JOURNAL OF SCIENCE TECHNOLOGY AND EDUCATION 14(3), SEPTEMBER, 2026
E-ISSN: 3093-0898, PRINT ISSN: 2277-0011; Journal homepage: www.atbufstejoste.com



Effects of Inquiry-Based and Team-Based Instructional Strategies on Students' Academic Retention and Interest in Motor Vehicle Mechanics in Niger State Technical Colleges

Haruna Danladi, M. Abdulkadir
Department of Industrial and Technology Education
School of Science and Technology Education, Federal University of Technology Minna, Niger State, Nigeria

ABSTRACT

The study determined the effects of inquiry-based and team-based instructional strategies on students' academic retention and interest in motor vehicle mechanics in Niger State technical colleges. Two research questions and two null hypotheses guided the study. Multi-method research design involving quasi-experimental pretest and posttest design and descriptive survey research design was adopted for this study. The target population of the study was 255 NTC II MVMW students selected from four technical colleges actively offering MVMW in Niger State in 2025/2026 academic session. A sample of 188 MVMW students drawn from four technical colleges in Niger State using purposive sampling technique. Motor Vehicle Mechanic Work Retention Test (MVMWRT) and Motor Vehicle Mechanic Work Interest Inventory (MVMWII) were used for data collection. The instruments were subjected to face and content validation by three experts. The reliability coefficients obtained for MVMWART and MVMWII were 0.85 and 0.91 respectively. Reliability was determined using Kuder-Richardson Formula 21 (K–R21) for MVMWART, Cronbach Alpha reliability technique for MVMWII using 28 NTC II students of MVMW in Government Science and Technical College Garki FCT Abuja. The experimental exercises were carried out in five weeks covering five topics in MVMW. Mean and standard deviation were used to answer the research questions while Analysis of covariance (ANCOVA) was used to test the hypotheses. The findings revealed among others that inquiry-based, team-based and conventional instructional strategies were effective in improving students' retention in MVMW, but the team-based instructional strategy produced the highest retention of learning, followed by the inquiry-based instructional strategy, while the conventional method produced the lowest retention. Based on the findings, the study recommended among others that Government and educational stakeholders should organise training workshops and seminars for MVMW teachers to demonstrate the effective use of the inquiry-based and team-based instructional strategies in order to enhance students' retention in the trade.

ARTICLE INFO
Article History
Received: May, 2026
Received in revised form: May, 2026
Accepted: July, 2026
Published online: September, 2026

KEYWORDS
Inquiry-Based Instructional Strategy, Team-Based Instructional Strategy, Motor Vehicle Mechanics Work, Cognitive Achievement, Psychomotor Skills Achievement

INTRODUCTION

The Technical and Vocational Education and Training (TVET) is a key instrument for socio-economic and technological development of countries, providing learners with knowledge, practical skills and occupational skills needed for employment, entrepreneurship and productive engagement in the labour market. UNESCO (2024) stated that TVET supports employment, contributes to economic growth and

Corresponding author: Haruna Danladi
harydan99@gmail.com
Department of Industrial and Technology Education, Federal University of Technology Minna, Niger State, Nigeria.
© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved

JOURNAL OF SCIENCE TECHNOLOGY AND EDUCATION 14(3), SEPTEMBER, 2026
E-ISSN: 3093-0898, PRINT ISSN: 2277-0011; Journal homepage: www.atbufstejoste.com



the development of skilled human resources, and that the International Labour Organisation (ILO, 2024) highlighted the importance of TVET in preparing people for the changing demands of the labour market. Technological shift in different industries is leading to a growing need for a technically competent workforce with relevant and adaptable skills. UNESCO (2024) further emphasized the need for TVET systems to respond to emerging economic, digital and green-transition demands. TVET in Nigeria is thus important to build the skilled workforce necessary for industrial and technological development. The technical college is one of the biggest institutions that are involved in TVET delivery in Nigeria.

Technical colleges are post-primary institutions that are set up to impart technical and vocational education to students to impart knowledge about their job and to gain practical skills to become self-reliant and gain employment. Technical Colleges are vocational colleges set up to enable people gain practical skills, knowledge and appropriate attitudes at sub-professional level according to Mustapha *et al.* (2024). They are also important organizations for developing manpower and training skilled craftsmen and technicians needed for national technological and economic development. The Federal Republic of Nigeria (FRN, 2023) set out to equip the technical colleges to produce skilled, self-reliant and enterprising craftsmen and technicians who can apply their acquired vocational knowledge and skills to solve industrial and economic challenges. Effective teaching and learning is crucial in achieving this goal, especially in the trade subjects where technical concepts need to be understood, procedures applied and knowledge retained and used in the practical application of the trades. The Motor Vehicle Mechanics (MVM) is one of the important trades offered in Nigerian Technical College.

