The Relationship Between Guided Discovery Method (Gdm) And Knowledge Retention Among Electrical Installation Students in Benue State

Okebe Ajima, James Tsetsim, Paul Aidi

Department of Business Management, Benue State University Makurdi, Nigeria

DOI: https://dx.doi.org/10.47772/IJRISS.2025.910000198

Received: 02 October 2025; Accepted: 10 October 2025; Published: 07 November 2025

ABSTRACT

This study examined the relationships between Guided Discovery Method (GDM) components and knowledge retention among Electrical Installation students in Benue State. The research objectives were to explore the associations between teacher guidance and scaffolding, problem-solving activities, and collaborative learning with students' knowledge retention. A correlational survey design was employed with 323 valid responses from Electrical Installation students across technical schools in Makurdi Metropolis. Data were collected using a structured questionnaire adapted from validated scales, with Cronbach's alpha coefficients ranging from 0.91 to 0.94, indicating high internal consistency. Data analysis involved descriptive statistics, Pearson correlation, and multiple regression analyses. The results revealed significant positive correlations between all three GDM components and knowledge retention: teacher guidance and scaffolding ($r = .691$, $p < .01$), problem-solving activities ($r = .688$, $p < .01$), and collaborative learning ($r = .678$, $p < .01$). Multiple regression analysis produced an R value of 0.701 and an adjusted R^2 of 0.485, indicating that these variables jointly accounted for 48.5% of the variance in students' knowledge retention scores. However, the high inter-correlations among predictors (e.g., $r = .989$ between teacher guidance and problem-solving) indicate multicollinearity, suggesting that the GDM components likely measure closely related aspects of the same instructional construct. Therefore, the results should be interpreted as the combined influence of GDM rather than distinct effects of each component. The study concludes that GDM components show strong positive relationships with knowledge retention measures. It recommends that technical education teachers adopt GDM as an integrated pedagogical approach. Future research should employ longitudinal or experimental designs with pre-tests and delayed post-tests to establish causation and measure actual long-term knowledge retention.

Keywords: Guided Discovery Method, Knowledge Retention, Electrical Installation, Technical Education, Correlational Study, Benue State

Background to the Study

Teaching strategies have long been recognized as crucial determinants of students' learning outcomes and retention, particularly in vocational and technical education where practical skills and conceptual understanding are required. One such learner-centered strategy is the **Guided Discovery Method (GDM)**. GDM is a teaching approach in which learners are actively involved in exploring concepts, solving problems, and discovering knowledge with the guidance of the teacher, rather than being passive recipients of information (Eggen & Kauchak, 2019). This method emphasizes active participation, critical thinking, and problem-solving, making it especially relevant to technical fields like Electrical Installation.

In this study, the independent variable is the Guided Discovery Method (GDM), which emphasizes learner-centered instruction. The method has several key dimensions. First, it involves teacher guidance and scaffolding, where the instructor provides structured support to facilitate students' learning process. Second, it incorporates problem-solving activities that actively engage learners in critical thinking and exploration of concepts. Third, it promotes collaborative learning, encouraging teamwork and interaction among students as they work together

to discover knowledge. Finally, GDM emphasizes hands-on practical exploration, which aligns learning tasks with vocational training and helps students connect theory to practice.

Knowledge retention, on the other hand, refers to the students' ability to remember and apply learned concepts over time, particularly during later assessments or in real-life problem-solving contexts (Okolie et al., 2021). The dimensions of knowledge retention include immediate recall, which reflects short-term remembrance of learned content; delayed recall, which refers to the ability to retain knowledge over a longer period; and the application of knowledge, which involves transferring and utilizing retained information in practical or novel situations

The relationship between the independent and dependent variables lies in the fact that GDM provides opportunities for deeper engagement with content, which enhances comprehension and encourages long-term retention (Mayer, 2020). Compared with traditional lecture methods, guided discovery promotes active learning, which has been shown to significantly improve retention in science, technology, and vocational education (Audu, 2022).

