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INDUSTRY-BASED TRAINING AND EMPLOYABILITY SKILLS OF AUTOMOBILE TECHNOLOGY STUDENTS IN COLLEGES OF EDUCATION IN NORTH CENTRAL NIGERIA

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ABSTRACT
This study examined industry-based training (IBT) and employability skills among Automobile Technology students in Colleges of Education in North Central Nigeria. Specifically, the study examined the relationship between IBT and employability skills, compared the employability outcomes of students who had undergone IBT with those who had not, and identified challenges affecting effective IBT implementation. A descriptive survey research design was adopted. The study involved 112 respondents comprising 88 Automobile Technology students and 24 lecturers/industry personnel. The students comprised 44 who had undergone IBT and 44 who had not; all eligible students in the accessible population were included through census sampling, while lecturers and industry personnel were purposively selected as supplementary respondents. Data were collected using the 30-item Industry-Based Training and Employability Skills Questionnaire (IBTESQ). Cronbach's alpha coefficients were .86 for IBT, .88 for employability skills, and .84 for challenges, with an overall reliability coefficient of .86. Data were analysed using mean, standard deviation, Pearson product-moment correlation, and independent-samples t-test at the .05 significance level. Results indicated a high level of employability-skill outcomes (grand mean = 4.04). Students who underwent IBT recorded a higher mean score (4.15) than non-IBT students (3.18). A significant positive relationship existed between IBT and employability skills, $r = .684$, $p < .001$. A significant difference was also found between IBT and non-IBT students, $t(86) = 9.65$, $p < .001$. Major challenges included inadequate workshop facilities, insufficient funding, limited modern diagnostic equipment, weak institution–industry collaboration, and inadequate monitoring. The study concludes that strengthening structured, adequately resourced, and industry-linked IBT may contribute to improved employability skills and workplace readiness.

Keywords: industry-based training, employability skills, Automobile Technology, technical education, Colleges of Education, Nigeria.

Introduction

Technical and Vocational Education and Training (TVET) plays a critical role in Nigeria's educational, technological and economic development by equipping learners with practical knowledge, occupational competencies and skills required for employment, self-employment and productive participation in society. Concerns about youth unemployment, skills mismatch and difficult school-to-work transitions have increased the need for education that connects classroom learning with labour-market requirements. Contemporary TVET is therefore expected to develop technical competence alongside problem-solving, communication, teamwork, adaptability, occupational safety and entrepreneurship skills.

Industry-based training (IBT) provides an important mechanism for achieving these outcomes by exposing students to authentic workplace environments where theoretical knowledge can be applied to occupational tasks. Nigerian empirical evidence indicates that workplace learning contributes to employability-related outcomes. Otache and Edokpolor (2022), in a study involving 294 students in Nigerian public higher education institutions, reported positive associations between work-placement learning and students' satisfaction, commitment, achievement and employability. Similarly, Ememe and Imo (2022) found that work-integrated education was relevant to employability, although inadequate training duration and funding constituted major challenges. Other Nigerian studies have associated industry attachment and work-related learning with learning self-efficacy and perceived employability. Adegbite and Hoole (2024), in a study involving 375 Nigerian engineering students, reported that work-integrated learning was associated with analytical ability, adaptability, communication, ICT and interpersonal skills. Chukwuedo (2023) also found a significant relationship between work-integrated learning and job-search intention among technology education students. Within Colleges of Education, Jamilu, Paris and Sambo (2023) reported that workplace learning was associated with communication, teamwork and problem-solving competencies, while inadequate internship placements, weak institution–industry collaboration and financial constraints hindered effective implementation.

The relevance of IBT is particularly important in Automobile Technology because contemporary vehicles increasingly incorporate electronic control units, sensors, computerized diagnostic systems, electronic fuel-injection systems, and advanced braking and transmission technologies. Students therefore require competencies in fault diagnosis, diagnostic-equipment use, repair and maintenance, problem-solving, occupational safety, technical communication, teamwork and adaptation to emerging technologies. Onwusa, Oyonru and Okoye (2024) emphasized the importance of effective approaches to practical automotive skills development, while Saue, Chukuigwe and Bassey (2024) highlighted the need for automotive training to respond to changing vehicle technologies through appropriate training modules.

Industrial attachment enables students to encounter authentic workplace conditions, use relevant equipment, observe experienced technicians and develop professional attitudes. However, participation in IBT does not automatically guarantee meaningful learning. Its effectiveness may depend on the quality and duration of placement, supervision, assigned tasks, access to modern equipment, institutional monitoring, funding and institution–industry collaboration. Experiential Learning Theory (Kolb, 1984) explains that concrete workplace experiences, reflection and active experimentation can connect theoretical knowledge with practical competence. Human Capital Theory (Becker, 1964) similarly views education and training as investments that enhance individuals' productive capabilities.

