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IMPACT OF GUIDED INQUIRY STRATEGY ON STUDENTS' ACADEMIC ACHIEVEMENT AND RETENTION IN ELECTROLYSIS IN BORIPE LOCAL GOVERNMENT AREA OF OSUN STATE, NIGERIA

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Abstract

The study investigated the impact of guided inquiry strategy on students' academic achievement and retention in electrolysis in Boripe Local Government Area of Osun State, Nigeria adopting quasi-experimental design involving one hundred and thirty-eight (138) SSS II Chemistry students. Four schools were selected using purposive sampling technique and the schools were pooled to two groups: one experimental and one control groups. The two groups were then randomly assigned to the experimental (Guided Inquiry Strategy) and one control groups (Teacher Expository Teaching Method). The students in the groups were taught Electrolysis. Three research instruments titled: Achievement Test on Electrolysis Aspect of Chemistry (ATEAC), Students' Attitude towards Guided Inquiry Strategy in Learning Electrolysis Questionnaire (SAGISLEQ), and Students' Perceptions towards Guided Inquiry Strategy in Learning Electrolysis Questionnaire (SPGISLEQ) were used, all adequately validated. The reliability of ATEAC was determined using Kuder Richardson formula 21 which yielded r = 0.79, and SAGISLEQ and SPGISLEQ with Cronbach Alpha yielded r = 0.82. Data collected were analyzed using mean score, t test and Analysis of Covariance (ANCOVA). The results showed students exposed to GIS performed better than those in TETM ($\overline{X}$ gain = 22.72), retained knowledge longer ($\overline{X}$ gain = 33.18), have positive attitude

Keywords: Academic Achievement, Chemistry Education, Electrolysis, Inquiry-Based Learning, Retention, Secondary School Students.

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towards Electrolysis ($\overline{X}$ = 2.83), and positive perceptions ($\overline{X}$ = 3.58). The result further revealed that significant difference existed between GIS and TETM in favour of GIS (F =144.327; p < 0.05). The findings concluded that guided inquiry strategy is an effective approach to improving students' performance, retention, attitude and perceptions towards electrolysis. The study recommends among others the adoption of guided inquiry strategy in teaching electrolysis and other Chemistry concepts to enhance students' learning outcomes in chemistry.

Introduction

The whole process of education needs to be geared towards developing the natural talents of a learner so as to empower him/her with capabilities of solving life's problems, facing challenges and disentangling the day to day complexities of life. Science is commonly for training in the ability to "do science", by engaging in scientific inquiry which involves observation, reasoning and experiment. Science involves content and product. It helps students to think logically, identify and demystify those beliefs that are superstitious and solve problems encountered on day-to-day basis. Through the knowledge of science, students develop their physical and social skills, and satisfy their curiosity through opportunities to carry out scientific investigation.

Chemistry is a central science that drives innovation in health, energy, agriculture, and materials, making its effective teaching a prerequisite for national development and global competitiveness. Yet, despite its importance, chemistry remains one of the most dreaded and poorly performed subjects among secondary in Nigeria. Electrolysis, a fundamental topic that underpins industrial processes such as metal extraction, electroplating, and battery technology, is particularly problematic because it is abstract, requires mastery of redox principles, and involves microscopic processes that learners cannot directly observe. The persistent poor achievement and negative attitude and perception toward electrolysis signal a gap between curriculum intent and classroom implementation, necessitating pedagogical reforms.

Teacher Expository Teaching Method (TETM) dominates chemistry instruction in most Nigerian classrooms, particularly, electrolysis that is often taught through chalkboard equations and rote memorization of ionic half-equations. This didactic approach positions students as passive recipients of information and limits opportunities for conceptual change, practical reasoning, and transfer of knowledge to real-life contexts. Empirical studies by WAEC Chief Examiners' Reports consistently identify electrolysis as a chief examiner's nightmare, with candidates failing to explain preferential discharge of ions, predict products at electrodes, or relate Faraday's laws to quantitative problems. Such

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outcomes indicate that the method of instruction, not merely student ability, is a critical factor.