Within the context of Electrical Installation education in Benue State, the use of effective teaching methods is crucial. Electrical Installation is a core trade in Technical and Vocational Education and Training (TVET), designed to equip students with both theoretical knowledge and practical skills for employability and technological advancement. However, despite its importance, many students in Benue State continue to perform poorly in national technical examinations and often struggle with applying concepts in real-world settings (National Business and Technical Examinations Board [NABTEB], 2022). This suggests that the prevalent instructional strategies often teacher-centered and lecture-driven may not adequately foster understanding and knowledge retention among learners (Eze & Okonkwo, 2021).

Therefore, applying the Guided Discovery Method could provide a more interactive, problem-solving, and hands-on approach that aligns with the practical nature of Electrical Installation. By encouraging active involvement and facilitating deeper learning, GDM has the potential to bridge the gap between theory and practice, thereby improving students' long-term knowledge retention in Benue State.

Statement of the Problem

Despite the crucial role of Technical and Vocational Education in producing skilled manpower for national development, students' performance in Electrical Installation in Benue State remains below expectation. Reports from NABTEB (2022) reveal persistent cases of poor academic achievement and low pass rates in electrical-related subjects among technical students. Additionally, many graduates of technical colleges demonstrate limited retention of knowledge, which hampers their ability to solve practical problems and apply acquired skills in real-life situations (Okolie et al., 2021).

Several factors have been identified as contributors to this challenge, including inadequate teaching resources, insufficient exposure to hands-on practice, and reliance on traditional lecture-based methods that emphasize rote memorization rather than conceptual understanding (Eze & Okonkwo, 2021). These approaches limit students' active participation and problem-solving skills, leading to surface learning and poor retention over time.

The Guided Discovery Method presents itself as a viable instructional strategy to address these gaps. By engaging students in structured problem-solving, fostering collaboration, and allowing them to discover principles through guided exploration, GDM encourages deeper comprehension and long-term retention (Mayer, 2020; Audu, 2022). However, in Benue State, little is known about the extent to which this method has been applied in Electrical Installation instruction and whether it significantly impacts students' knowledge retention.

This study, therefore, seeks to fill this gap by empirically investigating the impact of the Guided Discovery Method on the knowledge retention of Electrical Installation students in Benue State. It aims to determine whether adopting this learner-centered strategy can improve outcomes and equip students with the competencies required for success in technical education and industry

Objectives of the Study

The main objective of this study is to examine the relationships between the components of the Guided Discovery Method (GDM) and the knowledge retention of Electrical Installation students in Benue State. The specific objectives are to:

Examine the relationship between teacher guidance and scaffolding and the knowledge retention of Electrical Installation students in Benue State.

Assess the association between problem-solving activities and the knowledge retention of Electrical Installation students.

Determine the relationship between collaborative learning and the knowledge retention of Electrical Installation students.

Research Hypotheses

The following null hypotheses were tested:

H_{01}: There is no significant relationship between teacher guidance and scaffolding and the knowledge retention of Electrical Installation students in Benue State.

H_{02}: There is no significant relationship between problem-solving activities and the knowledge retention of Electrical Installation students in Benue State.

H_{03}: There is no significant relationship between collaborative learning and the knowledge retention of Electrical Installation students in Benue State.

REVIEW OF RELATED LITERATURE

Conceptual Framework

Guided Discovery Method: Definition and Core Components

The Guided Discovery Method (GDM) represents a pedagogical approach rooted in constructivist learning theory, where students actively construct knowledge through structured exploration with teacher support (Bruner, 1966). Unlike pure discovery learning, GDM provides scaffolding to prevent students from becoming lost in unproductive exploration while maintaining the benefits of active learning (Brown & Campione, 1994).

Contemporary implementations of GDM in technical education contexts emphasize four key dimensions:

Teacher Guidance and Scaffolding: This involves providing structured support that gradually decreases as student competence increases. Teachers offer prompts, worked examples when needed, and strategic questioning to guide student thinking without providing direct answers (Vygotsky's Zone of Proximal Development).

