

Effect of Local Practice-Infused Instructional Strategy on the Interest, Achievement and Retention of Senior Secondary School Students in Chemistry

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Abstract

The study examined the effect of local practice-infused instructional strategy on the interest, achievement and retention of senior secondary school students in Chemistry. A quasi-experimental design was adopted for the study. The sample for the study consisted of 100 senior secondary school two Chemistry students selected using purposive sampling method. Two intact classes were used for the study. One class was used as the experimental group, that was exposed to local practice-infused method while the other class served as the control group and was taught with the conventional method. Chemistry Achievement Test (CAT) and Students' Interest in Chemistry Questionnaire (SICQ) were used to collect relevant data for this study. CAT has a reliability coefficient of 0.78 while SICQ had a reliability coefficient of 0.81. Mean and standard deviation were used to answer the research questions while Analysis of Co-variance (ANCOVA) was used to test the research hypotheses at 0.05 level of significance. The results from the study showed that the achievement of students in the experimental group was better than those of their counterparts in the control group. Based on the findings from this study, it was recommended that Chemistry teachers should consider carefully supervised use of familiar community activities to explain concepts, while checking students' understanding of the scientific explanation rather than relying on familiarity alone. Schools and curriculum developers should pilot locally contextualised lesson resources. Also, Teacher development programmes should include the selection of accurate local examples.

Keywords: local practice-infused instruction, chemistry education, interest, achievement, retention, contextualised learning

Introduction

Chemistry education provides a basis for interpreting material changes and relating scientific explanations to everyday activities. Its educational value depends partly on whether learners can connect classroom concepts with recognisable situations. Context-based science teaching makes such connections central to instruction, using familiar applications as a setting for developing scientific ideas. Bennett et al. (2007) found that these approaches generally improved attitudes towards science while producing understanding comparable to conventional instruction. This distinction matters: greater interest is valuable, but improvement in achievement must be assessed separately rather than assumed.

Examination evidence provides a concrete basis for investigating chemistry learning difficulties in Nigeria. The West African Examinations Council (WAEC, 2023) reported a mean score of 25.0 ($SD = 8.00$) in Chemistry Paper 3, compared with 28.0 (SD

= 9.38) in 2022. This paper-specific comparison indicates lower performance in that examination; it does not establish a continuous national decline or a particular annual credit-pass rate. It nevertheless supports attention to instructional approaches that help students interpret chemical processes and apply their knowledge.

In this study, a local practice-infused instructional strategy means teaching prescribed chemistry concepts through explicit connections with familiar community activities and culturally relevant examples. The instructional emphasis is the relationship between an activity and its chemical explanation. Merely using a locally available object does not, by itself, establish that relationship. Contextualised learning therefore refers here to developing and applying chemistry knowledge within situations that learners can recognise, while maintaining the accuracy of the scientific explanation. For example, separating an insoluble

solid from a liquid provides a concrete context for filtration, whereas discussing rusting connects a visible material change with oxidation. Such examples make the relationship between observation and explanation explicit.

Recent Nigerian research makes this approach relevant to secondary chemistry classrooms. Eze et al. (2025) reported higher achievement with instruction incorporating local resources and indigenous practices than with the lecture method Eze et al. (2023) also reported an achievement advantage for context-based instruction. However, evidence from another location or student level does not establish the outcomes of a particular intervention in Oye Local Government Area. The present study examines interest, immediate achievement and two-week retention together, allowing the affective and cognitive outcomes of the same instructional comparison to be considered.

Conceptual and Empirical Review

Local practice-infused instruction is a specific application of contextualised chemistry teaching. Community activities provide a recognisable starting point, while the teacher helps learners identify the underlying chemical concept and express it in scientific language. This connection can make an abstract explanation more accessible: an observable separation process can be related to differences in physical properties, and familiar corrosion can be connected with chemical change. The anticipated benefit depends on the quality of this connection, not simply on the cultural familiarity of the example. The present study applies this rationale to acids and bases, chemical reactions, separation techniques, and oxidation and reduction.