In response to these challenges, science education research advocates constructivist strategies that engage learners actively in knowledge construction. Guided Inquiry Strategy (GIS), derived from the learning cycle and Vygotsky's Zone of Proximal Development, is one such approach where the teacher poses a problem, provides structured guidance and materials, and students generate data, interpret patterns, and construct explanations. Unlike teacher expository teaching method, guided inquiry strategy scaffolds the process of learning so that learners are neither lost nor spoon-fed, striking a balance between autonomy and support. This strategy aligns with the Nigerian National Policy on Education's emphasis on activity-based and learner-centered science teaching.

The relevance of guided inquiry strategy to electrolysis lies in the topic's abstract-microscopic nature. Students must visualize ion migration, electron transfer, and competing reactions at electrodes. Through guided inquiry, learners can perform micro-scale electrolytic experiments, collect data on gases evolved, test electrolytes of different concentrations, and use driving questions to deduce rules of preferential discharge. This hands-on, minds-on experience makes sub-microscopic concepts concrete and promotes meaningful learning, as postulated by Ausubel's theory. When students discover Faraday's first law by weighing copper deposited at varying currents, the law ceases to be an abstract formula and becomes empirical knowledge.

Several studies have documented positive impacts of guided inquiry on chemistry achievement, critical thinking, few on attitude and perception. Pikoli, Buhungo, Musa, Tangio, Sihaloho, Lukum, and Kilo (2025) reported achievement gains in salt hydrolysis when students linked macroscopic observations to sub-microscopic ion behavior. In the study, students in the inquiry group moved beyond memorizing electrode rules to actually deducing preferential discharge by testing electrolytes, observing gas evolution, and calculating Faraday relationships However, specific empirical evidence on electrolysis remains sparse, and even fewer studies target electrolysis concept aspect of chemistry. Despite its potential, the implementation of guided inquiry strategy faces hindrances in Nigerian secondary schools, probably, due to large class sizes, inadequate laboratory resources, lack of electrolytic kits, and teachers' poor inquiry pedagogical skills. Consequently, the curriculum objective that students should "acquire skills of scientific inquiry and problem solving" remains largely unachieved for electrolysis. Investigating the impact of guided inquiry strategy on students' academic achievement and retention in electrolysis is therefore crucial to provide empirical data for curriculum review, teacher training, and policy on resource allocation. The findings will provide evidence on whether

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shifting from TETM to GIS could bridge the gap between curriculum objectives and actual learning outcomes in secondary schools in Nigeria.

Statement of the Problem

Persistent failure in Chemistry has been linked to inappropriate, uninspiring and non-innovative instructional strategies which lack active students' engagement in the classrooms setting in our secondary schools in Osun State and particularly in Boripe Local Government area of the State. West African Examination Council Chief Examiner's' report (2024) further affirmed that inability to teach Electrolysis concepts that constitutes larger percentage of the examination's body questions is largely responsible for poor performance in Chemistry. Also, the poor performance has been attributed to students' negative attitudes and perceptions towards learning of Chemistry and their in-ability to retain concepts learnt for effective applications to everyday life situations coupled with teachers' use of inappropriate instructional strategies. Learner-centred instructional strategy such as Guided Inquiry Strategy (GIS) which involve hands-on, metacognitive process have been successfully used to improve performance in different subjects. However, research is yet to ascertain if this strategy can be effectively used to enhance Electrolysis conceptual understanding and improve students' performance, hence, this study.

Research Questions

The following research questions guided the study.

