strategy which stands as a veritable tool for fostering students understanding of what is taught. Enhanced explicit teaching strategy is an innovative teaching strategy which will facilitate effective teaching and learning of science at primary school level.

Explicit teaching, according to instructional strategies online (2013) is a strategy where the contents are broken down into small parts and taught individually. It involves explanation, demonstration, and practice directly by the teacher. The teacher thinks out loud when working through problem and demonstration process for student while sustaining students' attention through frequent question, student respond and feedback from the teacher. Tolu (2014) pointed out essential complements of this strategy to include frequent pupils' responses, appropriate pacing, adequate processing time, monitoring responses, providing immediate feedback, and modelling as well as guided and independence practice. Hall (2023) viewed explicit teaching strategy as a strategy which enhance with hands-on science drawing meaning and understanding from such experiences. These are activities which enable learners manipulate the things they are studying (plants, rocks, animals, water etc.) and handle scientific instrument in order to gain knowledge and understanding.

Okafor (2019) asserts that enhanced explicit teaching strategy gives pupils the opportunity to engage in many activities during which they observe, manipulate objects, measure, classify, collect data and make references from such. Pupils exposed to this strategy will perform significantly better in science achievement test than those in the conventional group. This corroborates the argument of Popoola (2002) that active participation of learners during instruction aids understanding and higher cognitive achievement. This implies that science learning is not just about learning what other have found, but also how they arrived at such findings. To Nneji (2017), using enhanced explicit strategy in teaching science activities tend to arouse and sustain learners' interest, make learning real and facilitate the understanding of science concepts.

Stofflet and Stoddart (2019) discovered that using enhanced explicit strategy allowed pupils to physically handle or manipulate objects during teaching and learning process which allow active learner participation which is essential for high cognitive achievement in science. Thus involving basic 1-9 pupils in class work can enhance effective learning of science at this level of education.

Bada (2012) observed that the attitude of pupils taught using conventional strategy has not improved much in achievement test in science, but when, enhanced explicit teaching strategy was implored to teach science there was a tremendous achievement in the science test. Pupil's performance in science using conventional strategies was abysmally poor because this method does not adequately expose pupils to the scientific process involving observation, manipulation of instruments, measurement, among others, these are the activities which tend to enhance pupils scientific attitude. To acquire the scientific attitude, pupils need to be exposed to the scientific process through science activities which are deliberately planned by the teacher and blended into the teaching process. A lack of these activities during the nine years for which the pupils will be taught science probably will be pupils performing poor in science achievement. An innovative and activity-based teaching strategy such as enhanced explicit teaching will facilitate learning and enhance the scientific attitude of pupils. There is the need for the government to provide science materials in order to encourage activity based teaching in our primary schools in Benue state. Seminars and workshops should also be organized for the teacher, particularly during holidays.

METHODOLOGY

Research Design:

The study adopted a pre-test control group quasi-experimental design. This design is considered appropriate because of its ability to identify cause and effect relationships due to treatment or intervention. The cause and effect, which this study intends to establish is between the two teaching strategies and achievement/scientific attitude.

Types of Data

- i. Data was collected for both experimental group and control group from the two selected primary schools in two selected primary schools in two local government area in Benue North East Senatorial Zone.
- ii. Data was collected for both Experimental and control groups from the two selected primary schools in two LGAs in Benue North West Senatorial Zone.
- iii. Data was collected for both experimental and control groups from the two selected local government in Benue south senatorial zone.

Sources of Data

The six public primary schools selected from the three Senatorial Zones (Benue North West, Benue North East and Benue South) where experimental and control groups was use to formed the primary sources of this research data.

Table 1: Data and their sources:

S/N	Data	Source of Data
1.	Experimental group	Three primary schools from Benue North West and south Senatorial zones (one primary school each)
2.	Control group	Three primary schools from Benue North East, North West and South Senatorial Zones (One primary school from each of the zone).

Sampling techniques and sample size

Out of all the primary schools in the three Benue Senatorial zones, six primary schools, two each from the three zones were purposively selected based on the criteria of co-education sampling method. Engagement was purposive, stratified and random sampling. Again, the schools (two each from each senatorial zone; i.e two L.G. A) were randomly selected. One arm of basic three and arm of basic six (i.e, Intact classes) from the six schools randomly sampled was given a total of 255 pupils. Three schools from the three senatorial zones were selected for treatment and the other three primary schools for control.