Problem-Solving Activities: Students engage with authentic problems that require hypothesis formation, testing, and reflection rather than passive reception of procedures. In electrical installation contexts, this might involve diagnosing circuit faults or designing wiring solutions.

Collaborative Learning: Small-group work where students share hypotheses, debate solutions, and co-construct understanding. Peers serve as additional scaffolds during the discovery process.

Hands-on Practical Exploration: Direct manipulation of materials and equipment that provides immediate feedback and connects abstract concepts to physical reality.

Knowledge Retention: Conceptualization and Dimensions

Knowledge retention refers to the persistence of learned information and skills over time, encompassing both recall and application capabilities (Ebbinghaus, 1885/1913).

Contemporary cognitive psychology distinguishes three key dimensions:

Immediate Retention: The ability to recall or demonstrate learned material shortly after instruction (minutes to days). This reflects successful initial encoding and short-term memory processes.

Delayed Retention: The persistence of knowledge over extended periods (weeks to months), indicating successful consolidation into long-term memory through rehearsal and meaningful connections.

Transfer and Application: The ability to apply retained knowledge in novel contexts or problem-solving situations, representing the highest level of retention that enables practical competence.

Theoretical Framework

Constructivist Learning Theory

This study is grounded in constructivist learning theory, drawing primarily from the works of Piaget (1952), Bruner (1966), and Vygotsky (1978). Constructivism posits that learners actively build knowledge by connecting new experiences with existing cognitive structures rather than passively receiving information.

Piaget's Contribution: Emphasized how learners reorganize mental frameworks through assimilation (incorporating new information into existing schemas) and accommodation (modifying schemas to fit new information).

Bruner's Discovery Learning: Advocated for learning through exploration and problem-solving, with the teacher's role being to structure experiences that enable students to discover principles themselves.

Vygotsky's Social Constructivism: Introduced the Zone of Proximal Development (ZPD), highlighting how learners achieve more with appropriate support from teachers or peers than they can accomplish independently.

Information Processing Theory

Information Processing Theory (Atkinson & Shiffrin, 1968; Baddeley, 2000) provides a cognitive framework for understanding how GDM might enhance retention. The theory describes learning as involving encoding (initial processing), storage (maintaining information in memory), and retrieval (accessing stored information).

GDM potentially enhances each stage: active exploration improves encoding through deeper processing; scaffolded practice supports consolidation; and problem-solving activities strengthen retrieval pathways through varied practice contexts.

Empirical Review

GDM in Technical and Vocational Education

Iloma (2019) conducted a quasi-experimental study examining GDM's impact on achievement in domestic electrical installation testing among 291 vocational students across three South-South Nigerian states. Using a 43-item achievement test ($\alpha = 0.87$), the study found significantly higher performance for students receiving GDM compared to traditional lecture methods. However, the study's use of intact classes and purposive school selection limits causal inference, and the absence of retention measures restricts understanding of long-term learning effects.

Ogbebor and Oviawe (2023) compared demonstration and lecture methods among 61 Vocational II students in Edo State technical colleges using the Electrical Installation and Maintenance Works Achievement Test. Results showed demonstration method superiority over lecture approaches, with no significant gender effects. The small, purposively selected sample limits generalizability, and the study focused on immediate achievement rather than retention outcomes.

GDM in Science and Mathematics Education

Yusuf (2020) examined GDM's impact on physics interest and achievement among 240 senior secondary students across 12 schools in Ilorin. Using multistage random sampling, the study found significant improvements in both interest ($\alpha = 0.64$) and achievement (KR-21 = 0.79) measures. While the broader sampling enhances generalizability, the lower reliability of the interest measure and absence of retention testing limit conclusions about sustained learning effects.

Udo and Umoh (2024) conducted a three-group quasi-experimental study comparing guided-discovery, demonstration, and expository methods on probability achievement and retention among 183 SS2 students. Results indicated demonstration exceeded both guided-discovery and traditional methods on immediate and retention measures. The study's strength lies in measuring both achievement and retention, though purposive sampling of well-resourced schools may limit transferability to typical educational contexts.