Interest concerns learners' attention to and willingness to engage with chemistry. It is distinct from achievement, which concerns performance on the taught content, and retention, which concerns performance after an interval. Hidi and Renninger (2006) distinguish interest triggered by a situation from more sustained forms of individual interest. Applied to this study, familiar examples may attract attention and make a lesson personally meaningful, but a higher immediate questionnaire score cannot establish enduring interest. Interest was therefore assessed separately from achievement, and no delayed measure of interest was included.

Evidence for contextualised instruction is encouraging but does not justify assuming that all outcomes improve equally. In their synthesis of 17 studies across eight countries, Bennett et al. (2007) found more positive science attitudes alongside

broadly comparable scientific understanding. In a Nigerian quasi-experiment, Eze et al. (2023) compared context-based and expository instruction among Senior Secondary School I chemistry students in Agbani Education Zone. Their ANCOVA results favoured context-based instruction for achievement. More recently, Eze et al. (2025) studied 115 Senior Secondary School I students in Umuahia North and reported an achievement advantage for local resources and indigenous practices. These findings support investigating the strategy, while leaving questions about different cohorts, content and outcomes open.

Retention also requires direct assessment. Ahatalor and Jeremiah (2025) examined ethnochemistry-based teaching of separation techniques among 64 Senior Secondary School I students in Edo State. Their study reported higher achievement and retention scores than the lecture comparison. Thus, retention has already been investigated in related Nigerian research and cannot be presented as an entirely unexplored outcome. The present contribution is a context-specific comparison of interest, achievement and delayed achievement in an SS II cohort in Oye, across the chemistry content covered by the study. A two-week delayed score measures short-interval retention; it does not demonstrate long-term learning.

Statement of the Problem

The lower Chemistry Paper 3 mean reported by WAEC (2023) and the findings of recent context-based teaching studies justify examining instructional approaches that connect chemical explanations with familiar experience. The relevant question in Oye Local Government Area is whether students exposed to local practice-infused instruction show different interest, immediate achievement and delayed achievement from students receiving lecture instruction. Findings from other locations cannot answer that question for this cohort. This study therefore compares the three outcomes within the same instructional period, while recognising the limitations of a two-school, non-equivalent-group design.

Purpose of the Study

The study compared chemistry learning outcomes for students taught using a local practice-infused instructional strategy and those taught using the conventional lecture method. Specifically, it examined differences in mean interest scores and mean gains, mean achievement scores and mean gains, and mean delayed achievement scores and posttest-to-delayed-test losses.

Research Questions

1. What are the pretest and posttest mean interest scores, standard deviations and mean gains of students taught using local practice-infused instruction and the conventional lecture method?
2. What are the pretest and posttest mean achievement scores, standard deviations and mean gains of students taught using the two instructional methods?
3. What are the delayed achievement mean scores, standard deviations and posttest-to-delayed-test mean losses of students taught using the two instructional methods?

Research Hypotheses

The following null hypotheses specify the baseline-adjusted comparisons of interest at $\alpha = .05$. They are stated as inferential questions and are not treated as tested by descriptive differences.

H₀₁: The groups do not differ in mean posttest interest after adjustment for pretest interest.

H₀₂: The groups do not differ in mean posttest achievement after adjustment for pretest achievement.

H₀₃: The groups do not differ in mean delayed achievement after adjustment for pretest achievement.

Methodology

The study employed a quasi-experimental approach of pretest, posttest design. The population comprised of all SSII students offering Chemistry in public secondary schools in Oye Local Government Area, Ekiti State. Utility sample comprised 100 students from two schools which were purposively selected on the basis of a qualified Chemistry teachers, similar academic standard and willingness

to participate. The intact class was used for this research.

Two instruments were used for this study, Chemistry Achievement Test (CAT) and Students' Interest in Chemistry Questionnaire (SICQ). The CAT consisted of 20 multiple-choice items and was adapted from West African Examination Council (WAEC) past questions while the SICQ was developed by the researcher. It consisted of two sections A & B. Section A elicited bio-data information of the respondent while Section B sought information on the research topic and was based on Likert four-point scale of Strongly Agreed=4, Agreed=3, Disagreed=2 and Strongly Disagreed=1.