Table 2: Sample of Basic 3 in three schools from Benue three Senatorial zones

S/N	Zone	Local Government	School
1.	Benue North East	katasina Ala Vandekiya	Katyasina central primary school Vandekiya central primary school
2.	Benue North West	Makurdi Gboko	Makurdi central primary school Gboko central primary school
3.	Benue south	Oju Otukpo	Ichokabe central primary school Otukpo central primary school
TOTAL	3	6	6

This table indicates the three senatorial zones with six LGAs (two drawn from each senatorial zone) and a total of 255 pupils from all the primary schools participating in this study.

Instrumentation:

For this study, four instruments were developed by the researcher:

- I. Science achievement test (SAT).
- II. Scientific attitude questionnaire (SAQ)
- III. Teachers Assessment Guide (TAG)
- IV. Operational Guide for instruction (OGI)

Scientific Achievement Test (SAT):

This instrument is design by the researcher to measure students' achievement in science. The test has 30 multiple choice items. These items, measured the pupil's ability to recall facts, interpret and apply those facts in real life situations. The ideas were limited to the first three levels of blooms taxonomy of educational objectives because these are level within the grasp of elementary school pupils (Akinbote, 2021).

Scientific attitude questionnaire (SAR)

The SAR consist of fifteen items which was develop by the researcher. These items are designed to measure the pupil's scientific attitude. Pupils will be expected to react to each statement by indicating agree and disagree in the appropriate column. This enables children to be definite or specific in taking a stand and expressing their opinion better since they are still in primary school. The items were based on the following categories of scientific attitudes: curiosity, open-mindedness, rationality objectivity, suspended judgment, honesty, humility and persistence reliability coefficient was determined.

Teachers' assessment guide (TAG)

The assessment guide was design to determine the extent to which the participating teachers followed the teaching strategy specifically the assessment guide will measure:

1. The extent to which the teacher dominates the lesson as in the chalk and talk method.
2. The extent to which the teacher continuously evaluates the pupils understanding through questioning as in enhance explicit teaching.
3. The extent pupil's participation during lessons.

The assessor/observer will ascertain whether there is no/partial high implementation in the treatment condition.

Operation guide instruction (OGI)

The infrastructural guide was based on three science topics (simple machines, pulleys and incline plane) taken from the primary school curriculum modules for basic six prepared by the National Primary Education Commission. The scheme work is used in all public primary schools in the state. For each lesson, instructional guides will be prepared for both the enhanced explicit teaching and the control group. That of the control group will reflect the chalk and talk methods, which has been founded to be the commonly used for teaching science in the class.

Procedure for Data collection

A written permission to make use of some of the schools was written to all Local Government Educational Authority (L.G.E.A) Secretaries in all the three senatorial zones of Benue State. Similarly, the approval and cooperation of the head teachers of all the selected schools within each of the zone was sorted. After this, the teachers selected to participate in the study were trained by the researcher in their respective schools. A three-man observer team made up of experienced

science teachers with a minimum of first degree and who have taught for at least five years were involved in the study. They used the teacher's assessment guide (T.A.G.) to assess the teachers. The study lasted for six weeks while SAT and SAQ were administered to all the pupils that were involved in the study as pre-text during the first week.

Data was analyzed using analysis of covariance (ANCOVA) to determine the treatment effects with pre-text scores as covariates.

DATA ANALYSIS

The data collected were analyzed using analysis covariance (ANCOVA) to determine the treatment effects with pre-test scores as covariates. The use of ANCOVA helped to readjust post-test scores so as to annul the effect of pre-instructional differences that might have existed among the groups due to the use of intact classes.

Results: -

Results of the data analysis are presented according to the two null hypotheses.