Collaborative and Problem-Based Approaches

Uduak and Onwiodukit (2019) investigated guided-discovery and demonstration methods for entrepreneurial skill acquisition in physics among senior secondary students in Akwa Ibom State. Using performance-based assessments of circuit sketching and wiring skills, the study found both methods effective for skill development. However, limited methodological details and purposive sampling restrict the strength of conclusions.

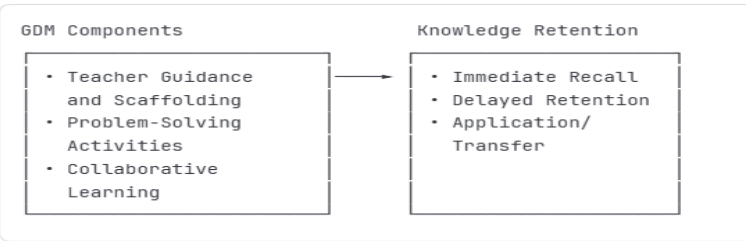
Research Gaps and Study Justification

This study fills a critical gap in the literature by providing empirical evidence on the relationships between specific Guided Discovery Method components and knowledge retention within Nigerian technical education. Previous studies largely focused on academic achievement rather than retention and often used quasi-experimental designs. By adopting a correlational approach with validated instruments and high response rates, this study contributes foundational evidence that informs future experimental investigations into the causal effects of GDM.

Conceptual Model

Based on the theoretical framework and empirical evidence, this study examines relationships between three key GDM components (teacher guidance and scaffolding, problem-solving activities, and collaborative learning) and knowledge retention among electrical installation students. The model assumes that these instructional components may be associated with enhanced retention through their impact on cognitive processing, engagement, and meaning-making processes identified in constructivist and information processing theories.

Figure 2.1: Conceptual Model



Note: Arrows indicate hypothesized relationships to be examined through correlational analysis; causal relationships cannot be established through the current study design.

METHODOLOGY

Research Design

This study employed a correlational survey research design to examine the relationships between Guided Discovery Method (GDM) components and knowledge retention among Electrical Installation students in Benue State. The correlational design was chosen to explore associations between variables as they naturally occur without manipulation, providing foundational evidence for future experimental investigations.

Population and Sample

Target Population

The target population consisted of all Electrical Installation students in technical colleges across Benue State, Nigeria. However, the accessible population was limited to students in Makurdi Metropolis due to the concentration of technical education institutions in this location.

Study Location and Justification

Makurdi was selected as the study location for several strategic reasons:

Central Geographic Location: Makurdi serves as the capital of Benue State and is centrally located, making it representative of the state's educational and economic context.

Concentration of Technical Institutions: Makurdi houses the majority of established technical colleges in Benue State, including:

Benue State University Technical College, Makurdi

St. Joseph Technical College, Makurdi

Resource Availability: These institutions have more developed electrical installation programs compared to smaller technical schools in other parts of the state, ensuring adequate sample representation of students with substantial GDM exposure.

Accessibility and Infrastructure: The central location provides better accessibility for data collection and ensures participation from institutions with established electrical installation curricula.

Sample Size and Distribution

The study sample comprised **323 Electrical Installation students** distributed across the two technical colleges in Makurdi:

Benue State University Technical College, Makurdi: 180 students (55.7%)

St. Joseph Technical College, Makurdi: 143 students (44.3%)

This sample size was determined based on the total enrollment of Electrical Installation students in both institutions (approximately 350 students), representing a **92.3% coverage** of the accessible population.

Sampling Technique

A **census sampling approach** was employed, attempting to include all available Electrical Installation students from both technical colleges. This comprehensive approach was feasible due to the manageable population size and ensured maximum representativeness within the accessible population.

Response Rate: Of the 330 questionnaires distributed, 323 were successfully completed and returned, yielding a **98% response rate**. This exceptionally high response rate was achieved through:

Direct administration during regular class periods

Multiple follow-up visits to ensure participation

Coordination with institutional administrators and faculty

Generalizability to Benue State

While the sample was drawn from Makurdi-based institutions, several factors support the generalizability of findings to Benue State's broader technical education context:

Limited Alternative Institutions: Benue State has relatively few technical colleges offering comprehensive Electrical Installation programs outside Makurdi. The two participating institutions represent the **primary centers** for technical education in the state.

Standardized Curriculum: All technical colleges in Benue State follow standardized curricula prescribed by the National Board for Technical Education (NBTE), ensuring consistency in educational content and approach across institutions.

Student Demographics: The participating institutions draw students from across Benue State's three senatorial zones, creating a geographically diverse student body representative of the state's population.

Resource and Infrastructure Patterns: While the Makurdi institutions may have better resources, the teaching methods and educational challenges observed are likely representative of patterns across the state's technical education system.

Faculty Background: Technical education instructors across Benue State typically receive similar training and certification, supporting the transferability of findings regarding teaching method effectiveness.

Inclusion and Exclusion Criteria

Inclusion Criteria:

Students currently enrolled in Electrical Installation programs

Minimum of one semester experience in technical education

Voluntary consent to participate

Exclusion Criteria:

Students with less than one semester of technical education experience

Incomplete questionnaire responses

Students absent during data collection periods

Limitations of Sampling Approach

Despite the strategic justification for focusing on Makurdi institutions, several limitations should be acknowledged:

Geographic Concentration: The sample represents primarily urban/semi-urban contexts and may not reflect challenges in more rural technical schools.

Resource Advantage: Participating institutions may have better resources than smaller technical schools elsewhere in the state, potentially influencing the observed relationships.

Selection Effects: Students who choose to attend technical colleges in the state capital may differ systematically from those attending local institutions.

Infrastructure Differences: Better laboratory facilities and equipment in Makurdi institutions might moderate the effectiveness of different teaching approaches.

Future research should attempt to include smaller technical institutions across different parts of Benue State to validate and extend these findings to more diverse educational contexts.

Research Instrument

The research instrument was a structured questionnaire divided into two sections. Section A captured the demographic characteristics of the respondents, while Section B measured the study variables. The items in the instrument were adapted from the works of Abtin and Pouramiri (2016) and Bataineh et al. (2015), and were modified to suit the context of Guided Discovery Method and knowledge retention. The independent variable, Guided Discovery Method, was operationalized through three dimensions: **teacher guidance and scaffolding**, **problem-solving**, and **collaborative learning**. Teacher guidance and scaffolding was measured with four items, problem-solving with five items, and collaborative learning with four items, while the dependent variable, knowledge retention, was measured with four items. Knowledge retention in this study was assessed through students' self-reported perceptions of their ability to recall and apply learned concepts. Although this provides valuable insights into learners' confidence and perceived retention, it does not capture actual long-term retention measured over time. Future studies should employ pre-tests and delayed post-tests to assess actual knowledge persistence.

To ensure the reliability of the instrument, Cronbach's alpha coefficients were computed for each construct. The results showed teacher guidance and scaffolding (0.93), problem-solving (0.94), collaborative learning (0.94), and knowledge retention (0.91), indicating high internal consistency. Data were analyzed using frequency counts and percentages for descriptive purposes, while Pearson correlation and multiple regression analyses were employed to test the study's hypotheses.

RESULTS AND DISCUSSION

Testing of Hypotheses

Table 2: Correlation Matrix for Teacher Guidance and Scaffolding, Problem-Solving, Collaborative Learning and Knowledge Retention

Variables	KR	TGS	PS	CL
Knowledge Retention (KR)	-			
Teacher Guidance & Scaffolding (TGS)	.691	-		
Problem-Solving (PS)	.688	.989	-	
Collaborative Learning (CL)	.678	.924	.952	-

Correlation is significant at the 0.01 level (2-tailed).