1. What are the differences in the post-test mean achievement scores of students taught Electrolysis using Teacher Expository Teaching Method (TETM) and those taught using Guided Inquiry Strategy (GIS) in Boripe Local Government Area of Osun State?
2. What are the differences in the post-test mean retention scores of students taught Electrolysis using Teacher Expository Teaching Method (TETM) and those taught using Guided Inquiry Strategy (GIS) in Boripe Local Government Area of Osun State?
3. What are the students' attitudes after the use of Guided Inquiry Strategy (GIS) in learning electrolysis?
4. What are the students' perceptions after the use of Guided Inquiry Strategy (GIS) in learning electrolysis?

Research Hypothesis

The following null hypothesis was tested at 0.05alpha level of significance:

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1. There is no significant difference between the post-test mean achievement scores of students taught Electrolysis using Teacher Expository Teaching Method (TETM) and those taught using Guided Inquiry Strategy (GIS) in Boripe Local Government Area of Osun State.

Literature Review

The impact of Guided Inquiry Strategy on students' learning of abstract chemistry concepts has attracted substantial empirical attention. Pikoli et al. (2025) conducted a quasi-experimental study in Indonesia on the guided inquiry model with multiple representations, termed "Interpellation," for salt hydrolysis: a topic that shares ionic equilibrium principles with electrolysis. With 44 Grade 11 students, the experimental group significantly outperformed the control in post-test achievement (_M_ = 73.86 vs. 62.27, _t_ = 3.428, _p_ <.05) and retention after two weeks (_M_ = 68.18 vs. 48.86, _t_ = 5.872, _p_ <.05). The study concluded that guided inquiry enables students to integrate macroscopic observations, sub-microscopic explanations, and symbolic equations, reducing misconceptions about ion behavior in solution.

Akpan and Sunday (2025) examined guided-inquiry teaching of electrochemical cells among 200 SS2 chemistry students in Itu Educational Zone, Nigeria. Electrochemical cells are conceptually linked to electrolytic cells, both requiring understanding of redox and electrode processes. Using a non-randomized pre-test post-test design, they found that students exposed to guided inquiry with English language scaffolding achieved higher scores and retained concepts better than those taught by lecture method. Also, Pahriah et al. (2024) performed a systematic review of 27 articles from 2015–2024 on constructivist approaches in chemistry, with guided inquiry as a major theme. Their quantitative synthesis revealed medium-to-large effect sizes for secondary school students, with electrochemistry topics showing 18–24% post-test gains when guided inquiry was used as intervention. In addition,

Ndukwe (2023) reported a study in Rivers State on guided inquiry and students' performance in redox reactions, the theoretical foundation of electrolysis. Using 132 SS2 students, ANCOVA results showed a significant main effect for teaching strategy, F = 28.64, p <.05, with the guided inquiry group outperforming the lecture group. The above studies indicated that inquiry-based learning shifts students from algorithmic problem-solving to meaningful learning, a premise directly relevant to electrolysis where learners often memorize electrode rules without understanding ion migration.

Most literature referred to in this study involved relatively well-equipped schools or virtual labs. There is scarce evidence on the feasibility and effectiveness of guided inquiry strategy for electrolysis in Nigerian secondary schools in rural areas such as Boripe Local Government Area, Osun State where laboratories are dilapidated, classes are large,

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reagents are scarce, and electricity is erratic. The gap is whether guided inquiry can work in such low-resource, high-enrollment settings. Again, no study has jointly examined achievement, retention, attitude as well as perception among secondary school students as outcomes of guided inquiry strategy. Attitude and perception are critical in learning abstract concepts like electrolysis. From reviewed literatures, guided inquiry research often clusters "electrochemistry" as one unit, covering cells, redox, and electrolysis together (Akpan & Sunday, 2025). Electrolysis has unique challenges like preferential discharge, Faraday's laws, and industrial applications that differ from galvanic cells. Empirical work isolating electrolysis as a standalone topic under guided inquiry strategy is sparse. The aforementioned are the gaps identified and filled in this study.