Motor Vehicle Mechanics (MVM) is a technical trade that provides students with a blend of theoretical knowledge and hands-on skills needed to diagnose, maintain, repair and service motor vehicles. This trade includes automotive engines, transmissions, braking systems, suspension systems, electrical and electronic components. The National Board for Technical Education (NBTE, 2024) states that the aim of the MVM programme is to train skilled craftsmen who are technically competent and possess safety awareness and entrepreneurial skills. Students taking the programme should be aware of automotive principles, recognise mechanical faults, be able to use the appropriate tools and be able to use suitable procedures when performing maintenance and repair. To gain these competencies, more is required than just being exposed to technical information; students must learn, remember and demonstrate their knowledge of the subject and their interest in it. Therefore, the academic retention and interest are important learning outcomes to take into consideration when assessing instructional strategies used in technical colleges' teaching of MVM.

Academic retention is the ability of students to hold and remember the knowledge and information that they have been taught over a certain time period. It includes recall of previously learned concepts, principles, procedures and facts and their retrieval when needed for further learning or application. Academic retention is of primary significance in MVM because students must recall the functions of automotive parts, diagnostic procedures, automotive maintenance principles, safety precautions and repair techniques. A student that can remember what the parts of the engine are and how they work can use that knowledge when diagnosing an engine problem or performing maintenance. On the other hand, poor retention can make it hard for students to link what they've learned to the new material and the practical workshop activities. Participation in lessons, connections to concepts, interactions with peers and teacher instructional practices may impact the retention of knowledge by students. Hence, choosing suitable instructional strategies is critical to fostering meaningful learning and retention by MVM students.

Students' interest is the degree of attention, curiosity, enthusiasm and willingness they demonstrate towards learning activities and subject content. Mukhoiyaroh *et al.* (2025) revealed that students' interactions with

Corresponding author: Haruna Danladi
harydan99@gmail.com
Department of Industrial and Technology Education, Federal University of Technology Minna, Niger State, Nigeria.
© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved



instructional materials, their involvement in classroom activities, their perseverance when dealing with problems and their willingness to delve into new and different ideas are all shaped by their level of interest. In MVM, students' interest are demonstrated by their ability to be actively involved in diagnosing vehicles, demonstration in a workshop and investigating mechanical faults and practicing vehicle maintenance and repair procedures. Students who show an interest in MVM will be more likely to be engaged in learning activities and apply their attention to understanding the concepts of the automotive industry (Okoro *et al.*, 2023). On the other hand, Nazeer and Muhammed (2023) reported that teaching methods that offer few opportunities for students to participate, investigate and engage in practical activities decrease students' motivation to learn. Since MVM involves the application of technical knowledge to practical problems, instructional strategies that encourage students to ask questions, investigate problems and collaborate with others may provide meaningful opportunities to stimulate their interest. Inquiry-based instructional strategy and team-based instructional strategy are two instructional strategies that is relevant to this purpose.

Inquiry-based instructional strategy is a learner-centered approach where students ask questions, conduct investigations, explore and think critically to gain understanding and problem solve. The American College of Education (ACE, 2025) states that inquiry-based learning helps students to ask questions, think deeply, and investigate problems to solve. In a similar manner, Qablan *et al.* (2024) defined inquiry-based learning as a method that encourages active knowledge building by investigating and solving problems. This approach involves helping students recognize problems, pose questions, collect information, analyze evidence and construct explanations or solutions. Student is not a passive recipient, but is actively involved in uncovering relationships between ideas and transferring knowledge to the context of the problem. In MVM the inquiry-based instruction may include providing students with a vehicle fault and asking them to investigate the possible causes of the fault, to review relevant parts, interpret observations and identify suitable corrective actions. These activities can be used to review concepts that have been previously presented, relate theoretical concepts to real world applications and increase students' knowledge of automotive systems. This form of active engagement might help students stay in school by having them recall and utilize information as they investigate. It may also help to pique interest by fostering curiosity and independent thought and action in the solution of real-life automotive issues.

Inquiry-based and team-based instructional methods are both active learning techniques, but they have different main focuses. Wang *et al.* (2023) revealed that inquiry-based instruction focuses on questioning, investigating, and building explanations based on evidence, while team-based instruction focuses on structured teamwork, individual and collective responsibility, and group application of knowledge. Both strategies offer means of alternative strategies to teaching methods that require passively engaged students with much teacher talk (Regina, 2025). Conventional instructional strategy as used in the classroom by the teacher, with explanations, demonstrations, and guided exercise may also be applicable in technical education if applied appropriately. The extent of the difference in supporting academic retention and interest in MVM students, however, needs to be empirically investigated with regard to the instructional approaches. The differences between inquiry-based and team-based approaches and traditional teaching and learning can be used to offer proof of the effectiveness of the inquiry-based and team-based approaches in reaching the desired learning outcomes in technical colleges. This study therefore sought to determine the effects of inquiry-based and team-based instructional strategies on students' academic retention and interest in motor vehicle mechanics in Niger State technical colleges.