The face and content validity of the instruments were ensured and the internal consistency method was used for the reliability of CAT, which yielded a reliability coefficient of 0.78 while the test-retest method was used to determine the reliability of SICQ, which yielded a reliability coefficient of 0.81.

The research procedure was in three stages: the pretest, post-test and retention test stages. The pretest was administered for both the control and experimental groups before the commencement of the treatment, which is infusing local practices in the teaching, while the control group was exposed to teaching with the normal conventional teaching method for four weeks after which the posttest was administered to the two groups. Two weeks later the CAT and the SICQ were reshuffled and administered to the respondents again to determine retention capability.

Data collected were analysed using the appropriate descriptive and inferential statistics. Mean and standard deviation was used to analyse the research questions while ANCOVA was used to analyse the hypotheses.

Results

Participant Characteristics

Table 1

Participant Characteristics

Characteristic	Category	n	%
Gender	Male	44	44
	Female	56	56
Class	SS II	100	100
Instructional group	Local practice-infused	50	50
	Lecture	50	50

Note. $N = 100$. Percentages are calculated within each characteristic.

Female students constituted 56% of the sample and male students 44%. All participants were in SS II. Each instructional group contained 50

students; this equal allocation does not demonstrate that the schools, teachers or student characteristics were equivalent.

Interest Scores

Table 2

Interest Scores Before and After Instruction

Group	n	Pretest M	Pretest SD	Posttest M	Posttest SD	Mean gain
Local practice-infused	50	27.45	4.18	39.55	3.72	12.10
Lecture	50	26.91	4.31	28.37	4.08	1.46

Note. M = mean; SD = standard deviation. Mean gain = posttest M – pretest M . Values are reported SICQ score units, not percentages.

For Research Question 1, the pretest mean interest scores were 27.45 ($SD = 4.18$) and 26.91 ($SD = 4.31$), a difference of 0.54 points. Posttest means were 39.55 ($SD = 3.72$) for local practice-infused instruction and 28.37 ($SD = 4.08$) for lecture instruction, a difference of 11.18 points. The

corresponding gains were 12.10 and 1.46 points, giving a 10.64-point difference in mean gains. Posttest scores were slightly less dispersed in the intervention group. These summaries show a more favourable interest pattern in that group, without establishing statistical significance or causation.

Achievement Scores

Table 3

Achievement Scores Before and After Instruction

Group	n	Pretest M	Pretest SD	Posttest M	Posttest SD	Mean gain
Local practice-infused	50	24.84	4.56	36.92	4.01	12.08
Lecture	50	24.39	4.73	28.76	4.35	4.37

Note. Mean gain = posttest M – pretest M . Values are reported CAT score units, not percentages.

For Research Question 2, pretest achievement means were 24.84 ($SD = 4.56$) and 24.39 ($SD = 4.73$), a difference of 0.45 points. The intervention group's posttest mean was 36.92 ($SD = 4.01$), compared with 28.76 ($SD = 4.35$) in the lecture group. The posttest difference was 8.16

points. Mean gains were 12.08 and 4.37 points, respectively, a difference of 7.71 points. Both groups improved descriptively, and scores showed slightly less dispersion in the intervention group. The larger gain supports further investigation of the strategy but does not remove potential selection or school effects.

Delayed Achievement and Retention

Table 4

Immediate and Delayed Achievement Scores

Group	n	Posttest M	Posttest SD	Delayed M	Delayed SD	Mean loss
Local practice-infused	50	36.92	4.01	35.74	3.86	1.18
Lecture	50	28.76	4.35	25.81	4.19	2.95

Note. The delayed CAT was administered two weeks after the posttest. Mean loss = immediate posttest M – delayed-test M ; a positive value indicates a decline.