Pearson correlation analysis was used to test the relationships between knowledge retention (dependent variable) and the dimensions of the Guided Discovery Method (Teacher Guidance and Scaffolding, Problem-Solving, and Collaborative Learning). The correlation matrix revealed extremely high correlations among the GDM

dimensions, particularly between teacher guidance and problem-solving (r = .989). This indicates multicollinearity and suggests that the three components of GDM are highly interrelated, measuring overlapping aspects of guided discovery learning. Consequently, the interpretation of individual beta weights in the regression model should be treated with caution. The overall findings are best understood as representing the collective influence of GDM as an integrated instructional approach. To further assess the predictive strength of each variable, multiple regression analysis was conducted, and the results are presented in **Table 3.**

Table 3: Summary of Multiple Regression Results (Knowledge Retention as Dependent Variable)

Models	B	T	Sig (p)	R	R^2	Adj R^2	F	Sig (p)
Constant	.256	1.704	.091					
Teacher Guidance & Scaffolding	.847	2.472	.014*					
Problem-Solving	.537	1.226	.022*	.701	.491	.485	79.220	.001
Collaborative Learning	.400	2.473	.014*					

*p < .05, **p < .01

FINDINGS

As shown in **Table 2**, knowledge retention (KR) demonstrated significant and positive correlations with:

This implies that the three components of the Guided Discovery Method are positively associated with students' knowledge retention. In other words, the more effectively teachers provide scaffolding, encourage problem-solving, and foster collaborative learning, the higher the level of knowledge retention among Electrical Installation students.

From **Table 3**, the regression results indicated that Teacher Guidance and Scaffolding, Problem-Solving, and Collaborative Learning are strong predictors of knowledge retention. The model produced an R value of 0.701, suggesting a good correlation, while the adjusted R^2 of 0.485 showed that these variables jointly explained 48.5% of the variations in knowledge retention. The overall regression model was statistically significant (F = 79.220, p < .001).

These findings align with previous studies such as Patrick et al. (2014), who reported that problem-solving and collaborative learning approaches significantly influenced students' performance outcomes, accounting for over 50% of the variation in learning achievement. Similar results have also been reported in related empirical works (Azzam, 2014; Uchendu, Anijaobi-Idem, & Odigwe, 2013; Tseveendorj, 2008), confirming that guided learning strategies enhance long-term retention and performance.

DISCUSSION OF FINDINGS

The findings of this study provide strong empirical evidence that the Guided Discovery Method significantly and positively enhances knowledge retention among Electrical Installation students. Specifically, the three components—Teacher Guidance and Scaffolding, Problem-Solving, and Collaborative Learning—were all significant contributors.

1. **Collaborative Learning** plays a central role, as it encourages interaction and mutual support among learners, thereby deepening understanding and enhancing retention. This agrees with Andersen (2001), who emphasized that collaboration builds a foundation for knowledge exchange and problem-solving. Studies have shown that when learners engage in cooperative tasks and resolve challenges collectively, their ability to recall and apply knowledge improves significantly (Roberts-Lombard, 2011).

2. **Problem-Solving** enables learners to actively engage with the subject matter rather than passively receive information. By tackling real-life electrical installation challenges, students enhance their critical thinking skills, which leads to stronger retention of concepts and techniques.

3. **Teacher Guidance and Scaffolding** ensures that learners receive the necessary support to navigate difficult concepts while gradually building autonomy. This guided support provides clarity, structure, and motivation, thereby reinforcing memory and comprehension.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study examined the relationships between Guided Discovery Method components and knowledge retention among Electrical Installation. The findings revealed that the three major components of GDM—**Teacher Guidance and Scaffolding, Problem-Solving, and Collaborative Learning**—have significant and positive association with students' knowledge retention. The correlation analysis confirmed strong associations, while the regression results showed that these variables jointly explained 48.5% of the variations in knowledge retention.

The implication is that when teachers provide structured guidance, encourage active problem-solving, and foster collaboration among students, learners are more likely to retain knowledge and apply it effectively in practice. Therefore, the Guided Discovery Method proves to be an effective learner-centered instructional strategy for enhancing knowledge retention in technical and vocational education.

Recommendations

Based on the findings of the study, the following recommendations are made:

Integration of GDM in Curriculum Delivery: Technical and vocational education teachers, especially those handling Electrical Installation, should adopt the Guided Discovery Method as a core teaching strategy to enhance students' long-term knowledge retention and practical competence.

Teacher Training and Professional Development: Education authorities and policymakers should organize regular training workshops to equip teachers with the skills needed to effectively implement scaffolding techniques, problem-solving activities, and collaborative learning in the classroom.

Provision of Learning Resources: Schools should provide adequate tools, laboratory equipment, and interactive learning materials that support problem-solving tasks and group-based learning, as these will reinforce students' ability to discover knowledge on their own.

Encouragement of Peer Collaboration: Teachers should create opportunities for group assignments, cooperative projects, and peer-to-peer learning sessions to strengthen collaborative learning and improve students' retention levels.

Policy Support: The Ministry of Education and curriculum planners should emphasize learner-centered approaches, such as the Guided Discovery Method, in technical education policies to promote critical thinking, innovation, and sustainable skill acquisition.

Limitations of the Study

This study has two key limitations. First, the high inter-correlation among the independent variables indicates multicollinearity, limiting the ability to isolate the unique contribution of each GDM component. Nevertheless, this overlap reinforces that the Guided Discovery Method operates as a holistic teaching strategy. Second, knowledge retention was measured through self-reported perceptions at a single point in time. This approach

captures perceived rather than objectively measured retention. Future research should adopt longitudinal or experimental designs that assess actual retention across multiple time points.

REFERENCES

1. Atkinson, R. C., & Shiffrin, R. M. (1968). Human memory: A proposed system and its control processes. In K. W. Spence & J. T. Spence (Eds.), The psychology of learning and motivation (Vol. 2, pp. 89-195). Academic Press.
2. Baddeley, A. D. (2000). The episodic buffer: A new component of working memory? Trends in Cognitive Sciences, 4(11), 417-423.
3. Brown, A. L., & Campione, J. C. (1994). Guided discovery in a community of learners. In K. McGilly (Ed.), Classroom lessons: Integrating cognitive theory and classroom practice (pp. 229-270). MIT Press.
4. Bruner, J. S. (1966). Toward a theory of instruction. Harvard University Press.
5. Ebbinghaus, H. (1913). Memory: A contribution to experimental psychology (H. A. Ruger & C. E. Bussenius, Trans.). Teachers College, Columbia University. (Original work published 1885)
6. Eggen, P., & Kauchak, D. (2019). Educational psychology: Windows on classrooms (10th ed.). Pearson.
7. Iloma, U. (2019). Effect of guided-discovery pedagogy on students' achievement in inspection and testing of domestic electrical installations in technical colleges in South-South Nigeria. Journal of Technical and Vocational Education, 12(3), 45-58.
8. Mayer, R. E. (2020). Learning and instruction (3rd ed.). Pearson Higher Ed.
9. National Business and Technical Examinations Board. (2022). Chief examiners' report on technical and vocational subjects. NABTEB Press.
10. Ogbebor, S. O., &Oviawe, J. I. (2023). Effects of demonstration teaching method on academic performance in electrical installation and maintenance works among vocational students in Edo State. Nigerian Journal of Technical Education, 8(2), 112-125.
11. Piaget, J. (1952). The origins of intelligence in children (M. Cook, Trans.). International Universities Press.
12. Udo, U. J., & Umoh, J. B. (2024). Effects of guided-discovery and demonstration method on achievement and retention in probability among secondary school students in Akwa Ibom State. West African Journal of Educational Research, 25(1), 78-92.
13. Uduak, J. U., &Onwiodukit, F. A. (2019). Effects of guided-discovery and demonstration methods on acquisition of entrepreneurial skills in physics among senior secondary school students in Akwa Ibom State. Journal of Science and Mathematics Education, 14(2), 156-168.
14. Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds. & Trans.). Harvard University Press.
15. Yusuf, A. A. (2020). Impact of guided-discovery method on students' interest and academic achievement in physics in Ilorin Metropolis. Ilorin Journal of Education, 40(1), 89-103.