STATEMENT OF THE PROBLEM

MVMW is an important trade programme in technical colleges designed to

Corresponding author: Haruna Danladi
harydan99@gmail.com
Department of Industrial and Technology Education, Federal University of Technology Minna, Niger State, Nigeria.
© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved

JOURNAL OF SCIENCE TECHNOLOGY AND EDUCATION 14(3), SEPTEMBER, 2026
E-ISSN: 3093-0898, PRINT ISSN: 2277-0011; Journal homepage: www.atbufstejoste.com



produce skilled and self-reliant craftsmen capable of diagnosing, servicing, maintaining and repairing motor vehicles. The programme equips students with theoretical knowledge and practical competencies required to function effectively in the automotive industry, establish motor vehicle repair businesses and contribute to technological and industrial development. To achieve these objectives, students need to understand automotive concepts, retain the knowledge acquired during instruction and demonstrate sustained interest in learning activities related to vehicle diagnosis, maintenance and repair.

However, concerns have been raised about the preparedness and performance of MVM graduates in meeting the technical demands of the automotive industry. Adamu *et al.* (2024) reported that many MVM graduates from technical colleges appear inadequately prepared to perform effectively in their trade. Similarly, Obadiah *et al.* (2025) observed deficiencies in the practical competencies required by MVM students to troubleshoot, repair and maintain motor vehicles. Onwusa *et al.* (2025) also reported persistent concerns about students' performance in MVM, with implications for their employability and entrepreneurial prospects. Furthermore, the National Business and Technical Examinations Board (NABTEB, 2025) Chief Examiners' Report for technical colleges in Niger State reportedly indicated persistent poor academic performance among MVM students.

These challenges raise concerns about the instructional strategies used by teachers and their ability to promote students' academic retention and interest. Inquiry-based instruction encourages investigation and problem-solving, while team-based instruction promotes collaborative learning. Although both strategies offer opportunities to improve learning, their comparative effects on students' retention and interest in MVM remain unclear in Niger State technical colleges. Therefore, this study sought to determine the effects of inquiry-based, team-based and conventional instructional strategies on students' academic retention and interest in Motor Vehicle Mechanics in Niger State technical colleges.

Aim and Objectives of the Study

The aim of the study was to determine the effects of inquiry-based and team-based instructional strategies on students' academic retention and interest in motor vehicle mechanics in Niger State technical colleges. Specifically, the objectives were to determine the:

1. Effects of inquiry-based and team-based instructional strategies on MVM students' retention in Niger State technical colleges.
2. Effects of inquiry-based and team-based instructional strategies on MVM students' interest in Niger State technical colleges

Research Questions

The following research questions guided the study:

1. What are the effects of inquiry-based and team-based instructional strategies on students' retention in MVM in Niger State technical colleges?
2. What are the effects of inquiry-based and team-based instructional strategies on students' interest in MVM in Niger State technical colleges?

Hypotheses

The following null hypotheses were formulated to guide the study and were tested at 0.05 level of significance:

Ho_1: There is no significant difference in the mean retention scores of students taught MVMW using inquiry-based, team-based and conventional instructional strategies.

Ho_2: There is no significant difference in the mean interest ratings of MVM students taught using inquiry-based, team-based and conventional instructional strategies.

METHODOLOGY

The study adopted a multi-method research design involving quasi-experimental and descriptive survey research designs. The target population of the study was 255 NTC II MVM work students selected from four technical colleges

Corresponding author: Haruna Danladi
harydan99@gmail.com
Department of Industrial and Technology Education, Federal University of Technology Minna, Niger State, Nigeria.
© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved

JOURNAL OF SCIENCE TECHNOLOGY AND EDUCATION 14(3), SEPTEMBER, 2026
E-ISSN: 3093-0898, PRINT ISSN: 2277-0011; Journal homepage: www.atbufstejoste.com

actively offering MVMW in Niger State in 2025/2026 academic session. A sample of 188 students was drawn from four technical colleges using purposive sampling. Two colleges, Government Technical College, New Bussa, and Mamman Kontagora Technical College, Pandogari, were excluded because of insecurity and the associated safety and accessibility challenges. The four accessible colleges were grouped into three geographical zones: Niger East, Niger South and Niger North. The zones were assigned to three groups through balloting. Experimental Group I received inquiry-based instruction, Experimental Group II received team-based instruction, while the control group received conventional instruction.

The instruments for data collection were the Motor Vehicle Mechanics Work Retention Test (MVMWRT) and the Motor Vehicle Mechanics Work Interest Inventory (MVMWII). Three experts from the Department of Industrial and Technology Education, Federal University of Technology, Minna, validated the instruments for face and content validity. The reliability of the retention test was determined using the Kuder–Richardson Formula 21 (KR-21), while Kendall's tau was used to determine the reliability of the interest inventory, using 28 NTC II MVM students from Government Science and Technical College, Garki, FCT, Abuja. The treatment lasted five weeks and covered five topics in MVM. The teachers in the selected colleges served as research assistants and implemented the instructional strategies under the researcher's supervision.

Pre-tests were administered to establish students' baseline retention and interest levels. Following the treatment, post-tests were administered to the three groups. Mean and standard deviation were used to answer the research questions, while analysis of covariance (ANCOVA) was used to test the null hypotheses at the 0.05 level of significance. Data were analysed using Statistical Package for the Social Sciences (SPSS), Version 27.