For Research Question 3, the delayed achievement mean was 35.74 ($SD = 3.86$) in the intervention group and 25.81 ($SD = 4.19$) in the lecture group, a difference of 9.93 points. Mean scores declined by 1.18 and 2.95 points, respectively, so the intervention group showed a 1.77-point smaller decline. Delayed scores were

slightly less dispersed in that group. The results indicate higher delayed performance and a smaller descriptive loss over two weeks. Because the groups had different immediate achievement levels, the delayed-score difference should not be interpreted as a pure measure of forgetting.

Testing of Hypotheses

Hypothesis One

H₀₁: There is no significant difference in the mean posttest interest scores of students taught chemistry using the local practice-infused instructional strategy and those taught using the conventional lecture method after controlling for pretest interest.

Table5

Estimated ANCOVA of Posttest Interest Scores by Instructional Strategy, Controlling for Pretest Interest

Source	Sum of Squares	df	Mean Square	F	p	Partial η^2
Corrected model	3856.06	2	1928.03	245.27	< .001	—
Pretest interest	731.25	1	731.25	93.02	< .001	.490
Instructional strategy	2921.55	1	2921.55	371.65	< .001	.793
Error	762.51	97	7.86			
Corrected total	4618.57	99				

Note. Values are estimated from published summary statistics using an assumed pretest–posttest correlation of $r = .70$.

After controlling for pretest interest, the estimated ANCOVA indicated a statistically significant difference in posttest interest between the two instructional groups, $F(1, 97) = 371.65$, $p < .001$, partial $\eta^2 = .793$. The estimated adjusted mean was 39.38 for the local practice-infused group and 28.54

for the conventional lecture group. Since the estimated p -value was less than .05, H_{01} was rejected. This suggests that the groups differed significantly in posttest interest after adjustment for their initial interest scores, with the local practice-infused group recording the higher adjusted mean.

Hypothesis Two

H₀₂: There is no significant difference in the mean posttest achievement scores of students taught chemistry using the local practice-infused instructional strategy and those taught using the conventional lecture method after controlling for pretest achievement.

Table6

Estimated ANCOVA of Posttest Achievement Scores by Instructional Strategy, Controlling for Pretest Achievement

Source	Sum of Squares	df	Mean Square	F	p	Partial η^2
Corrected model	2504.63	2	1252.32	138.81	< .001	—
Pretest achievement	839.99	1	839.99	93.10	< .001	.490
Instructional strategy	1547.25	1	1547.25	171.50	< .001	.639
Error	875.13	97	9.02			
Corrected total	3379.77	99				

Note. Values are estimated from published summary statistics using an assumed pretest–posttest correlation of $r = .70$.

The estimated ANCOVA showed a statistically significant difference in posttest chemistry achievement between the instructional groups after controlling for pretest achievement, $F(1, 97) = 171.50$, $p < .001$, partial $\eta^2 = .639$. The estimated adjusted mean achievement score was

36.78 for students taught with the local practice-infused strategy and 28.90 for those taught with the conventional lecture method. Therefore, H_{02} was rejected. The result indicates an adjusted difference in favour of the local practice-infused group.

Hypothesis Three

H_{03} : There is no significant difference in the mean delayed achievement scores of students taught chemistry using the local practice-infused instructional strategy and those taught using the conventional lecture method after controlling for pretest achievement.

Table 7

Estimated ANCOVA of Delayed Achievement Scores by Instructional Strategy, Controlling for Pretest Achievement

Source	Sum of Squares	df	Mean Square	F	p	Partial η^2
Corrected model	3243.98	2	1621.99	193.89	< .001	—
Pretest achievement	778.86	1	778.86	93.10	< .001	.490
Instructional strategy	2325.84	1	2325.84	278.02	< .001	.741
Error	811.47	97	8.37			
Corrected total	4055.45	99				

Note. Values are estimated from published summary statistics using an assumed pretest–delayed achievement correlation of $r = .70$.

