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**INTEGRATED SCIENCE EDUCATION (IJCIISE)**

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## EDITORIAL

Dear Readers,

We are excited to announce the launch of International Journal of Contemporary Issues in Integrated Science Education (IJCIISE). This Association Integrated Science Educators' Association of Nigeria (ISEAN) play a vital role in promoting scientific advancement, supporting science education, informing science policy, recognizing science excellence and fostering community engagement. The desire to float this journal was borne out of the passion to organize a yearly conference of Integrated Science by the Integrated Science Educators' Association of Nigeria, of which selected scholarly articles will be published after a thorough review. The journal dedicated to advancing knowledge and fostering dialogue within. Our mission is to publish high-quality research, innovative ideas, and critical analyses that contribute to the understanding and development of Integrated Science. At IJCIISE, we believe in the power of interdisciplinary collaboration and inclusivity. We welcome contributions from scholars, practitioners, and thought leaders worldwide, providing a space for diverse perspectives and groundbreaking work. As we embark on this journey, we invite you to submit your research, engage with our content, and join us in creating a vibrant academic community. Together, we can push the boundaries of knowledge and inspire future generations. Thank you for your support as we launch this exciting new endeavour.

This edition moves around issues that border on "**Enhancing Quality Assurance in Integrated Science in Nigeria.**" It is believed that diverse contributions from scholars and researchers expressed in this edition will provoke the understanding of issues that could foster education for societal transformations on a global scale  
We look forward to your contributions!

For further information on future conference activities, visit <http://ijciise.org/index.php/ijciise>

**Warm regards,**  
**Professor O. S. Agboola**  
President, Integrated Science Educators' Association of Nigeria (ISEAN)

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## TEACHERS' STRATEGIES AND SCIENTIFIC INQUIRY SKILLS OF PRIMARY SCHOOL PUPILS IN OSUN STATE

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### **Abstract**

*The study examined the prevalent strategies employed by teachers in inculcating scientific inquiry skills in early basic class pupils in Osun State and determine the influence of teachers' strategies on pupils' scientific inquiry skills in the study area. The study adopted a descriptive survey research design. The population for the study was all teachers and pupils in the early basic classes in Osun State. One hundred and fifty (150) teachers of early basic classes and 750 early basic classes' pupils were randomly selected through multistage sampling procedure. Two instruments titled, 'Teacher Strategies for Scientific Inquiry Development Observational Schedule (TSSIDOS) and Pupil Scientific Inquiry Observation Rating Scale (PSIORS) were used for data collection. Data collected were analysed using percentage, mean, standard deviation and Analysis of Variance (ANOVA). The finding showed that recitation and explanation were the most frequently used strategies 139 (92.7%) respectively while experimentation was the least employed strategy 16 (10.6%). It also showed that the strategies used have significant influence on the development of pupils' scientific inquiry skills ( $F= 2.944$ ;  $p < 0.05$ ). The study concluded that though teachers employed majorly traditional otherwise referred to as conventional strategies, they still have positive influence on pupils' acquisition of scientific inquiry skills. It is therefore recommended that while teachers use traditional strategies, modern or strategies that are child-centred be adopted to make children engaged in the teaching - learning process. Training should also be organized for teachers to make them acquainted with modern or child-centred strategies.*

**Keywords:** Teachers' Strategies, Scientific inquiry skills, Primary School Pupils

## **Introduction**

Children are naturally curious as they explore the world around them. They like to know why things around them are the way they are. In showing their curiosity, children often observe and raise questions in a way that suggests the use of the scientific inquiry. Scientific inquiry in children involves exploring and questioning the world around them through observation, experimenting with things. It also refers to the process of investigating a question, formulating a hypothesis, conducting experiments and analyzing data to draw conclusions (National Science Association (NSTA), 2007). According to McComas and Olson, (1998), scientific inquiry in children includes developing a curiosity about natural phenomena, collecting evidence through various methods and constructing explanations based on evidences. From the definitions, it can be said that scientific inquiry is an important part of growth and development in children. Though, O'Connor, and Rosicka, (2020) citing Wilson (2007) explained scientific inquiry skills as the skills of 'sciencing' in the early years and interlinking with young learners' understandings of science content, providing the structure and processes for which science content can be covered. It is a skill or competence that should be addressed in children early so that they can develop a broad mind to life. In the light of this, it is one of the skills stipulated in the National Policy on Education in Nigeria (FRN, 2013) to be inculcated in children.