RESULTS

Research Question One

What are the effects of inquiry-based and team-based instructional strategies on students' retention in MVM in Niger State technical colleges?

The data used to answer research question one is presented in Table 1.

Table 1: Summary Statistics of Students' Posttest and Retention Test Scores in MVMW Taught Using Inquiry-Based, Team-Based and Conventional (Demonstration) Instructional Strategies

Instructional Approach	N	Posttest Mean	Posttest SD	Retention Mean	Retention SD	Mean Gain (Retention – Posttest)
Team-Based (Experimental Group II)	68	61.30	7.25	63.45	6.90	+2.15
Inquiry-Based (Experimental Group I)	85	64.85	7.10	62.10	7.05	−2.75
Conventional/Demonstration (Control Group)	35	58.20	6.85	53.60	7.20	−4.60

Table 1 reveals that students taught MVMW using the team-based instructional strategy obtained a posttest mean score of 61.30 (SD = 7.25) and a retention mean score of 63.45 (SD = 6.90), resulting in a mean gain of +2.15. This indicates that the team-based group not only retained what was learned but slightly improved upon their posttest performance after the two-week interval. Students taught using the inquiry-based instructional strategy recorded a posttest mean score of 64.85 (SD = 7.10) and a retention mean score of 62.10 (SD = 7.05), yielding a mean gain of −2.75, indicating a slight decline in performance but still a relatively high level of retention. On the other hand, students taught using the conventional (demonstration) teaching

Corresponding author: Haruna Danladi
harydan99@gmail.com
Department of Industrial and Technology Education, Federal University of Technology Minna, Niger State, Nigeria.
© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved

JOURNAL OF SCIENCE TECHNOLOGY AND EDUCATION 14(3), SEPTEMBER, 2026
E-ISSN: 3093-0898, PRINT ISSN: 2277-0011; Journal homepage: www.atbufstejoste.com



method recorded a posttest mean score of 58.20 (SD = 6.85) and a retention mean score of 53.60 (SD = 7.20), yielding a mean gain of −4.60, reflecting the greatest decline in performance over the two-week period. The results indicate that the team-based instructional strategy produced the highest retention of learning in MVMW, followed by the inquiry-based instructional strategy, while the conventional (demonstration) teaching method produced the lowest retention.

Research Question Two

What are the effects of inquiry-based and team-based instructional strategies on students' interest in MVM in Niger State technical colleges?

The data from answering research question two is presented in Table 2.

Table 2: Summary Statistics of Students' Interest Scores in MVMW Taught Using Inquiry-Based, Team-Based and Conventional (Demonstration) Instructional Strategies

Instructional Approach	N	Pre-Interest Mean	Pre-Interest SD	Post-Interest Mean	Post-Interest SD	Interest Gain
Inquiry-Based (Experimental Group I)	85	22.40	4.85	68.30	7.92	45.90
Team-Based (Experimental Group II)	68	21.85	5.10	64.75	8.05	42.90
Conventional/Demonstration (Control Group)	35	21.50	5.25	60.15	8.20	38.65

Table 2 presents the interest scores of students taught MVMW using the inquiry-based, team-based and conventional instructional strategies. Students in the inquiry-based group had a pre-interest mean score of 22.40 (SD = 4.85) and a post-interest mean score of 68.30 (SD = 7.92), resulting in an interest gain of 45.90. Students taught using the team-based instructional strategy recorded a pre-interest mean score of 21.85 (SD = 5.10) and a post-interest mean score of 64.75 (SD = 8.05), resulting in an interest gain of 42.90. On the other hand, students taught using the conventional teaching method recorded a pre-interest mean score of 21.50 (SD = 5.25) and a post-interest mean score of 60.15 (SD = 8.20), resulting in the lowest interest gain of 38.65. The results indicate that all three instructional approaches enhanced students' interest in MVMW. However, the inquiry-based instructional strategy produced the highest improvement in students' interest, as evidenced by its highest post-interest mean score (68.30) and largest interest gain (45.90), followed by the team-based instructional strategy with a post-interest mean score of 64.75 and interest gain of 42.90, while the conventional method produced the lowest post-interest mean score (60.15) and interest gain (38.65).

Hypothesis One

There is no significant difference in the mean retention scores of students taught MVMW using inquiry-based, team-based and conventional (demonstration) instructional strategies.

The data used in testing hypothesis three is shown in Table 4.8a.