HO₁:- There is no significant effect of treatment on pupil's achievement in primary science

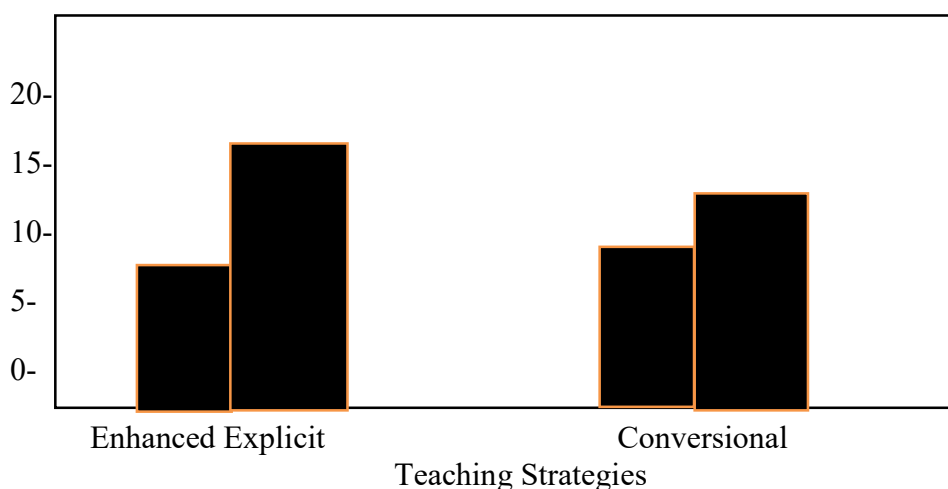


Fig1: Comparison of pre-and post-achievement test scores according to treatment groups.

Data in fig. 1 reveals that the enhanced explicit teaching strategy facilitated learning more than the conventional teaching strategy. Hypothesis one was based on whether or not there would be significant differences in the mean post achievement scores of pupil's taught with the different teaching strategies. Thus, the relative effectiveness of each of the teaching strategies in facilitating achievement was the focus here. To test this hypothesis, ANCOVA was computed and the results are presented in tables 2.

Table 2 summary of the analysis of covariance of post-test achievement

Dependence variable: post achievement

Source	type Sum Squares	/// of	Df	mean square	F	Sig	partial square	Eta
Corrected Model	1981	.296	2	995.698	162.088	.000	.689	
Intercept	1559	.80	1	1559.190	253.818	.000	.639	
Pre test	51.302		1	51.301	8.352	.004	.056	
Teaching Strategy	1928	.787	1	1938.867	316.463	.000	.695	
Error	879	.440		6.242				
Total	26770	0.12	146					
Correct Total	2870	.836	145					

.aR square = .689(adjusted R square = .690)

The table reveals that, there is significant mean effect of treatment on pupils achievement in science, hypothesis 1 is therefore rejected.

In order to determine the actual score of the observed significant differences as indicated in table 1, a pair wise comparison analysis was carried out on the mean scores of the two groups. The result is given in table 3.

Table 3: summary of pair wise comparisons of the post-test achievement mean scores according to treatment groups;

Dependent variable: post achievement

(1)Teaching Strategy	(1) teaching strategy	Mean Deference(-1-J)	Std Error	Sig.b	95% confidence interval difference b	for upper Bound
					lower bound	
Enhanced Explicit	Conventional	7.341*	.459	.000	7.316	9.146
Conventional	Enhanced Explicit	-7.231*	.462	.000	-9.146	-8.315

Based on estimated marginal means

*The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: least significant difference (equivalent to no adjustments).

As revealed in table 3, the enhanced explicit teaching group is significantly different from the conventional teaching group.

H₀₂: There is no significant effect of treatment on pupil's scientific attitude scores:

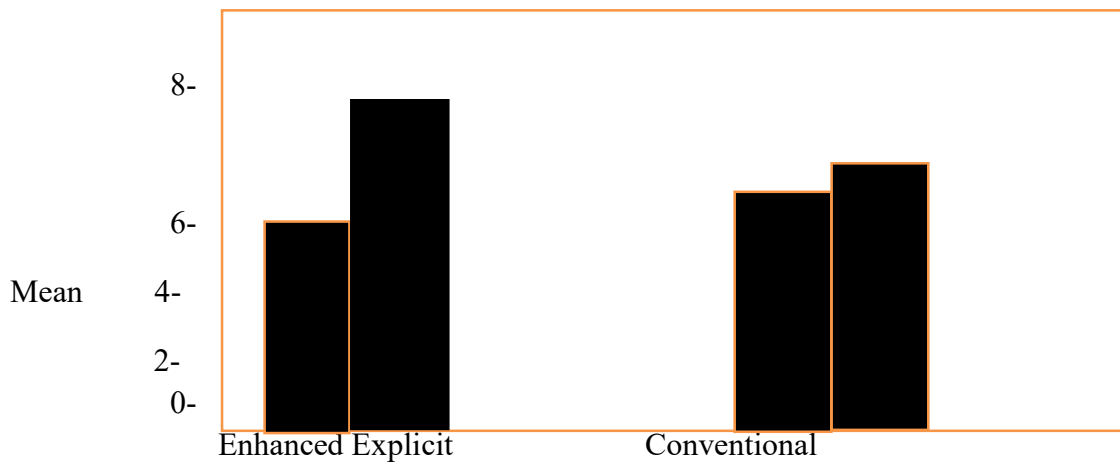


Fig 2: Comparison of pre-test and post attitude scores according to treatment groups.