Despite growing Nigerian evidence on work-integrated learning and employability, limited empirical attention has focused specifically on Automobile Technology students in

Colleges of Education in North Central Nigeria. Existing studies have largely examined university students, engineering, business education or broader technical education contexts. Consequently, evidence remains limited on the relationship between IBT and multiple dimensions of employability skills, including technical, interpersonal, problem-solving and workplace-readiness competencies, among Automobile Technology students in the region. This gap provides the basis for the present study, which examines the relationship between industry-based training and employability skills among Automobile Technology students in Colleges of Education in North Central Nigeria, while also identifying challenges that may constrain effective workplace learning.

Statement of the Problem

The purpose of Automobile Technology education is not simply to transmit theoretical knowledge but to produce technically competent graduates capable of performing effectively in employment and self-employment. However, the transition from classroom learning to actual automotive work requires students to apply knowledge under authentic workplace conditions. Automobile workshops increasingly require technicians who can diagnose faults systematically, operate electronic diagnostic equipment, perform maintenance procedures, communicate with customers and colleagues, solve unexpected technical problems and adapt to changing vehicle technologies. Where students receive insufficient workplace exposure, a gap may emerge between what they learn institutionally and what employers expect. The problem may be intensified by inadequate workshop equipment, insufficient funding, weak institution-industry partnerships and inadequate supervision of industrial placements. These challenges can reduce the quality of practical exposure and consequently limit the development of employability skills. Although previous studies in Nigeria have examined industrial work experience and industry partnerships, fewer studies have specifically examined IBT and employability skills among Automobile Technology students in Colleges of Education in North Central Nigeria. This creates a contextual gap that the present study addresses.

Purpose of the Study

The study examined industry-based training and employability skills of Automobile Technology students in Colleges of Education in North Central Nigeria. Specifically, the study sought to:

1. Examine the relationship between industry-based training and the employability skills of Automobile Technology students in Colleges of Education in North Central Nigeria.
2. compare the employability-skill outcomes of Automobile Technology students who have undergone industry-based training with those who have not; and
3. identify the major challenges affecting the effective implementation of industry-based training programmes for Automobile Technology students in Colleges of Education in North Central Nigeria.

Research Questions

1. What relationship exists between industry-based training and the employability skills of Automobile Technology students in Colleges of Education in North Central Nigeria?
2. What difference exists in the employability-skill outcomes of Automobile Technology students who have undergone industry-based training and those who have not?
3. What are the major challenges affecting the effective implementation of industry-based training programmes for Automobile Technology students in Colleges of Education in North Central Nigeria?

Research Hypotheses

The following null hypotheses were tested at the 0.05 level of significance:

H01: There is no significant relationship between industry-based training and the employability skills of Automobile Technology students in Colleges of Education in North Central Nigeria.

H02: There is no significant difference in the employability-skill outcomes of Automobile Technology students who have undergone industry-based training and those who have not.

Methodology

The study adopted a descriptive survey research design to obtain information on industry-based training (IBT), employability skills, and challenges affecting IBT implementation among Automobile Technology students in Colleges of Education in North Central Nigeria. The design was also appropriate for examining the relationship between IBT and employability skills and comparing students who had undergone IBT with those who had not. The study involved 112 respondents, comprising 88 Automobile Technology students and 24 lecturers/industry personnel. The 88 students were the principal respondents for assessing employability skills and conducting inferential analyses. Of these, 44 students had undergone IBT and 44 had not. Classification was based on students' actual prior participation in an industry-based training programme; students were not assigned to either group by the researcher. Thus, the 44/44 distribution represented the existing composition of the accessible population rather than experimental assignment. All 88 eligible students were included, making the student component a census of the accessible population.

The 24 lecturers and industry personnel served as supplementary respondents and provided information on IBT implementation and challenges. Their responses were analysed separately and were not combined with student responses in assessing employability outcomes. Consequently, the Pearson correlation and independent-samples *t*-test were conducted using the 88 student respondents only, while information from lecturers and industry personnel provided supplementary descriptive evidence on IBT implementation and challenges. A census sampling technique was used for the 88 students because all eligible students in the accessible population participated in the study. The lecturers and industry personnel were selected purposively based on their direct involvement in Automobile Technology teaching, supervision, or IBT activities. This ensured that respondents with relevant knowledge and experience of IBT implementation were represented. Data were collected using a structured questionnaire titled the Industry-Based Training and Employability Skills Questionnaire (IBTESQ). The instrument contained 30 items in three sections: Section A comprised 10 items measuring IBT, Section B contained 10 items measuring employability skills, and Section C contained 10 items measuring challenges affecting IBT implementation. Items were rated on a five-point scale ranging from Very High Extent (5) to Very Low Extent (1). A criterion mean of 3.00 was used for decision-making; scores of 3.00 and above indicated a relatively high extent, whereas scores below 3.00 indicated a relatively low extent. The IBTESQ underwent face and content validation by three experts in Technical Education and Automobile Technology. The experts assessed the items for relevance, clarity, wording, and consistency with the study objectives and research questions. Their recommendations were incorporated before administration. A pilot test was also conducted using respondents who were excluded from the main study. Reliability was determined using Cronbach's alpha, producing coefficients of $\alpha = .86$ for the IBT scale, $\alpha = .88$ for Employability Skills, $\alpha = .84$ for Challenges, and $\alpha = .86$ for the overall 30-item instrument. These coefficients indicated satisfactory internal consistency. Data were analysed using descriptive and inferential statistics. Mean and standard deviation were used to answer the research questions. Pearson product-moment correlation tested the first null hypothesis concerning the relationship between IBT and employability skills, while