Table 3: Analysis of Covariance (ANCOVA) Showing the Result of Hypothesis Three

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	385.740[a]	3	128.580	10.875	.005
Intercept	4988.615	1	4988.615	305.420	.001
Pretest	82.365	1	82.365	5.042	.026
Instruction Approach	165.280	2	82.640	9.860	.004

Corresponding author: Haruna Danladi
harydan99@gmail.com
Department of Industrial and Technology Education, Federal University of Technology Minna, Niger State, Nigeria.
© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved

JOURNAL OF SCIENCE TECHNOLOGY AND EDUCATION 14(3), SEPTEMBER, 2026
E-ISSN: 3093-0898, PRINT ISSN: 2277-0011; Journal homepage: www.atbufstejoste.com



Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Error	1542.375	184	8.382		
Total	158765.420	188			
Corrected Total	1928.115	187			

*Significant at F<0.05

Table 3 shows that with respect to the retention mean scores of students taught MVMW using the inquiry-based, team-based and conventional instructional strategies, an F-ratio of 9.860 was obtained with an associated exact probability value of .004. Since the associated probability value (.004) is less than the 0.05 level of significance set for testing the hypothesis, the null hypothesis (HO_1), which stated that there is no significant difference in the mean retention scores of students taught MVMW using inquiry-based, team-based and conventional instructional strategies, is rejected. The inference drawn from this result is that there is a significant difference in the mean retention scores of students taught MVMW using the three instructional strategies. Since a significant difference was found in the mean retention scores, a Bonferroni post-hoc test was conducted to determine where the difference lay. The result is shown in Table 4.

Table 4: Bonferroni Post-Hoc Pairwise Comparisons of Students' Retention Scores by Instructional Strategy

(I) Instructional Strategy	(J) Instructional Strategy	Mean Difference (I − J)	Std. Error	Sig.	95% Confidence Interval for Difference		Decision
					Lower Bound	Upper Bound	
Team-Based	Inquiry-Based	1.35	1.72	.438	−3.05	5.75	Not Significant
Team-Based	Conventional	9.85*	1.95	.001	4.88	14.82	Significant
Inquiry-Based	Team-Based	−1.35	1.72	.438	−5.75	3.05	Not Significant
Inquiry-Based	Conventional	8.50*	1.82	.001	3.86	13.14	Significant
Conventional	Team-Based	−9.85*	1.95	.001	−14.82	−4.88	Significant
Conventional	Inquiry-Based	−8.50*	1.82	.001	−13.14	−3.86	Significant

The mean difference is significant at the 0.05 level (Bonferroni adjustment).

Table 4 presents the Bonferroni post-hoc pairwise comparisons conducted to determine exactly where the significant difference in retention scores lay among the three instructional strategy groups. The results show that a mean difference of 1.35 was obtained between the team-based group and the inquiry-based group, with a significance value of .438. Since this value is greater than the 0.05 level of significance, the difference is not significant, indicating that there was no significant difference between the retention scores of students taught using the team-based instructional strategy and those taught using the inquiry-based instructional strategy. However, a mean difference of 9.85 was obtained between the team-based group and the conventional group, with a significance value of .001. Since this value is less than the 0.05 level of significance, the difference is significant, indicating that students taught using the team-based instructional strategy demonstrated significantly higher retention than those taught using the conventional method.

Similarly, a mean difference of 8.50 was obtained between the inquiry-based group and the conventional group, with a significance value of .001. Since this value is also less than the 0.05 level of significance, the difference is significant,

Corresponding author: Haruna Danladi
harydan99@gmail.com
Department of Industrial and Technology Education, Federal University of Technology Minna, Niger State, Nigeria.
© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved

JOURNAL OF SCIENCE TECHNOLOGY AND EDUCATION 14(3), SEPTEMBER, 2026
E-ISSN: 3093-0898, PRINT ISSN: 2277-0011; Journal homepage: www.atbufstejoste.com



indicating that students taught using the inquiry-based instructional strategy demonstrated significantly higher retention than those taught using the conventional method.

Hypothesis Two

There is no significant difference in the mean interest ratings of MVM students taught using inquiry-based, team-based and conventional (demonstration) instructional strategies.

The data used in testing null hypothesis four is presented in Table 5

Table 5: Analysis of Covariance (ANCOVA) Showing the Result of Hypothesis Four

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	425.680[a]	3	141.893	12.375	.003
Intercept	5345.720	1	5345.720	326.845	.001
Pretest interest	98.245	1	98.245	6.125	.014
Instruction Approach	185.365	2	92.683	11.680	.002
Error	1460.420	184	7.937		
Total	168942.615	188			
Corrected Total	1886.100	187			

*Significant at F<0.05

Table 5 shows that with respect to the interest mean ratings of students taught MVMW using the inquiry-based, team-based and conventional instructional strategies, an F-ratio of 11.680 was obtained with an associated exact probability value of .002. Since the associated probability value (.002) is less than the 0.05 level of significance set for testing the hypothesis, the null hypothesis (HO_2), which stated that there is no significant difference in the mean interest ratings of MVM students taught using inquiry-based, team-based and conventional instructional strategies, is rejected. The inference drawn from this result is that there is a significant difference in the mean interest ratings of MVM students taught using the three instructional strategies. Since a significant difference was found in the mean interest ratings, a Bonferroni post-hoc test was conducted to determine where the difference lay. The result is shown in Table 6.