Data in fig.2 reveals that the enhanced explicit teaching strategy enhanced scientific attitude more than the conventional teaching strategy. It can therefore be safely concludes that the pupils in the enhanced explicit teaching group have a better scientific attitude based on treatment than those in the conventional group.

Table 4: summary of the analysis of covariance of post-test attitude scores.

Dependent variable: new post attitude

Source	type/// Squares	Sum of	Df	Mean square	F	Sig	partial square	Eta
Corrected Model	57.683 ^a 2		28.891	6.240	.003	.080		
Intercept	548.4081		548.4081	118.655	.000	.453		
Pre-test	17.618 1		17.618	3.812	.053	.026		
Teaching Strategy	42.012	142		42.012	9.090	.003	.060	
Error	660.927		4.622					
Total	8371.00146							
Correct Total	718.610145							

.aR square = .080(adjusted R square = .067)

Hypothesis two was based on whether or not there would be significant difference in the mean post attitude scores of pupils taught with the different teaching strategies. Thus, the relative effectiveness of each of the teaching strategies in facilitating achievement was focus here. To test this hypothesis, ANCOVA was computed and the results ate presented in table 4. The table reveals that, there is significant mean effect of treatment on pupil’s attitude scores in science. Hypothesis 2 is therefore rejected.

In order to determine the actual source of the observed significant differences as indicated in table 4. A pair wise comparison analysis was carried out on the mean scores of the two groups. The result is given in table 5.

Table 5: Summary of pair-wise comparisons of the post-test attitudinal mean scores according to treatment groups.

Dependent variable: new post attitude

(1)Teaching Strategy	(1) teaching strategy	Mean Defference(1 ⁻)	Std Error	Sig.b	95% confidence interval difference b lower bound	for upper Bound
Enhanced Explicit	Conventional	1.148*	.379	.003	.386	.903
Conventional	Enhanced Explicit	-1.147*	.379	.003	-1.903	-.386

Based on estimated marginal means

*The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: least significant difference (equivalent to no adjustments).

As revealed in table 4, the enhanced explicit teaching group is significantly different from the conventional teaching group.

DISCUSSION

As revealed in table 1. There was significant main effect of treatment on pupil's achievement in science. Fig 1. Also revealed that the enhanced explicit teaching strategy facilitated learning more than the conventional method. This supports the assertion that the conventional (chalk-and-talk) teaching methods is unproductive (Okafor, 2019) and ineffective in engaging learners' interest and developing conceptual understanding of subject matter (Stofflet & Stoddart, 2019). The enhanced explicit teaching strategy gave pupils the opportunity to engage in many activities during which they observed, manipulated objects measured, classified, collected data and made inferences. From such pupils in this experimental group performed significantly better in the science achievement test than those in the conventional group. This corroborates the argument of Popoola (2002) that active participation of learners during instruction aids understanding and higher cognitive achievement. This implies that science learning is not just about learning what others have found, but also to arrive at such findings. Furthermore science activities tend to arouse and sustain learner interest making learning real and facilitate the understanding of science concepts.

The pupils in the control group were however not exposed to such activities. The best the teacher in the control group did was to once in a while show relevant objects and/or pictures to the pupils. The pupils were not allowed to physically handle or manipulate such objects themselves. Unfortunately, this is actually what obtains during science lessons in most schools. The lack of opportunity for hands-on activities probably explains why the pupils in the control group had lower mean achievement scores. This finding lends support to the submission of Nneji (2017), Stofflet & Stoddart (2019) and Popoola (2002) on the inadequacy and ineffectiveness of the chalk and talk method in developing conceptual understanding of the subject matter. This is because, as observed by Counihan (2022), the chalk and talk method does not allow active learner participation which is essential for high cognitive achievement in science.