Methodology

The study adopted the non-equivalent pre-test, post-test, control group quasi experimental design. The design was appropriate because random assignment of individual students is not feasible in intact secondary classes but intact groups can be assigned to treatment and control conditions. The design is represented as:

E: O_1 X O_2

C: O_3 O_4

Where:

E = Experimental group, C = Control group (Teacher Expository Teaching Method)

O_1, O_3 = Pretest scores

X = Treatment (Guided Inquiry Strategy)

O_2, O_4 = Posttest scores.

As shown above, there are two groups: Guided Inquiry Strategy (GIS) that formed the experimental group and Teacher Expository Teaching Method (TETM) which formed the control group. The population for the study comprised all Senior Secondary School II Chemistry students in Osun State while those in Boripe Local Government Area of Osun State are the target population. Electrolysis is contained in Chemistry curriculum for Senior Secondary School II Students. The sample consisted of 138 Senior Secondary School II students in four schools purposively selected on criteria of availability of Chemistry laboratory and registration of students for senior Secondary School Certificate Examination (SSCE) for at least ten years. Four schools initially selected were pooled to form two groups: experimental and control groups, then randomly assigned to the experimental and control groups.

Prior to the administration of the instruments, the schools selected were visited by the researcher to obtain permission from the school authority and be familiar with the professional colleagues. The researcher trained the teachers on the use of Guided Inquiry Strategy (GIS) and Teacher Expository Teaching Method (TETM) to be used only in their

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respective the general procedure for each teaching methods together with the researcher's instructional guides on GIS and TETM were jointly studies and discussed in each case. Before the commencement of the study, the participants were given the pre-test as contained in the Achievement Test on Electrolysis Aspect of Chemistry (ATEAC). Real teaching took four weeks of two periods per week, students were all taught by their different regular teachers. The researchers checked the teachers and students periodically during the treatment period to ensure that teachers used the prescribed methods of teaching for each group. Post-test was conducted at the end of the treatment while the retention test was conducted two weeks after the post-test.

Three instruments used were the Achievement Test on Electrolysis Aspect of Chemistry (ATEAC), Students' Attitude towards Guided Inquiry Strategy in Learning Electrolysis Questionnaire (SAGISLEQ), and Students' Perceptions towards Guided Inquiry Strategy in Learning Electrolysis Questionnaire (SPGISLEQ). Achievement Test on Electrolysis Aspect of Chemistry (ATEAC) were derived from past questions of the West African Examinations Council (WAEC) in Chemistry. The achievement test contains twenty (20) objective questions which reflect the levels of knowledge, comprehension, application and analysis in the entire topics taught (reference Table 1). Each item has a correct answer (the key). The test items for the pre-test, post-test and retention test were made of same questions but printed in different colours. The same achievement test was used for both groups.

Table 1: Table of Specification for the construction of the Achievement Test on Electrolysis Aspect of Chemistry (ATEAC)

Content	Knowledge	Comprehension	Application	Analysis	Total
Concept of Electrolysis (25%)	1, 2, 5	7, 8	-	-	5
Factors Affecting Electrolysis (30%)	3, 4, 6	10, 13	14	-	6
Applications of Electrolysis (20%)	-	15, 16	9, 12	-	4
Faraday's Laws Calculations (25%)	--	-	17, 18, 19	11, 20	5
Total (100%)	6	6	6	2	20

Source: Field Work, 2026

The validity and of the instrument (ATEAC) were carried out using the table above. The instrument was validated through input from three experience Chemistry teachers marking WAEC papers for the past five years. Based on their comments and suggestions, the original test questions were scaled down from twenty-five previously drafted to twenty objective questions. Copies of the test were then administered on chemistry

students of Senior Secondary School II in another school different from schools used for study. The reliability of ATEAC was determined using Kuder Richardson formula 21 which yielded r = 0.79, and SAGISLEQ and SPGISLEQ with Cronbach Alpha yielded r = 0.82. The r value was adjudged good for use because of its high value. SAGISLEQ comprised two (2) sections. Section A contained respondents' bio data while Section B contains ten (10) questions that elicited information on students' attitude towards GIS in learning electrolysis, and another ten (10) questions on perceptions, measured through four-point Likert-type scale: SA = 4, A = 3, D = 2 and SD = 1 respectively ($\bar{X}$ = 4 + 3+ 2+1/4 = 2.50). The bench mark for agree was mean value 2.50 and above, while value less than 2.50 indicates disagree. The researcher administered the questionnaire through respective schools' Vice Principals. Data were analyzed using mean scores, t test and Analysis of Covariance (ANCOVA).

Research Question 1: What are the differences in the post-test mean achievement scores of students taught Electrolysis using Teacher Expository Teaching Method (TETM) and those taught using Guided Inquiry Strategy (GIS) in Boripe Local Government Area of Osun State?

The question was asked in order to find out the impact of teaching students Electrolysis aspect of Chemistry with the use of GIS and TETM before and after being taught. The researcher first determined the possible difference in background knowledge of the two groups with pre-test, and administered post-test after treatments. The result obtained is presented in Table 2 below.

Table 2: Mean Achievement Scores of Students in Electrolysis aspect of Chemistry Using GIS and TETM

Group	N	Pretest ($\bar{X}$)	Posttest ($\bar{X}$)	Mean ($\bar{X}$)
GIS	70	30.00	54.91	
TETM	68	31.12	32.19	22.72

Source: Field Work, 2026

Table 2 showed that the pre-test mean score difference between GIS and TETM is negligible, indicating similar background knowledge of the respondents before being taught. The posttest mean score of experimental group (GIS) and control group (TETM) indicated ($\bar{X}$ = 54.91) and 32.19 respectively with mean gain ($\bar{X}$ = 22.72) in favour of the experimental group (GIS). This means that GIS had a better impact on students' academic achievement in Electrolysis aspect of Chemistry.

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Research Question 2: What are the differences in the mean retention scores of students taught Electrolysis using Teacher Expository Teaching Method (TETM) and those taught using Guided Inquiry Strategy (GIS) in Boripe Local Government Area of Osun State?
The question was asked in order to find out the retention ability of students in Electrolysis aspect of Chemistry with the use of GIS and TETM where the respondents retested after two weeks of conducting post-test. The result obtained is presented in Table 3 below.

Table 3: Mean Retention Scores of Students in Electrolysis aspect of Chemistry Using GIS and TETM

Group	N	Delayed Posttest ($\bar{X}$)	($\bar{X}$) Gain
GIS	70	63.27	
TETM	68	30.09	33.18

Source: Field Work, 2026

Table 3 showed that the mean retention score of ($\bar{X}$) = 62.27 for the experimental group (GIS) and 30.09 for control group (TETM) with mean gain ($\bar{X}$) = 33.18 in favour of the experimental group. This implied that GIS had a better retention impact on students in Electrolysis.

Research Question 3: What are the students' attitudes after the use of Guided Inquiry Strategy (GIS) in learning electrolysis?

Table 4: Respondent's Views on Attitudes towards Guided Inquiry Strategy in Learning Electrolysis

S/N	Item	SA	A	D	SD	Σfx	$\bar{x}$	Decision
1.	Guided Inquiry Strategy (GIS) makes Electrolysis more interesting for me.	400 (100)	60 (20)	8 (4)	14 (14)	482 138	3.50	Agree
2.	My performance in Electrolysis tests improves with GIS.	480 (120)	30 (10)	8 (4)	4 (4)	522 138	3.78	Agree
3.	GIS enhances my understanding of Electrolysis applications.	360 (90)	96 (32)	16 (8)	8 (8)	480 138	3.44	Agree
4.	I have confidence in solving Electrolysis calculation problems with the use of GIS in the classroom.	440 (110)	90 (30)	4 (2)	6 (6)	540 138	3.91	Agree
5.	GIS enables easy remembrance of Electrolysis applications to my everyday live.	400 (100)	60 (20)	18 (9)	9 (9)	487 138	3.53	Agree
6.	GIS is less effective for learning Electrolysis than Teacher	4 (1)	3 (1)	264 (134)	2 (2)	280 138	2.03	Disagree