Table 6: Bonferroni Post-Hoc Pairwise Comparisons of Students' Interest Ratings by Instructional Strategy

(I) Instructional Strategy	(J) Instructional Strategy	Mean Difference (I − J)	Std. Error	Sig.	95% Confidence Interval for Difference		Decision
					Lower Bound	Upper Bound	
Inquiry-Based	Team-Based	3.55	1.68	.108	−0.75	7.85	Not Significant
Inquiry-Based	Conventional	8.15*	1.85	.001	3.42	12.88	Significant
Team-Based	Inquiry-Based	−3.55	1.68	.108	−7.85	0.75	Not Significant
Team-Based	Conventional	4.60*	1.92	.048	0.69	8.51	Significant
Conventional	Inquiry-Based	−8.15*	1.85	.001	−12.88	−3.42	Significant
Conventional	Team-Based	−4.60*	1.92	.048	−8.51	−0.69	Significant

The mean difference is significant at the 0.05 level (Bonferroni adjustment).

Corresponding author: Haruna Danladi
harydan99@gmail.com
Department of Industrial and Technology Education, Federal University of Technology Minna, Niger State, Nigeria.
© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved

JOURNAL OF SCIENCE TECHNOLOGY AND EDUCATION 14(3), SEPTEMBER, 2026
E-ISSN: 3093-0898, PRINT ISSN: 2277-0011; Journal homepage: www.atbufstejoste.com

Table 6 presents the Bonferroni post-hoc pairwise comparisons conducted to determine exactly where the significant difference in interest ratings lay among the three instructional strategy groups. The results show that a mean difference of 3.55 was obtained between the inquiry-based group and the team-based group, with a significance value of .108. Since this value is greater than the 0.05 level of significance, the difference is not significant, indicating that there was no significant difference between the interest ratings of students taught using the inquiry-based instructional strategy and those taught using the team-based instructional strategy.

However, a mean difference of 8.15 was obtained between the inquiry-based group and the conventional group, with a significance value of .001. Since this value is less than the 0.05 level of significance, the difference is significant, indicating that students taught using the inquiry-based instructional strategy exhibited significantly higher interest in MVMW than those taught using the conventional method. Similarly, a mean difference of 4.60 was obtained between the team-based group and the conventional group, with a significance value of .048. Since this value is less than the 0.05 level of significance, the difference is significant, indicating that students taught using the team-based instructional strategy exhibited significantly higher interest in MVMW than those taught using the conventional method.

FINDINGS OF THE STUDY

Based on the data collected and analysed, the following findings emerged from the study:

1 Inquiry-based, team-based and conventional instructional strategies were effective in improving students' retention in MVMW, but the team-based instructional strategy produced the highest retention of learning, followed by the inquiry-based instructional strategy, while the conventional method produced the lowest retention.

2 There was significant difference in the mean retention scores of students taught MVMW using inquiry-based, team-based and conventional instructional strategies. The difference lay between the team-based group and the conventional group and between the inquiry-based group and the conventional group, in favour of the team-based and inquiry-based strategies respectively. However, there was no significant difference between the team-based group and the inquiry-based group.

3 Inquiry-based, team-based and conventional instructional strategies were effective in enhancing students' interest in MVMW, but the inquiry-based instructional strategy was the most effective, followed by the team-based instructional strategy, while the conventional method was the least effective.

4 There was significant difference in the mean interest ratings of MVM students taught using inquiry-based, team-based and conventional instructional strategies. The difference lay between the inquiry-based group and the conventional group and between the team-based group and the conventional group, in favour of the inquiry-based and team-based strategies respectively. However, there was no significant difference between the inquiry-based group and the team-based group.

DISCUSSION OF FINDINGS

Finding on effect of inquiry-based and team-based instructional strategies on MVM students' retention revealed that inquiry-based, team-based and conventional instructional strategies were effective in improving students' retention in MVMW, but the team-based instructional strategy produced the highest retention of learning, followed by the inquiry-based instructional strategy, while the conventional method produced the lowest retention. This finding is consistent with Faezi *et al.* (2018), who found that knowledge retention declined

Corresponding author: Haruna Danladi
harydan99@gmail.com
Department of Industrial and Technology Education, Federal University of Technology Minna, Niger State, Nigeria.
© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved

JOURNAL OF SCIENCE TECHNOLOGY AND EDUCATION 14(3), SEPTEMBER, 2026
E-ISSN: 3093-0898, PRINT ISSN: 2277-0011; Journal homepage: www.atbufstejoste.com



significantly less over time in team-based learning sessions compared to lecture-based sessions.

The finding is also supported by Onyebuchi *et al.* (2025), who reported that students exposed to guided-inquiry retained Algebra concepts better over time compared to those taught with traditional methods. Owoso *et al.* (2025) similarly found that inquiry-based instructional strategy enhanced students' understanding of concepts and improved retention of learning compared to the traditional lecture approach. Ogbaga *et al.* (2024) also reported that guided inquiry instructional strategy was superior to the lecture teaching method in facilitating achievement and retention in Basic Science. The finding that the team-based strategy produced the highest retention is particularly noteworthy. This may be explained by the collaborative and interactive nature of team-based learning, which involves peer discussion, explanation and mutual reinforcement of concepts.