Looking at the two groups, the control groups where the chalk and talk method was employed had lower post scientific attitude mean score. The enhanced explicit teaching group where there were adequate practice science activities had

significantly higher post-scientific attitude mean score. This is quite impressive considering the fact that the pupils were exposed to science activities for a short period of about six weeks.

The attitude of pupils in the conventional group has been affected much probably as compared with those in the enhanced explicit teaching group because their teacher all along had been teaching them science through the chalk and talk methods. This is the method commonly used for science teaching in schools as observed by (Buda et al, 2023). This method does not adequately expose pupils to the scientific process involving observation, manipulation of instruments, and measurement among others. These are the activities, which tend to enhance pupils scientific attitude. Smilly (2018) postulated that to acquire scientific attitude, Pupils need to be exposed to scientific process through science activities, which are deliberately planned by the teacher and blended into the teaching process. A lack of these activities during the six years for which the pupils have been taught science probably explain why the scientific mean scores were low. This, therefore, suggests that the more the science activities pupils are exposed to, the more scientific their attitude becomes

RECOMMENDATIONS AND CONCLUSION

The finding that the enhanced explicit teaching strategy was better than the conventional chalk and talk method for science teaching in enhancing pupils understanding of scientific concepts has great implication for the effective teaching and learning of science in Nigerian primary school. In the conventional science classroom, pupils are usually passive listeners rather than active participants. When an activity-based teaching strategy (such as the enhanced explicit teaching) is used, pupils are active, and their interest is aroused and sustained. There are also exposed to science process skill which inculcate in them such. Scientific attitude as curiosity, objectivity, rationality, suspended judgment and open-mindedness. This suggests that the conventional teaching method is no longer adequate for science teaching in a country, such as Nigeria, which is aiming at high technological advancement. Science teaching, particularly at the primary school level should be full of stimulating activities, which could arouse and sustain learners' interest as well as enhance conceptual understanding of the subject matter in science. These activities make the learner active participants in the teaching and learning process rather than passive listeners and no-lookers.

The development of the pupil's scientific attitude is also of great importance; especially since this is one of the goals of primary education as stated in the national policy on education. The findings of this study have revealed that when pupils are exposed to activities-based teaching strategy, their scientific attitude is greatly enhanced. This is evidenced by the significantly higher scientific attitude scores of the pupils in the enhanced explicit teaching group compared with those in the conventional teaching group. If education at the primary school level is able to develop Nigerian children's scientific attitude, then we are breeding a future generation of problem-solvers.

This could be a catalyst for the technology breakthrough which we have always desired as a nation. Besides, there are some children whose education would stop at the primary school level. There are yet some others who, though they proceed to secondary and tertiary levels of education, may not offer science related courses. Such children would not in any way be disadvantaged, if the science teaching they received at the primary school is able to promote their acquisition of the scientific attitude. A good scientific attitude, right from the primary school level, would produce for Nigeria future leader who are averse to superstitious and fetish beliefs; who through objectivity, rationality and verification of facts will make good decision which could move the state and nation forward.

Recommendations:

1. The primary school science teachers should therefore provide a variety of science activities for pupils which will expose them to the cognitive gain as well as the skills and attitudes of science.

2. The finding that an innovative and activity-based teaching strategy such as enhanced explicit teaching facilitated learning and enhanced the scientific attitudes of pupils implies that teacher educator has a role to play in teaching pre-service teachers the use of such strategy.
3. The reluctance of primary school teachers to teach science through inquiry could be due to their lack of competence based on the fact that during their training, they themselves were not exposed to such strategy. Therefore, strategies that are Inquiry-oriented should be introduced into the curriculum of pre-service teachers.
4. This will improve both their competence and confidence as science teachers. If student teachers acquire the skills involved in the use of activity-based strategies for science teaching, there is the tendency that it will become a part of their classroom practice when they eventually become professional primary school teachers.
5. This may help to minimize if not totally eradicate the use of the passive conventional chalk and talk method, which has been found to be less productive particularly for science teaching.
6. There is also the need of the Government provide science materials in order to encourage activity-based teaching in our primary schools.
7. Seminars and workshops should also be organized for the teachers, particularly during the holidays, to expose them to innovative teaching strategies such as the enhanced explicit teaching strategy, which could enhance the teaching and learning of science in the school as well as to teach them the improvisation of simple instructional materials.

In conclusion, as Nigeria continues to aspire towards technological independence, adequate attention should be paid to the quality of science teaching particularly at the primary school level. This is because good science teachings at the primary school level will translate to higher achievement both at the primary as well as higher levels of education. As a result, more people will be able to enroll for science-related courses thereby increasing the nation's science work force.

Similarly, through appropriate teaching strategy, pupils are introduced early to the skill and attitude of science such as objectivity, rationality, suspended judgment as well as verification of data, problem-solving skills which will bring out about scientific discoveries and breakthroughs are rooted in these traits. Furthermore, pupils will possess these traits, these traits are averse to superstitions and fetish belief. They are also being equipped for future leadership roles as they enable these traits to make wise choices and decisions based on authenticated information. For these reasons, more effective strategies such as the enhanced explicit teaching should be employed for science teaching in schools in the place of the chalk and talk method, which has been found not to be very effective in enhancing achievement in sciences as well as promoting scientific attitude among primary school pupils.

References

- Ajagun, G. A. (2006). Toward good performance in science education. *Nigerian Journal of Teacher Education and Teaching*, 2(1), 117-125.
- Akinbote, R. O. (2021). Instructional sequencing modes and feedback mechanism as determinants of achievement in primary school social studies. Unpublished Ph.D. Thesis University of Ibadan.
- Alebiosu, K. A. (2023). Readings in science education; Ibadan Majestic printer and publishers.
- Bada, T. A., Adekomi B. & Ojo O. A. (2012). Effects of animated Agricultural Science instructional package on attitude and performance of Junior Secondary School students in South West Area. *Nigeria Mediterranean Journal of Social Sciences* 3(1), 425-435.
- Cunihan, B. (2002). Primary school science education - is there a winning formula? The conversation. Retrieved on 11th October, 2024 from *Journal of Science Teachers Association of Nigeria*, Volume 49, Issue 1 (July 2014).

- Counihan, B. (2022). primary school science education - Is there a winning formula? The conversation retrieved on the 29th January, 2026 from bitpill the conversations. edu, a primary-School-online-education-is-there-a- au whiting formula-5449.
- Esiobu, G.O. (2005) Genre Issues in Science and Technology Education Development. In: Uwowi, U.M.O., Ed., Science and Technology Education for Development, NERDC Press, Lagos, 137-156.
- Federal Republic of Nigeria (2004). National Policy on Education. Lagos: Federal Government Press
- Hall, T. (2023). Explicit instruction: Wave field MA: National centre on Assessing the General Curriculum, retrieved from <http://aim.cast.org/learn/historyarchived/backgroundpaper/explicitinstruction>
- Instructional Strategies Online (2013). Direct Instruction. Retrieved online 5th October, 2024 from <http://ole.spsd.sk.ca/de/pd/instr/strats/explicitteaching/index.html>
- Jegede, S. A. (2003). The effect of the component analysis model of instruction on students' performance in chemistry. Unpublished Ph.D. Thesis University of Ado-Ekiti, Nigeria.
- Lane, N. F. (2012). Science is the key to growth. New York Times, October 2, 2024, p. 427.
- Math VIDS (2023). Explicit Teacher modelling. Retrieved online on 3rd October. 2024 from <http://fcit.usf.edu/mathvids/strategies/em.html>
- Nneji S. O. (2017). Effect Of Ethno-Mathematics Approach on Student's Achievement and Retention in Mathematics in Enugu State. Unizik Journal of Atm Education, 2(1), 1-14.
- Okafor, P. N. (2019). Effects of cooperative learning and conceptual change. Unpublished Ph.D. Thesis, University of Ibadan, Ibadan.
- Olatoye, R. A. (2002). A causal model of school factors as determinants of science achievement in Lagos state secondary schools. Unpublished Ph.D. Thesis, university of Ibadan Ibadan.
- Popoola, A. A. (2002). Effects of heuristic problem solving and programmed instructional strategies on senior secondary school students' learning outcomes in mathematics in Ekiti State, Nigeria. Unpublished Ph.D. Thesis, University of Ibadan, Ibadan.
- Stofflet, R. and Stoddart, T. (2019). The accommodation of conceptual change constructs to teacher education. Journal of research in science teaching. 31(8), 787-810.
- Tolu O. O. (2014). Comparative effects of conceptual change and enhanced explicit teaching strategies on achievement in primary science. Unpublished PhD. Thesis. University of Ibadan