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S/N	Item	SA	A	D	SD	Σfx	x̄	Decision
	Expository Teaching Method (TETM).							
7.	I struggle to participate in class whenever GIS activities are used in teaching Electrolysis.	24 (6)	36 (12)	200 (100)	20 (20)	282 138	2.04	Disagree
8.	I find it hard to understand Electrolysis concepts when GIS is used for teaching.	- (-)	- (-)	268 (134)	4 (4)	276 138	2.00	Disagree
9.	GIS waste a lot of time in learning Electrolysis.	4 (1)	3 (1)	200 (100)	20 (20)	282 138	2.04	Disagree
10.	I prefer TETM to GIS for Electrolysis concept teaching.	- (-)	- (-)	268 (134)	4 (4)	276 138	2.00	Disagree
	Cluster x̄						2.83	Agree

Table 4 depicts the respondents' views on attitudes towards Guided Inquiry Strategy in Learning Electrolysis aspect of Chemistry with cluster mean ($\bar{x} = 2.83 > \bar{x} = 2.50$), the bench mark for agree. GIS makes electrolysis more interesting ($\bar{x} = 3.50$). The results revealed that majority of the respondents agreed that electrolysis tests improve with GIS ($\bar{x} = 3.78$), GIS enhances understanding of electrolysis applications ($\bar{x} = 3.44$), and boost confidence in solving calculation on electrolysis ($\bar{x} = 3.91$). It could be inferred that students have positive attitudes toward the use of GIS in learning electrolysis and by extension favourably disposed to the strategy.

Research Question 4: What are the students' perceptions after the use of Guided Inquiry Strategy (GIS) in learning electrolysis?

Table 5: Respondent's Views on Perceptions on Guided Inquiry Strategy in Learning Electrolysis

S/N	Item	SA	A	D	SD	Σfx	x̄	Decision
1.	Guided Inquiry Strategy (GIS) made complex electrolysis idea understandable.	480 (120)	30 (10)	8 (4)	4 (4)	522 138	3.78	Agree
2.	GIS improved my problem-solving in Electrolysis.	360 (90)	96 (32)	16 (8)	8 (8)	480 138	3.44	Agree
3.	GIS enables me apply electrolysis concepts to everyday life applications.	400 (100)	60 (20)	18 (9)	9 (9)	487 138	3.53	Agree
4.	I prefer GIS over teacher centred methods.	440 (110)	90 (30)	4 (2)	6 (6)	540 138	3.91	Agree
5.	GIS made learning Electrolysis more interesting.	400 (110)	60 (20)	8 (4)	14 (14)	482 138	3.50	Agree

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S/N	Item	SA	A	D	SD	Σfx	x̄	Decision
6.	I enjoy discussing Electrolysis concepts better through GIS	440 110	90 30	4 2	6 6	540 138	3.91	Agree
7.	I felt more involved in learning with GIS.	400 100	60 20	18 9	9 9	487 138	3.53	Agree
8.	I understand Electrolysis concepts better through GIS	320 80	84 28	6 3	7 7	417 138	3.02	Agree
9.	GIS boosts my confidence in Chemistry.	280 70	120 40	40 20	8 8	448 138	3.25	Agree
10.	I would recommend GIS for learning other science subjects	440 100	90 30	4 2	6 6	540 138	3.91	Agree
	Cluster x̄						3.58	Agree

Table 5 depicts the respondents' views on perceptions towards Guided Inquiry Strategy in Learning Electrolysis aspect of Chemistry with cluster mean ($\bar{x}$ = 3.58 > $\bar{x}$ = 2.50), the bench mark for agree. The results also revealed that GIS made complex electrolysis idea understandable ($\bar{x}$ = 3.78), improved problem-solving in electrolysis ($\bar{x}$ = 3.44), and majority prefers GIS over TETM ($\bar{x}$ = 3.91). It could be inferred that students have positive perceptions toward the use of Guided Inquiry Strategy in learning electrolysis.

Research Hypothesis: There is no significant difference between the post-test mean achievement scores of students taught Electrolysis using Teacher Expository Teaching Method (TETM) and those taught using Guided Inquiry Strategy (GIS) in Boripe Local Government Area of Osun State.

In order to test the hypothesis, the scores of students in Electrolysis were subjected to Analysis of Covariance. The result obtained was presented in Table 6 below.

Table 6: ANCOVA Summary of Impact of GIS and TETM on Students' Achievement Scores in Electrolysis

Source	Type III Sum of Squares	Df	Mean Square	F	P	Decision
Corrected Model	266955.492	2	133477.746	212.695	0.00*	
Intercept	3314.837	1	3314.837	52.312	0.00*	
Groups	19305.834	1	19305.834	304.669	0.00*	
Posttest	9145.514	1	9145.514	144.327	0.00*	Rejected
Error	8554.487	135	63.367			
Total	299257.000	138				
Corrected Total	35509.978	137				

* = significant at p < 0.05

Source: Field Work, 2026

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Table 6 depicted that there was a significant impact in the performance of students taught Electrolysis aspect of Chemistry using GIS and TETM (control group) ($F = 144.327$; $p < 0.05$) at 0.05 level of significance. This indicate that there was significant difference between the post-test mean achievement scores of students taught Electrolysis aspect of using GIS and TETM. The null hypothesis was, therefore, rejected.

Discussion of Findings

The study revealed that students who were taught Electrolysis using Guided Inquiry Strategy (GIS) achieved higher post-test scores than those taught using Teacher Expository Teaching Method (TETM), therefore students performed better when exposed to GIS compared to TETM. This finding aligns with previous studies of Bolarinwa, Abubakar, Akintokun, Adedoyin & Adeoye (2025) who posited that problem-based learning significantly improves students' achievement in the law of electrolysis compared to traditional lecture methods. In their quasi-experimental study with 58 SSII students, they found PBL had a significant main effect on achievement in electrolysis ($F(1,55)=8.043$, $p<0.05$, $\eta^2=0.838$). Students in the PBL group outperformed the control group. Three possible reasons could be adduced for GIS usage enhancing better performance than TETM: GIS encourages student-led exploration and fostering deeper conceptual grasp, develops critical thinking, problem-solving skills and applications of electrolysis concepts with contextual relevance to link a connection of abstract concepts to real-world contexts (Pikoli et al. (2025)).

Also, the result showed that students taught electrolysis with GIS retained more knowledge of the concepts than those taught using TETM. This agreed with the study carried out by (Akpan & Sunday, 2025) that supports the effectiveness of Guided Inquiry Strategy in enhancing Chemistry students' retention of knowledge. Possible reasons that could be adduced for GIS enhancing better retention of knowledge than TETM may be that GIS promotes conceptual understanding over rote memorization, students construct knowledge, aiding recall, and were able to link concepts to practical contexts, boosting retention.

On the third research questions that centred on students' attitudes after the use of Guided Inquiry Strategy (GIS) in learning electrolysis, the findings showed that students have positive attitudes toward the use of Guided Inquiry Strategy in learning electrolysis and by extension favourably disposed to the strategy. This is similar to the study carried out by Chengere, Mekonnen, & Tesfaye, (2025) though focused on biology, the pattern holds for electrolysis studies. Guided inquiry-based laboratory experiments increased enthusiasm and improved attitudes toward science as a process. In electrolysis-specific studies, similar results are reported for interest and scientific attitude. The study is also congruent to Rahayu (2021) finding where a diagnostic study revealed that students

taught traditionally often hold fragmented knowledge of voltaic and electrolytic cells and cannot explain concepts. In contrast, studies using guided inquiry report higher explanatory ability and more positive attitudes toward electrochemistry. This could be attributed to students' autonomy and engagement that gives them control over learning hat boost their attitudes.

Furthermore, the results revealed students have positive perceptions toward the use of Guided Inquiry Strategy in learning electrolysis. The finding is similar to Nandiyanto, Hufad, Girsang, Ragadhita, Aziz, & Al-Obaidi (2022) study: using video-based teaching with simple copper media in a guided inquiry format, where vocational students reported that guided inquiry approach made electrolysis "less abstract" and directly connected to real-world waste processing. This could be attributed to students' appreciation on the use of low-cost materials and seeing immediate chemical changes which reduced anxiety around abstract ion movement and made the concept "tangible" and "less intimidating."

On the hypothesis that stated no significant difference between the post-test mean achievement scores of students taught Electrolysis using Teacher Expository Teaching Method (TETM) and those taught using Guided Inquiry Strategy (GIS) in Boripe Local Government, the finding revealed that significant differences existed in favor of Guided Inquiry strategy compared to teacher expository method. This is congruent to Ndukwe (2023) study in Rivers State on guided inquiry and students' performance in redox reactions, the theoretical foundation of electrolysis. Using 132 SS2 students, ANCOVA results showed a significant main effect for teaching strategy, $F = 28.64$, $p < .05$, with the guided inquiry group outperforming the lecture group. The above studies indicated that inquiry-based learning shifts students from algorithmic problem-solving to meaningful learning, a premise directly relevant to electrolysis where learners often memorize electrode rules without understanding ion migration. This could be due to active learning characteristics in GIS that engages students in problem-solving, enhancing understanding, conceptual focus leading to conceptual understanding over memorization and adaptability nature of GIS that accommodates diverse learning styles.

Conclusion

The study revealed that students taught electrolysis using Guided Inquiry Strategy (GIS) performed better, retained knowledge longer, and had positive attitudes and right perceptions compared to those taught with Teacher Expository Teaching Method (TETM). GIS enhances understanding, retention, and attitudes as well as perceptions in Electrolysis aspect of Chemistry learning. There was a significant difference between the mean scores of students exposed to GIS and TETM in learning Chemistry, so the hypothesis was rejected. The result, therefore, confirmed that GIS improved students' academic achievement in Chemistry than TETM.

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Recommendations

Based on the findings of the study, it was recommended that:

1. Chemistry teachers should use Guided Inquiry Strategy in teaching Chemistry to improve students' academic achievement and enhance mastery and retention of knowledge of the students.
2. Science teachers and their students should be encouraged to use GIS since it enhances academic performance, retention of knowledge, students' positive attitudes and perceptions.
3. School administration should provide opportunities for in-service training for Chemistry and other science teachers in order to equip them with competencies needed in the use of GIS for teaching.
4. Stakeholders in education should incorporate GIS as a strategy for teaching Chemistry in secondary schools.

Limitations to the Study

1. Guided inquiry strategy requires time for students to explore, question, and construct knowledge. The study's treatment for four weeks is a short duration, and may underestimate the full impact of guided inquiry strategy on retention, attitude and perception which often stabilizes over longer exposure.
2. A trained research assistant teaches the experimental group, teacher effectiveness and enthusiasm may confound results. The positive outcomes could reflect the teacher's skill rather than the strategy alone. Using regular teachers reduces this bias but introduces variability in implementation fidelity.
3. Many secondary schools lack functional electrolysis apparatus, constant electricity, and internet for virtual labs and their availability may differ between participating schools. Unequal access to materials could weaken internal validity. Factors such as prior chemistry background, English and language proficiency were not controlled and could influence how students benefit from guided inquiry. ANCOVA can control for pretest, but not all covariates.

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