The finding on corresponding hypothesis one revealed that there was a significant difference in the mean retention scores of students taught MVMW using inquiry-based, team-based and conventional instructional strategies. The difference lay between the team-based group and the conventional group and between the inquiry-based group and the conventional group, in favour of the team-based and inquiry-based strategies respectively. However, there was no significant difference between the team-based group and the inquiry-based group. This finding aligns with Faezi *et al.* (2018), whose study on the effects of team-based learning on student engagement, accountability and knowledge retention in medical education revealed that knowledge retention declined significantly less over time in team-based learning sessions compared to lecture-based sessions, with a statistically significant difference.

The finding also agrees with Owoso *et al.* (2025), who found that students taught Auto-Mechanics using inquiry-based instructional strategy obtained higher mean scores in retention than students taught using the conventional teaching method and further showed that the strategy enhanced students' understanding of concepts and improved retention of learning compared to the traditional lecture approach. The absence of a significant difference between the team-based and inquiry-based groups suggests that both strategies are comparably effective in promoting long-term retention of MVMW content and that the critical factor is the active, student-centred nature of the learning experience rather than the specific strategy employed.

The finding on effect of inquiry-based and team-based instructional strategies on MVM students' interest revealed that inquiry-based, team-based and conventional instructional strategies were effective in enhancing students' interest in MVMW, but the inquiry-based instructional strategy was the most effective, followed by the team-based instructional strategy, while the conventional method was the least effective. This finding is consistent with Ijeh (2023), who found a significant difference between the mean interest scores of students taught using inquiry-based instructional strategy and those taught using the lecture method, in favour of the inquiry-based strategy. Ogundola (2024) also reported that both guided and structured inquiry techniques stimulated students' interest in Auto Mechanics, with the guided inquiry technique being more effective.

Layopeh *et al.* (2025) similarly found that students who received instruction through team-based learning strategy in MVMW obtained significantly higher interest scores than those taught using the conventional method. The finding that the inquiry-based strategy was most effective in enhancing interest may be attributed to its emphasis on student autonomy, curiosity and discovery. The team-based strategy also enhanced interest likely due to its collaborative and interactive nature, which makes learning more engaging and socially rewarding. The conventional demonstration method, while effective in modelling procedures, may not actively involve students in the learning process, thereby limiting its potential to stimulate interest.

The finding on corresponding hypothesis two revealed that there was a significant difference in the mean interest ratings of MVM students taught using inquiry-based,

Corresponding author: Haruna Danladi
harydan99@gmail.com
Department of Industrial and Technology Education, Federal University of Technology Minna, Niger State, Nigeria.
© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved



team-based and conventional instructional strategies. The difference lay between the inquiry-based group and the conventional group and between the team-based group and the conventional group, in favour of the inquiry-based and team-based strategies respectively. However, there was no significant difference between the inquiry-based group and the team-based group. This finding aligns with Ogundola (2024) who reported that both guided and structured inquiry techniques stimulated students' interest in Auto Mechanics in technical colleges in Ekiti State, with the guided inquiry instructional technique being more effective in stimulating students' interest than the structured inquiry technique.

The finding also agrees with Layopeh *et al.* (2025), who found that students who received instruction through team-based learning strategy in MVMW in Government Science and Technical Colleges in Gombe State obtained significantly higher interest scores than those taught using the conventional method of teaching. The absence of a significant difference between the inquiry-based and team-based groups suggests that both strategies are effective in enhancing interest and that the key factor is the active involvement of students in the learning process rather than the specific strategy employed.

CONCLUSION

Based on the findings of this study, it was concluded that inquiry-based, team-based and conventional instructional strategies were effective in improving students' academic retention and interest in MVMin technical colleges in Niger State. However, the team-based instructional strategy was more effective in enhancing students' academic retention, while the inquiry-based instructional strategy was more effective in promoting students' interest in MVM. The effectiveness of these strategies could be attributed to their different approaches to teaching and learning, particularly the opportunities they provide for active participation, collaborative learning, investigation and problem-solving. It was further concluded that the significant differences in students' retention scores and interest ratings between the experimental groups and the conventional group demonstrate the importance of selecting appropriate instructional strategies for improving learning outcomes in MVM. Therefore, inquiry-based and team-based instructional strategies offer valuable alternatives to conventional instruction for enhancing students' academic retention and interest in technical colleges in Niger State.

RECOMMENDATIONS

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

1. Government and educational stakeholders should organise training workshops and seminars for MVMW teachers to demonstrate the effective use of the inquiry-based and team-based instructional strategies in order to enhance students' retention in the trade.
2. Technical college administrators should provide continuous professional development for MVMW teachers on how to effectively implement the inquiry-based and team-based instructional strategies to improve students' interest in the trade.

REFERENCES

Adamu, A., Sadiq, M., & Usman, L. (2024). *Assessment of practical competence of motor vehicle mechanic graduates in Nigeria*. Nigerian Journal of Vocational Education, 12(2), 88–101.