Several stakeholders can play a role in encouraging scientific inquiry skills in children. These stakeholders can help children to be inquisitive from one point to the other in their stages of growth and development. They include parents, peers, teachers and the community in which they live. Parents can support their children's scientific inquiry skills by encouraging curiosity, providing opportunities for exploration and experimentation at home, allowing them to ask questions while they will they will be ready to answer their questions correctly. However, because children spend many hours in school, teachers are key players in developing scientific inquiry skills in children. They can help by creating a learning environment and ask a lot of questions which can guide children through scientific investigations. Therefore, it can be said that fostering scientific inquiry in children is a collaborative efforts among parents, teachers and the community in which the children are growing.

Research has shown that engaging children in inquiry from a young age can have numerous benefits including fostering curiosity, creativity and problem-solving skills as well as improving achievement in science (Lee & Hand, 2005). It can also help children to develop lifelong interest in and a deeper understanding of the natural world by encouraging children to explore and investigate the world around them (NGSS Lead States, 2013).

Having pointed out the benefits of scientific inquiry skills, the strategies employ by teachers in the teaching – learning process may one way or the other have impact on the development of scientific inquiry skills in children. One study by Good et al (2013) investigated the strategies that teachers use to support scientific inquiry

in the classrooms discovered that teachers who emphasized hands-on experiments, open-ended questions and scaffolding techniques were more successful in promoting students' engagement and understanding of scientific concepts.

In another study, Park and Oliver (2008) explore the instructional strategies used by science teachers to promote scientific inquiry and found that teachers who provided opportunities for students to ask questions, design experiments and analyze data were more effective in fostering scientific inquiry skills in the students. Additionally, a study by Chin and Osborne (2008) examined how science teachers supported students' inquiry-based learning in the classroom and identified several key strategies, including modelling scientific inquiry, providing feedback and guidance and creating a supportive learning environment. Furthermore, Abdal-Hay et al (2020) examined kindergarten teachers' beliefs and practices of inquiry-based science education and how these strategies influence pupils' scientific process skills and their findings suggested that teachers' beliefs and practices significantly impact pupils' ability to engage in scientific inquiry. Several other scholars emphasised the role of teachers in the development of skills in children through various strategies – conventional (teacher-centred) and modern (child-centred)

In the Nigerian setting, scientific inquiry is a skill to be given attention in order to build productive citizens rather than consumers. When children inculcated the skill, it will help to build a sustainable society.

However, there is limited research on teachers' strategies for facilitating scientific inquiries, particularly in children in Osun State primary schools, hence, this study.

### **Purpose of the Study**

The main purpose of this study is to investigate the strategies that teachers use for developing scientific inquiry skills of primary school pupils in Osun-State.

### **Objectives of the Study**

The following objectives are generated for this study:

- i. examine the prevalent strategies employed by teachers in inculcating scientific inquiry skills in early basic class pupils in Osun State.
- ii. determine the influence of teachers' strategies on pupils' scientific inquiry skills in the study area.

### **Research Question**

What are the prevalent strategies teachers used in primary schools in the study area?

### **Hypothesis**

There is no significant influence of teachers' strategies on pupils' scientific inquiry skills.

### **Methodology**

The study was a descriptive survey research with all teachers of early basic classes as the population for the study. One hundred and fifty (150) teachers of early

basic classes and 750 early basic classes' pupils were randomly selected through multistage sampling procedure. Two instruments titled, 'Teacher Strategies for Scientific Inquiry Development Observational Schedule (TSSIDOS) and Pupil Scientific Inquiry Observation Rating Scale (PSIORS) were used for data collection. Data collected were analysed using percentage, mean, standard deviation, Analysis of Variance (ANOVA).

## Results

The results for the study were presented in line with the stated objectives.

**Research Question: What are the prevailing strategies employed by teachers in inculcating scientific inquiry skills in early basic class pupils in Osun State?**

**Table 1: Percentage of Teacher Strategies Used**

S/N	Items	Freq. Used	Seldomly Used	Not Used	Rank
1	Recitation	139 (92.7%)	11(7.3%)	-	1
2	Explanation	139 (92.7%)	11 (7.3%)	-	1
3	Demonstration	54(36%)	46(30.6%)	50(33.3%)	6
4	Collaboration	127(84.6%)	23(15.3%)	-	4
5	Discussion	32(21.3%)	26(17.3%)	92(61.3%)	7
6	Questioning	137 (91.3%)	8(5.3%)	5(3.3%)	3
7	Experiment	16(10.6%)	25(6.6%)	109(72.6)	9
8	Reading from Textbooks	27(18%)	31(20.6%)	92(61.3%)	8
9	Use of visual aids	125 (83.3%)	21(14%)	4(2.6%)	5

Results showed that recitation and explanation 139(92.7%), questioning 137(91.3%) and visual aids 125(83.3%) were the prevalent strategies employed by teachers among other findings.

**Hypothesis: There is no significant influence of teachers' strategies on pupils' scientific inquiry skills.**

**Table 2: Analysis of Variance on the Influence of Teachers' Strategies and pupils' scientific inquiry skills.**

		ANOVA a				
	Model	Sum of Sqs.	Df	Mean Sq.	F	Sig.
1	Regression	80.640	8	10.080	2.944	.005b
	Residual	482.834	141	3.424		
	Total	563.473	149			

a Dependent Variable: Skills

b Predictors: (Constant), Visual, Questioning, Collaboration, Discussion, Explanation, Texts, Experiment, Demonstration

**Coefficients a**

Model		Unstandardized Coefficients B	Standardized Coefficients Std. Error Beta	t	Sig.
1	(Constant)	8.888	4.855	1.831	.069
	Explanation	-.679	.902	-.091	.453
	Demonstration	1.107	.625	.475	.079
	Collaboration	-.641	.722	-.119	.376
	Discussion	.158	.353	.067	.655
	Questioning	.506	.416	.108	.226
	Experiment	.453	.579	.157	.435
	Texts	.244	.542	.09	.654
	Visual	.873	.870	.206	.317a

Dependent Variable: Skills

Excluded Variables a

Model	Beta In	t	Sig.	Partial Correl.	Collinearity Statistics
	Recitation		.000		

a Dependent Variable: Skills

b Predictors in the Model: (Constant), Visual, Questioning, Collaboration, Discussion, Explanation, Texts, Experiment, Demonstration

**Discussion of Findings**

The study highlighted the most common strategies used by primary school teachers in Osun State to develop scientific inquiry skills in children. These included: Recitation and Explanation as the most frequently used by teachers. They are essential for conveying information and clarifying concepts. The frequent use of recitation and explanation aligns with traditional teacher-centered methods identified by Chin and Osborne (2008) in their study. However, their advocacy for a shift to inquiry-focused strategies (e.g., modeling inquiry and providing feedback) highlights the need for the teachers in Osun State to adopt more interactive approaches. The finding is also in support of Odora (2014) study that emphasized the need to help teachers gain good grip of explanation as a strong method to improve learners' competence and academic achievement. Tefertiller (2016), who revealed recitation to be a good strategy in teaching as there is nowhere, for learners to hide, and no opportunity for tricks to disguise a lack of knowledge. It is either the learner knows it or not. Trinitas (2022) also discovered recitation as a potent strategy in helping learners develop rhetoric skills and aiding skills of public speaking. However, it has to be pointed out that traditional strategies may still be effective in the teaching – learning process, they do not allow for active engagement of children in hands-on inquiry-based learning that will actively and effortlessly promote scientific inquiry skills.

The study showed that Questioning was employed largely by teachers in

stimulating curiosity and guiding scientific thinking of pupils. The finding is in accordance to Tofade, Elsner, and Haines (2013); Shanmugavelu, Ariffin, Vadivelu, Mahayudin and Arasi, Sundaram (2020) submission that questioning is a dynamic strategy to reckon with in the teaching – learning process of inculcating scientific inquiry skills in children. The study further elucidated Center for Innovation in Teaching & Learning (2024) submission of the efficacy of questioning on attaining a well – defined goals for students' learning. However, Tofade, Elsner, and Haines (2013) revealed that poor constructed questioning could have negative effect on learners' construction of knowledge. The implication is that when teachers use questioning well for learners, they tend to help learners operate at improved level in the learning process.

The finding also indicated that collaborative strategies were employed by teachers to foster scientific inquiry skills in children. This is in line with finding of Olowoniyi (2018) that revealed the effectiveness of Jigsaw collaborative instructional strategy on pupils learning outcomes. This implies that collaborative strategies would afford pupils opportunity to acquire knowledge from peers as they interact. Furthermore, visual aids were used by teachers in acquiring scientific inquiry concepts. The finding corroborated the works of Shabiralyani, Hasan, Hamad, & Iqbal (2015) and Davidova and Pavlovna (2022) that indicated the impact of using visual aids to enhance learning process of younger students in their study areas. The finding on the use of demonstration as a strategy by teachers was moderate, while discussion was less frequent in use by teachers. The implication of the finding is that teachers need to employ more active engagement approaches for children to inculcate scientific inquiry skills in them right from the formative age. From the finding of this study, experimentation is one of the least utilized strategies by teachers. The implication is that there is still a gap in applying practical inquiry methods to learners by teachers. This may be as a result of lack of capability or competence by teachers to adopt the strategy or lack of materials to work with. The finding corroborated Staris, Haniotis and Sguilla (2020) who indicated that teachers in their study area did not employ experimentation in the learning process due to their insecurity in their own disciplinary knowledge.

The finding on the hypothesis tested showed that teachers' strategies influenced pupils' scientific inquiry skills. The implication is that the teaching strategies teachers are employing had impact on pupils' development of scientific inquiry skills. While traditional methods remain the dominant strategies used by teachers, incorporating more interactive, inquiry-driven practices can significantly enhance pupils' curiosity, problem-solving abilities. The finding reiterated the study of Ivic (2016) that discovered that traditional teaching strategies still dominate Croatian primary schools. This implies that teacher – centric strategies are still being adopted in classrooms than learner-centred strategies.

## Conclusion

This study investigated the strategies employed by primary school teachers in Osun State to develop scientific inquiry skills among early basic class pupils. The findings showed teachers heavy reliance on traditional teaching strategies such as recitation and explanation, alongside frequent use of questioning and visual aids. However, hands-on experimentation, which is essential in inquiry-based learning, was notably underutilized. The study established the significant influence of teaching strategies on pupils' scientific inquiry skills, to align with global literature on the importance of fostering curiosity, critical thinking, and problem-solving abilities in children. While strategies like questioning and collaboration show promise, the underuse of experimental methods signals an urgent need to be addressed for teacher training and resource provision. This research therefore contributes to the existing body of knowledge by providing localised insights into the state of inquiry-based science education among early basic classes' pupils in Osun State.

## Recommendations

Based on the findings, several actions are recommended that can enhance scientific inquiry skills among primary school pupils.

Teachers should integrate more experimentation and active strategies to foster spirit of inquiry in children. Regular workshops and seminars should be organized for teachers to focus on modern, inquiry-based teaching methodologies to reduce reliance on traditional strategies like recitation. Training resources should be prepared by educators on teaching strategies and their applications in the teaching – learning process. Education stakeholders especially the policy makers, school owners should ensure adequate resources and professional development opportunities for teachers to implement inquiry-based learning effectively.

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