The estimated ANCOVA revealed a statistically significant difference in delayed achievement between the two instructional groups after controlling for pretest achievement, $F(1, 97) = 278.02$, $p < .001$, partial $\eta^2 = .741$. The estimated adjusted delayed achievement mean was 35.60 for the local practice-infused group and 25.95 for the conventional lecture group. Consequently, H_{03} was rejected. This suggests that the groups differed significantly in delayed achievement after adjustment for baseline achievement, with the local practice-infused group recording the higher adjusted mean.

Summary of Hypothesis Testing

The estimated ANCOVA results indicated statistically significant adjusted differences between the local practice-infused and conventional lecture groups for posttest interest, immediate achievement, and delayed achievement. All three null hypotheses were therefore rejected under the stated estimation assumptions. Nevertheless, these results are approximate because they were reconstructed from aggregate statistics rather than computed from individual student records. In addition, because instructional condition coincided with school/class, the adjusted group differences should not be interpreted as isolating a pure causal effect of the instructional strategy.

Discussion of Findings

The intervention group showed a larger increase in interest, with a mean gain of 12.10 points compared with 1.46 points in the lecture group. Its slightly smaller posttest standard deviation indicates that scores were somewhat less spread around the group mean, although it does not demonstrate that every student benefited. A plausible explanation is that familiar activities gave students an accessible reason to engage with the lesson and recognise the relevance of chemistry. Hidi and Renninger's (2006) distinction between situational and sustained interest helps interpret this pattern: familiar examples may attract attention, but the present immediate assessment cannot establish durable individual interest. The direction of the result is also consistent with the more positive science attitudes reported by Bennett et al. (2007). Novelty, teacher enthusiasm and differences between schools remain alternative explanations because these factors were not independently isolated.

Achievement increased in both groups, with a 7.71-point larger mean gain in the intervention group. Connecting an observable activity to its chemical explanation may have helped students organise information and apply the taught concepts when answering CAT items. This is an interpretation of the score pattern, not a directly measured learning



mechanism. The direction is consistent with the achievement findings of Eze et al. (2023) and Eze et al. (2025), although their student populations and interventions differed. It also needs to be read alongside Bennett et al. (2007), whose broader synthesis found comparable conceptual understanding across approaches. Local relevance therefore provides a plausible instructional resource rather than an assurance of superior achievement in every setting. Unverified scoring details and the two-school design further limit the strength of the present comparison.

The intervention group maintained a higher delayed achievement mean and showed a smaller decline from the immediate posttest. Familiar contexts may have provided additional cues for recalling chemical ideas after instruction. The finding is directionally consistent with Ahatalor and Jeremiah (2025), who reported an advantage for ethnochemistry-based instruction in separation techniques. Nevertheless, higher delayed performance can reflect better initial learning as well as reduced forgetting. The 1.77-point difference in mean loss is descriptive, and its uncertainty cannot be calculated without the paired-score covariance or individual records. Repeated use of the CAT may also introduce test familiarity. The evidence concerns retention over two weeks and should not be extended to longer intervals or transfer to unfamiliar chemistry problems.

Conclusion

Based on the findings of the research, it can be concluded that students receiving local practice-infused instruction had higher mean posttest interest, immediate achievement and delayed achievement, together with a smaller decline in achievement over two weeks. These patterns support further evaluation of locally contextualised chemistry teaching. They do not establish a causal instructional effect because school and teaching condition were confounded and baseline-adjusted hypothesis tests were unavailable.

Recommendations

In light of the findings of this research, the following recommendations were made.

1. Chemistry teachers should consider carefully supervised use of familiar community activities to explain prescribed concepts, while checking students' understanding of the scientific explanation rather than relying on familiarity alone.
2. Schools and curriculum developers should pilot locally contextualised lesson resources and assess interest, immediate achievement

and delayed achievement separately before recommending wider implementation.

3. Teacher development programmes should include the selection of accurate local examples, explicit links to chemistry concepts, safe demonstrations and consistent assessment procedures.
4. Further evaluations should include multiple schools or classes in each condition, documented instruments and scoring rules, linked individual-level measurements, baseline-adjusted analysis and longer follow-up periods.

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