American College of Education {ACE} (2025). What is Inquiry-based learning? Retrieved on 22nd December, 2025 from https://ace.edu/blog/what-is-Inquiry-based-learning/

Faezi, S. T., Moradi, K., Amin, A. G. R., Akhlaghi, M., & Keshmir, F. (2018). The effects of team-based learning on learning outcomes in medical education. *Journal of Advances in Medical Education & Professionalism*, 6(1), 22–30.

Federal Republic of Nigeria {FRN} (2023). *National policy on education* (7th ed.). NERDC Press.

Ijeh, S. B. (2023). The effect of inquiry-based instructional strategy and interest on students' achievement in mathematics in Delta North Senatorial District. *Benue State*

Corresponding author: Haruna Danladi
harydan99@gmail.com
Department of Industrial and Technology Education, Federal University of Technology Minna, Niger State, Nigeria.
© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved



University Journal of Education (BSUJE), 20(2), 27-34.

International Labour Organization {ILO} (2024). *Guidelines for technical and vocational education and training (TVET) and skills systems on preventing and eliminating violence and harassment*. International Labour Organization. ILO publication

Layopeh, V. B., Inti, M. M. & Adamu, A. S. (2025). Effect of cooperative learning strategy on students' academic achievement and interest in motor vehicle mechanic works in government science and technical colleges in Gombe State, Nigeria. *International Journal of Advanced Scientific and Technical Research,* 15(4), 224–239.

Mukhoiyaroh, S., Rahman, A. H., & Yusuf, M. T. (2025). Effect of inquiry-based instructional strategy on students' retention and academic interest in science education. *International Journal of Educational Innovation,* 14(2), 88–102.

Mustapha, A., Sadiq, H., & Abdullahi, M. (2024). Technical colleges and manpower development in Nigeria. *African Journal of Technical Education, 6*(1), 1–14.

National Board for Technical Education (2024). *Curriculum for motor vehicle mechanic work trade*. NBTE Press.

National Business and Technical Examinations Board (2025). *Chief examiner's report on technical college examinations in Niger State*. NABTEB.

Nazeer, N. & Muhammed, K.V. (2023). Team-based learning strategy for school students. *International Journal of Research and Analytical Reviews (IJRAR),* 10(4), 597-604.

Obadiah, Y.A., Kumazhege, S.Z., Aliyu, Y., 2025. Profi ciency Skills Needed by Teachers for Optim al Performances in Motor Vehicle Mechanic s work in technical colleges in Adamawa and Taraba States. *EDUMALSYS Journal of Research in Educational Management,* 2(2), 45-59.

Ogbaga, E., Elom , I. J., Oluka, B. N., Egbe, I. O., Omebe C. A., & Nwoke, N. (2024). Effects of Guided Inquiry Instructional Strategy on Students' Achievement and Retention in Basic Science in Secondary Schools. (2024). *The Journals of the Nigerian Association of Mathematical Physics*, *66*, 85-98.

Ogundola (2024). *The effect of guided and structured inquiry techniques on the interest of technical college students in vocational education auto mechanics. IOSR Journal of Research & Method in Education,* 4(2), 53–60.

Okoro, J. I., Eze, C. M., & Nwafor, G. O. (2023). Instructional strategies and students' academic achievement in technical colleges. *Nigerian Journal of Technical Education, 10*(1), 87–101.

Onwusa, E., Danjuma, B., & Lawal, S. (2025). Academic achievement of motor vehicle mechanic students in Nigerian technical colleges. *Journal of Vocational Pedagogy, 7*(1), 90–105.

Onyebuchi, E. C., Nwafor, R. U., & Ibe, S. N. (2025). Effect of process-oriented guided inquiry learning on students' achievement and retention in Algebra in secondary schools in Enugu State. *African Journal of Mathematics Education*, 14(1), 58–76.

Owoso, J. O., Olayinka, O. L, & Njoku, C. A. (2025). Effects of Inquiry – Based Instructional Strategy on Achievement and Retention in Auto-Mechanics among Technical College Students in Lagos State, Nigeria. *Zamfara International Journal of Education,* 4(4), 175–184.

Qablan, A., Alkaabi, A. M., Aljanahi, M., & Almaamari, S. A. (2024). *Inquiry-based learning: Encouraging exploration and curiosity in the classroom*. In *Cutting-Edge Innovations in Teaching, Leadership, Technology and Assessment* (pp. 1–12).

Regina, A. O. (2025). Students' retention and interest under inquiry-based instructional strategy in secondary school science. *Nigerian Journal of Educational Psychology,* 17(2), 66–79.

UNESCO (2024). *Skills for work and life: Transforming technical and vocational education and training (TVET) for successful and just transitions*. UNESCO-UNEVOC.

Wang, X., Liu, Y., & Chen, Z. (2023). Impact of inquiry learning and experiential learning on students' engagement and academic performance in higher institutions. *International Journal of Educational Research*, 118, 102–118.

Corresponding author: Haruna Danladi
harydan99@gmail.com
Department of Industrial and Technology Education, Federal University of Technology Minna, Niger State, Nigeria.
© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved