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Guided Inquiry in Chemistry Classrooms: Investigating Its Effects on Student Interest and Achievement in Secondary Schools in Enugu State, Nigeria.

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ABSTRACT

This study investigated the effects of guided inquiry-based learning on student interest and achievement in chemistry in secondary schools in Enugu State, Nigeria. Purposive sampling was used to sample of 240 SSII students from six public secondary schools, 40 students from one secondary school from each of the six education zones in Enugu State, were selected for the study. The students were randomly assigned to experimental and control groups. The experimental group was taught using guided inquiry-based learning strategy, while the control group was taught using conventional lecture method. Three research questions and three hypotheses guided the study. The study adopted a quasi-experimental research design. Data was collected using Chemistry Interest Inventory (CII) and Chemistry Achievement Test (CAT). The instruments were validated and reliability tested. Mean and standard deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The results showed that students taught using guided inquiry-based learning strategy had significantly higher mean achievement scores than those taught using conventional lecture method. Similarly, the experimental group had higher interest scores than the control group. The study also revealed that there was no significant interaction effect between teaching methods and gender on students' achievement and interest in chemistry. The findings suggest that guided inquiry-based learning strategy is effective in enhancing students' interest and achievement in chemistry. Therefore, chemistry teachers should adopt guided inquiry-based learning strategy in teaching chemistry concepts to enhance students' interest and achievement. Based on the findings, recommendations were made for educational stakeholders as well as guided inquiry-based learning strategy is recommended for use in chemistry classrooms to improve student outcomes.

INTRODUCTION

Chemistry is a fundamental science subject that plays a crucial role in understanding the world around us. However, students' performance in chemistry has been a concern globally (Kibirige, 2019). In Nigeria, the West African Examination Council (WAEC) Chief Examiners' reports have consistently highlighted students' poor performance in chemistry (WAEC, 2020). This poor performance has been attributed to various factors, including inadequate teaching methods, lack of resources, and students' negative attitudes towards chemistry. Guided inquiry-based learning has been proposed as a potential solution to these challenges. This approach involves guiding students to explore and discover concepts through inquiry-based activities. Research has shown that guided inquiry-based learning can enhance students' understanding and achievement in science subjects, including chemistry (Gillies, 2019).Effective teaching methods are essential for promoting students' interest and achievement in chemistry. Despite its potential benefits, guided inquiry-based learning is not widely used in Nigerian secondary schools. Many chemistry teachers in Nigeria still rely on traditional lecture methods, which may not be effective in promoting students' interest and achievement in chemistry.

The importance of chemistry in everyday life cannot be overemphasized. Chemistry is used in various fields, including medicine, agriculture, and industry. Despite its importance, many students find chemistry to be a challenging subject. Research has shown that students' difficulties in chemistry can be attributed to various factors, including inadequate prior knowledge, poor teaching methods, and lack of resources (Kibirige, 2019). Guided inquiry-based learning has been proposed as a potential solution to these challenges. This approach involves guiding students to explore and discover concepts through inquiry-based activities. By using guided inquiry-based learning, teachers can create a learning environment that is engaging and challenging for students. Research has shown that guided inquiry-based learning can enhance students' understanding and achievement in science subjects, including chemistry (Gillies, 2019). Guided inquiry-based learning can also promote students' critical thinking and problem-solving skills. These skills are essential for success in chemistry and other science subjects. By investigating the effects of guided inquiry-based learning on student interest and achievement in chemistry, this study hopes to provide insights into the effectiveness of this approach.

Guided inquiry-based learning is an instructional approach that involves guiding students to explore and discover concepts through inquiry-based activities. This approach is student-centered and allows students to take an active role in the learning process. Research has shown that guided inquiry-based learning can enhance students' understanding and achievement in science subjects, including chemistry (Gillies, 2019). Guided inquiry-based learning can also promote students' critical thinking and problem-solving skills. By using guided inquiry-based learning, teachers can create a learning environment that is engaging and challenging for students. The study's results can also contribute to the ongoing debate on the effectiveness

of guided inquiry-based learning in science education. Effective teaching methods are essential for promoting students' interest and achievement in chemistry. Guided inquiry-based learning has the potential to enhance students' outcomes in chemistry.

The study's focus on guided inquiry-based learning is timely and relevant. With the increasing emphasis on science, technology, engineering, and mathematics (STEM) education, there is a need for effective teaching methods that can promote students' interest and achievement in science subjects, including chemistry. Guided inquiry-based learning has been proposed as a potential solution to the challenges facing chemistry education in Nigeria. By investigating the effects of guided inquiry-based learning on student interest and achievement in chemistry, this study hopes to provide insights into the effectiveness of this approach.

LITERATURE REVIEW

Guided inquiry-based learning is an instructional approach where teachers guide students to explore and discover concepts through inquiry-based activities, providing support and scaffolding as needed. There are different types of guided inquiry-based learning, including structured inquiry, guided inquiry, and open inquiry, each varying in the level of teacher guidance and student autonomy (Gillies, 2019; Kibirige, 2019; Oliver-Hoyo, 2003). In guided inquiry-based learning, teachers act as facilitators, providing guidance and support to students as they explore and discover concepts, promoting critical thinking, problem-solving, and collaboration skills. Guided inquiry-based learning has been widely recognized as an effective instructional approach in science education (Kibirige, 2019). This approach involves guiding students to explore and discover concepts through inquiry-based activities.

Guided inquiry-based learning has been shown to enhance students' understanding and achievement in science subjects, including chemistry, by creating an engaging and challenging learning environment (Effiom, 2020). This approach promotes critical thinking and problem-solving skills, essential for success in chemistry and other science subjects (Jegede, 2019). Studies have also found that guided inquiry-based learning improves students' retention and recall of scientific concepts, fosters curiosity and interest in science, and promotes scientific literacy (Okebukola, 2018). By adopting guided inquiry-based learning, teachers can help students develop a deeper understanding of scientific concepts. Nigerian researchers such as Effiom, Jegede, and Okebukola have contributed significantly to this area of study, highlighting the effectiveness of guided inquiry-based learning in promoting students' achievement and interest in science. Overall, guided inquiry-based learning is a valuable instructional strategy for science teachers.

The effectiveness of guided inquiry-based learning in science education can be attributed to its student-centered approach, which allows students to take an active role in the learning process, enhancing their engagement and motivation (Gillies, 2019; Oliver-Hoyo, 2003). This approach promotes students' autonomy and self-directed learning, fostering independence and self-reliance as students explore and discover concepts. Additionally, guided inquiry-based learning promotes collaboration and teamwork skills, essential for success in science and other fields. By working in groups, students improve their communication and problem-solving skills, while also enhancing their creativity and innovation. Guided inquiry-based learning has been found to promote students' scientific habits of mind, helping students develop a range of skills essential for success in science. By adopting this approach, teachers can create a learning environment that supports the development of these critical skills.

Guided inquiry-based learning has been found to be effective in promoting students' achievement in science subjects, including chemistry (Kibirige, 2019; WAEC, 2020). This approach enhances students' understanding and retention of scientific concepts, creating an engaging and challenging learning environment that promotes critical thinking and problem-solving skills (Effiom, 2020; Okebukola, 2018). These skills are essential for success in chemistry and other science subjects. Guided inquiry-based learning has also been shown to improve students' performance in science assessments and foster curiosity and interest in science. By adopting guided inquiry-based learning, teachers can help students develop a deeper understanding of scientific concepts and enhance their scientific literacy. Additionally, this approach can boost students' confidence and self-efficacy in science, leading to better academic outcomes.

The impact of guided inquiry-based learning on students' interest in science has been a topic of interest for many researchers (Oliver-Hoyo, 2003; Simpson, 2017). Research has shown that guided inquiry-based learning can enhance students' interest and engagement in science, creating an enjoyable and interactive learning environment (Jegede, 2019; Effiom, 2020). Guided inquiry-based learning promotes students' motivation and enthusiasm for science, improving their attitudes towards the subject. Additionally, this approach fosters curiosity, creativity, and scientific habits of mind, essential for success in science. By adopting guided inquiry-based learning, teachers can help students develop a range of skills, enhance their confidence and self-efficacy in science, and promote their interest in the subject. Guided inquiry-based learning has been found to be effective in achieving these outcomes, making it a valuable instructional strategy for science education.

Guided inquiry-based learning promotes students' scientific literacy by enhancing their understanding and application of scientific concepts (Adeyemo, 2022). This approach creates an engaging and challenging

learning environment that fosters critical thinking and problem-solving skills, essential for success in science and other fields (Eze, 2021). Studies have shown that guided inquiry-based learning improves students' performance in science assessments and promotes scientific habits of mind. By adopting guided inquiry-based learning, teachers can help students develop a range of skills essential for success in science, including curiosity, interest, and confidence. Effective implementation requires teachers to act as facilitators and guides rather than lecturers (Ogunleye, 2023).

The benefits of guided inquiry-based learning in science education are well-documented (Simpson, 2017; Okebukola, 2022). This approach promotes students' autonomy and self-directed learning, fostering independence and self-reliance. Guided inquiry-based learning also promotes collaboration and teamwork skills, essential for success in science and other fields. By improving communication and problem-solving skills, guided inquiry-based learning enhances students' creativity and innovation. This approach has been found to be effective in promoting students' interest and engagement in science, addressing challenges facing science education, and adapting to diverse learners' needs.

Moreover, guided inquiry-based learning is a valuable instructional approach that promotes students' scientific literacy, critical thinking, and problem-solving skills (Adeyemo, 2022). This approach has been found to be effective in enhancing students' understanding and application of scientific concepts, fostering curiosity and interest in science (Eze, 2022). Guided inquiry-based learning also promotes students' autonomy and self-directed learning, essential for success in science and other fields (Okebukola, 2022). By adopting guided inquiry-based learning, teachers can create a learning environment that is engaging and challenging for students. This approach can also improve students' performance in science assessments and promote scientific habits of mind (Ogunleye, 2022). The benefits of guided inquiry-based learning in science education are well-documented, and its effectiveness in promoting students' interest and engagement in science is evident. Guided inquiry-based learning can be adapted to suit the needs of diverse learners, making it a valuable approach for inclusive science education. Overall, guided inquiry-based learning is a powerful tool for promoting students' scientific literacy and preparing them for success in science and other fields. By implementing guided inquiry-based learning, chemistry teachers can help students develop a range of skills essential for success in science. Guided inquiry-based learning has the potential to transform science education and improve students' outcomes (Nwosu, 2022).

Aim of the study:

This study aims to investigate the effects of guided inquiry-based learning on student interest and achievement in chemistry in secondary schools in Enugu State, Nigeria. The study seeks to determine whether guided inquiry-based learning can enhance students' understanding and application of chemistry concepts. Specifically, the study will examine the impact of guided inquiry-based learning on students' achievement in chemistry assessments. The study also investigate the effects of guided inquiry-based learning on students' interest and engagement in chemistry. The study's findings are expected to provide insights into the effectiveness of guided inquiry-based learning in promoting students' outcomes in chemistry. The study's results can inform teaching practices and policy decisions aimed at improving chemistry education in Nigeria. By exploring the impact of guided inquiry-based learning on student interest and achievement, this study hopes to provide a deeper understanding of the role of instructional approaches in shaping students' outcomes. The study's findings can also inform the development of teacher training programs and educational resources. Overall, this study aims to contribute to the improvement of chemistry education in Nigeria.

Statement of the Problem

Despite the growing interest in guided inquiry-based learning, there is limited research on its effectiveness in Nigerian secondary schools, particularly in Enugu State, where no such study has been conducted, hence the need to investigate its impact. Persistent poor performance in chemistry and the lack of engaging instructional methods further underscore the necessity for this study. Moreover, enhancing student interest and achievement in chemistry is crucial for developing a skilled workforce, and guided inquiry-based learning may offer a solution. This study aims to address these gaps and contribute to the improvement of chemistry education in Nigeria by investigating the impact of guided inquiry-based learning on student interest and achievement.

Objectives of the Study

The study has the following objectives:

1. To investigate the effects of guided inquiry-based learning on students' achievement in chemistry in secondary schools in Enugu State, Nigeria.
2. To examine the impact of guided inquiry-based learning on students' interest in chemistry in secondary schools in Enugu State, Nigeria.
3. To determine whether there is a significant interaction effect between teaching methods (guided inquiry-based learning and conventional lecture method) and gender on students' achievement and interest in chemistry.

Research Questions

The study seeks to answer the following research questions:

1. What is the effect of guided inquiry-based learning on students' achievement in chemistry in secondary schools in Enugu State, Nigeria?
2. What is the effect of guided-inquiry method on students' mean interest ratings in Chemistry in secondary schools in Enugu State, Nigeria?
3. Is there a significant interaction effect between teaching methods (guided inquiry-based learning and conventional lecture method) and gender on students' achievement and interest in chemistry?

Hypotheses

The study tests the following null hypotheses at 0.05 level of significance:
$H0_1$: There is no significant difference in the mean achievement scores of students taught chemistry using guided inquiry-based learning and those taught using conventional lecture method.
$H0_2$: There is no significant difference in the mean interest scores of students taught chemistry using guided inquiry-based learning and those taught using conventional lecture method.
$H0_3$: There is no significant interaction effect between teaching methods (guided inquiry-based learning and conventional lecture method) and gender on students' achievement and interest in chemistry.

METHODOLOGY

This study employed a quasi-experimental research design to investigate the effects of guided inquiry-based learning on student interest and achievement in chemistry. A sample of 240 SSII students from six public secondary schools in Enugu State, Nigeria, was selected using purposive sampling. The students were randomly assigned to experimental and control groups. The experimental group received guided inquiry-based learning, while the control group received conventional lecture method. The study used two research instruments: Chemistry Interest Inventory (CII) and Chemistry Achievement Test (CAT). Both instruments were validated and reliability tested, with the CII yielding a Cronbach alpha reliability coefficient of 0.79. The CII measured students' interest in chemistry, while the CAT assessed students' achievement in chemistry. Data analysis was performed using mean and standard deviation to answer research questions, while Analysis of Covariance (ANCOVA) was used to test hypotheses at a 0.05 level of significance. The experimental and control groups were taught for the same duration.
The guided inquiry-based learning strategy was implemented in the experimental group, where students were guided to explore and discover chemistry concepts through inquiry-based activities. The teacher acted as a facilitator, providing guidance and support as needed. In contrast, the control group received conventional lecture method, where the teacher delivered instruction through lectures. The study ensured that both groups received the same content coverage. The researcher ensured that the teacher for both groups was trained to deliver the instruction effectively. Data collection was done using the CII and CAT instruments. The study followed standard procedures for administering the instruments, including briefing participants on the purpose and procedures, obtaining informed consent from participants and their schools, and administering the Chemistry Interest Inventory (CII) and Chemistry Achievement Test (CAT) to both experimental and control groups before and after the intervention in a controlled environment. The collected data was analyzed using mean and standard deviation to answer research questions, and Analysis of Covariance (ANCOVA) to test hypotheses at a 0.05 level of significance.

RESULTS

The results were presented in alignment with the research questions and null hypotheses, facilitating a clear and structured analysis of the study's findings.

Research One: What is the effect of guided inquiry-based learning on students' achievement in chemistry in secondary schools in Enugu State, Nigeria?

Table 1: Mean and standard deviation of students' academic achievement in Chemistry when exposed to guided-inquiry and lecture methods

Groups		Pre-test		Post-test		Mean Gain Scores	Mean Gain Difference
	N	Mean	SD	Mean	SD		
Experimental Group	120	15.57	2.95	24.62	3.30	9.05	4.18
Control Group	120	14.76	3.46	19.63	3.75	4.87	

The results analysis in Table 1 show that students in the experimental group, who received guided inquiry-based learning, had a higher mean gain score (9.05) compared to the control group, who received conventional lecture method (4.87). This indicates that guided inquiry-based learning had a more significant impact on students' achievement in chemistry. The mean gain difference of 4.18 further supports this finding, suggesting that guided inquiry-based learning is an effective instructional approach for enhancing student achievement in chemistry.

Research Question Two: What is the effect of guided-inquiry method on students' mean interest ratings in Chemistry in secondary schools in Enugu State, Nigeria?

Table 2: Mean and standard deviation of students' mean interest ratings in Chemistry when exposed to guided-inquiry and lecture methods

Groups		Pre-test		Post-test		Mean Gain Scores	Mean Gain Difference
	N	Mean	SD	Mean	SD		
Experimental Group	120	27.29	8.02	56.26	7.01	28.97	19.05
Control Group	120	27.66	4.88	37.58	6.05	9.92	

The results analysis in Table 2 indicate that students in the experimental group, who received guided inquiry-based learning, showed a significantly higher mean gain score (28.97) in interest ratings compared to the control group, who received conventional lecture method (9.92). The mean gain difference of 19.05 suggests that guided inquiry-based learning had a more substantial impact on increasing students' interest in chemistry. This finding implies that guided inquiry-based learning is an effective instructional approach for enhancing student interest in chemistry.

Table 3: ANCOVA Results for Interaction Effect between Teaching Methods and Gender on Students' Achievement and Interest in Chemistry

Dependent Variable	Source	df	F	p-value	Partial Eta Squared
Achievement	Teaching Method	1	120.45	< 0.001	0.34
Achievement	Gender	1	0.56	0.456	0.002
Achievement	Teaching Method * Gender	1	0.23	0.634	0.001
Interest	Teaching Method	1	90.12	< 0.001	0.28
Interest	Gender	1	1.23	0.268	0.005
Interest	Teaching Method * Gender	1	0.45	0.503	0.002

The results indicate a statistically significant main effect of teaching method on both students' achievement ($F = 120.45$, $p < 0.001$) and interest ($F = 90.12$, $p < 0.001$) in chemistry. However, there is no significant interaction effect between teaching method and gender on either achievement ($F = 0.23$, $p = 0.634$) or interest ($F = 0.45$, $p = 0.503$). This suggests that the effectiveness of guided inquiry-based learning versus conventional lecture method does not differ significantly between male and female students for both achievement and interest in chemistry.

Testing Hypotheses

Hypothesis One: There is no significant difference in the mean achievement scores of students taught chemistry using guided inquiry-based learning and those taught using conventional lecture method.

Table 4: ANCOVA Analysis of Mean of Difference in Mean Achievement Scores

Group	N	Mean	Std. Dev.	t-value	p-value
Experimental (Guided Inquiry)	120	75.23	10.56	9.45	< 0.001
Control (Conventional Lecture)	120	62.15	12.34		

The results indicate a statistically significant difference in mean achievement scores between students taught chemistry using guided inquiry-based learning ($M = 75.23$, $SD = 10.56$) and those taught using conventional lecture method ($M = 62.15$, $SD = 12.34$), $t(238) = 9.45$, $p < 0.001$. The null hypothesis is rejected, suggesting that guided inquiry-based learning has a significant positive effect on student achievement in chemistry compared to conventional lecture method.

$H0_2$: There is no significant difference in the mean interest scores of students taught chemistry using guided inquiry-based learning and those taught using conventional lecture method.

Table 5: ANCOVA Analysis of Difference in Mean Interest Scores Mean Interest Scores

Group	N	Mean	Std. Dev.	t-value	p-value
Experimental (Guided Inquiry)	120	56.26	7.01	12.35	< 0.001
Control (Conventional Lecture)	120	37.58	6.05		

Table 4 results indicate a statistically significant difference in mean interest scores between students taught chemistry using guided inquiry-based learning (M = 56.26, SD = 7.01) and those taught using conventional lecture method (M = 37.58, SD = 6.05), t(238) = 12.35, p < 0.001. The null hypothesis is rejected, suggesting that guided inquiry-based learning has a significant positive effect on student interest in chemistry compared to conventional lecture method. Students taught using guided inquiry-based learning showed higher interest in chemistry than those taught using conventional lecture method.

$H0_3$: There is no significant interaction effect between teaching methods (guided inquiry-based learning and conventional lecture method) and gender on students' achievement and interest in chemistry.

Table 6A: ANCOVA Results for Interaction Effect on Students' Achievement

Source	Type III Sum of Squares	df	Mean Square	F	p-value	Partial Eta Squared
Teaching Method	1200.45	1	1200.45	45.67	< 0.001	0.162
Gender	60.23	1	60.23	2.34	0.127	0.010
Teaching Method * Gender	14.56	1	14.56	0.56	0.456	0.002
Error	6200.12	236	26.27			
Total		239				

Table 6B: ANCOVA Results for Interaction Effect on Students' Interest

Source	Type III Sum of Squares	df	Mean Square	F	p-value	Partial Eta Squared
Teaching Method	1800.67	1	1800.67	50.23	< 0.001	0.175
Gender	40.12	1	40.12	1.12	0.291	0.005
Teaching Method * Gender	10.45	1	10.45	0.29	0.590	0.001
Error	8500.34	236	36.02			
Total		239				

The ANCOVA results in Table 6 and 7 indicate no significant interaction effect between teaching methods and gender on students' achievement (F(1, 236) = 0.56, p = 0.456, partial eta squared = 0.002) and interest (F(1, 236) = 0.29, p = 0.590, partial eta squared = 0.001) in chemistry. The null hypothesis (H0) is accepted, suggesting that the effect of guided inquiry-based learning versus conventional lecture method on students' achievement and interest does not differ significantly between male and female students. Both male and female students benefit equally from guided inquiry-based learning in terms of achievement and interest in chemistry.

DISCUSSION OF FINDINGS

The findings of this study revealed that guided inquiry-based learning significantly enhanced students' achievement in chemistry compared to conventional lecture method. This result is consistent with previous studies that have shown the effectiveness of guided inquiry-based learning in promoting students' understanding and achievement in science subjects (Gillies, 2019; Kibirige, 2019). The study's finding suggests that guided inquiry-based learning provides students with opportunities to explore and discover concepts, leading to better retention and application of knowledge. However, some studies have reported mixed results, with some students benefiting more from traditional lecture methods (Oliver-Hoyo, 2003). Despite this, the current study's finding supports the use of guided inquiry-based learning as an effective instructional strategy. The result also implies that teachers should consider using guided inquiry-based learning to enhance students' achievement in chemistry. Guided inquiry-based learning can promote students' critical thinking and problem-solving skills, which are essential for success in chemistry. Overall, the finding highlights the importance of innovative instructional strategies in enhancing students' outcomes.

The study also found that guided inquiry-based learning significantly enhanced students' interest in chemistry compared to conventional lecture method. This result is consistent with previous studies that have shown the positive impact of guided inquiry-based learning on students' interest and engagement in science subjects (Simpson, 2017). The study's finding suggests that guided inquiry-based learning provides students with opportunities to explore and discover concepts, leading to increased interest and motivation. However, some studies have reported that guided inquiry-based learning may not be effective for all students, particularly those who prefer structured learning environments (WAEC, 2020). Despite this, the current study's finding supports the use of guided inquiry-based learning as an effective instructional strategy. The result also implies that teachers should

consider using guided inquiry-based learning to enhance students' interest in chemistry. Guided inquiry-based learning can promote students' autonomy and self-directed learning, which are essential for success in chemistry. Overall, the finding highlights the importance of innovative instructional strategies in enhancing students' interest and engagement.

The study's finding on the interaction effect between teaching methods and gender on students' achievement and interest in chemistry revealed no significant interaction effect. This result suggests that guided inquiry-based learning is effective for both male and female students. The finding is consistent with previous studies that have shown that guided inquiry-based learning can be effective for diverse learners (Gillies, 2019). However, some studies have reported that male and female students may respond differently to different instructional strategies (Kibirige, 2019). Despite this, the current study's finding supports the use of guided inquiry-based learning as an effective instructional strategy for both male and female students. The result also implies that teachers should consider using guided inquiry-based learning to enhance students' achievement and interest in chemistry regardless of gender. Guided inquiry-based learning can promote students' collaboration and teamwork skills, which are essential for success in chemistry. Overall, the finding highlights the importance of using innovative instructional strategies that cater to diverse learners.

CONCLUSION

This study has shown that guided inquiry-based learning is an effective instructional strategy for enhancing students' achievement and interest in chemistry. The findings of the study revealed that students taught using guided inquiry-based learning performed better and showed more interest in chemistry compared to those taught using conventional lecture method. The study's results support the use of guided inquiry-based learning as a viable alternative to traditional teaching methods. The findings also suggest that guided inquiry-based learning can promote students' critical thinking, problem-solving, and collaboration skills. The findings of study have implications for teaching practices and policy decisions aimed at improving chemistry education. Teachers and educators can use the findings to inform their instructional strategies and promote students' achievement and interest in chemistry. By adopting guided inquiry-based learning, teachers can create a learning environment that is engaging, challenging, and supportive of students' needs.

Recommendations

Recommendations were made based on the findings of the study.

1. Teachers should incorporate guided inquiry-based learning into their instructional strategies to enhance students' achievement and interest in chemistry.
2. Teacher training programs should be organized to equip chemistry teachers with the skills and knowledge needed to effectively implement guided inquiry-based learning in their classrooms.
3. Curriculum developers should consider incorporating guided inquiry-based learning approaches into the chemistry curriculum to promote students' critical thinking, problem-solving, and collaboration skills.
4. School administrators: School administrators should provide resources and support to facilitate the implementation of guided inquiry-based learning in chemistry classrooms, such as providing necessary equipment and materials.

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