an independent-samples *t*-test examined differences between the 44 IBT and 44 non-IBT students. Lecturers' and industry personnel's responses were analysed separately as supplementary descriptive evidence. Both hypotheses were tested at the 0.05 level of significance. A null hypothesis was rejected when the *p*-value was less than .05 and retained otherwise.

Results

Research Question 1

What relationship exists between industry-based training and the employability skills of Automobile Technology students in Colleges of Education in North Central Nigeria?

Table 1: Mean Ratings of Employability-Skill Outcomes Associated with Industry-Based Training

S/N	Employability-skill outcome	Mean	SD	Decision
1	Fault diagnosis	4.21	0.68	High
2	Use of diagnostic equipment	4.08	0.74	High
3	Practical repair and maintenance	4.25	0.65	High
4	Problem-solving	4.02	0.71	High
5	Workplace safety practices	4.17	0.69	High
6	Teamwork	3.91	0.77	High
7	Technical communication	3.82	0.81	High
8	Adaptability to new technology	3.96	0.73	High
9	Workshop organization	3.88	0.76	High
10	Employment/self-employment readiness	4.05	0.70	High
	Grand Mean	**4.04**	**0.72**	**High**

Table 1 shows that all ten employability outcomes recorded mean scores above the criterion mean of 3.00. The grand mean of 4.04 indicates that respondents rated IBT as contributing to employability-skill development to a high extent. The highest-rated areas were practical repair and maintenance (4.25), fault diagnosis (4.21) and workplace safety (4.17).

Research Question 2

What difference exists in the employability-skill outcomes of Automobile Technology students who have undergone industry-based training and those who have not?

Table 2: Comparison of Employability-Skill Outcomes of IBT and Non-IBT Students

S/N	Employability outcome	IBT Students (n=44) Mean	Non-IBT Students (n=44) Mean	Mean Difference
1	Fault diagnosis	4.32	3.18	1.14
2	Diagnostic equipment use	4.20	3.10	1.10
3	Repair and maintenance	4.35	3.24	1.11
4	Problem-solving	4.15	3.16	0.99
5	Workplace safety	4.28	3.31	0.97
6	Teamwork	4.08	3.22	0.86
7	Technical communication	3.95	3.08	0.87
8	Adaptability	4.02	3.13	0.89
9	Workshop organization	3.96	3.17	0.79
10	Employment readiness	4.20	3.20	1.00
	Grand Mean	**4.15**	**3.18**	**0.97**

Table 2 shows that students who underwent Industry-Based Training (IBT) recorded higher employability-skill outcomes than students who did not undergo IBT. The overall mean of 4.15 for IBT students compared with 3.18 for non-IBT students produced a mean difference of 0.97.

Research Question 3

What are the major challenges affecting the effective implementation of IBT programmes?

Table 3: Challenges Affecting Industry-Based Training Implementation

S/N	Challenge	Mean	SD	Rank
1	Inadequate funding	4.20	0.72	2
2	Inadequate workshop facilities	4.25	0.69	1
3	Limited modern diagnostic equipment	4.12	0.75	3
4	Weak institution-industry collaboration	4.10	0.81	4
5	Inadequate monitoring	4.06	0.78	5
6	Limited practical opportunities in some industries	3.98	0.83	6
7	Transportation/logistical difficulties	3.87	0.86	7
8	Inadequate student preparation	3.76	0.79	8
9	Poor institution-industry communication	3.71	0.82	9
10	Limited qualified industry supervisors	3.68	0.88	10
	Grand Mean	**3.97**	**0.80**	

Table 3 indicates that all ten challenges had mean scores above 3.00, indicating that respondents considered them relevant constraints to effective IBT implementation.

Hypothesis 1

H01: There is no significant relationship between industry-based training and the employability skills of Automobile Technology students in Colleges of Education in North Central Nigeria.

Table 4: Pearson Correlation between IBT and Employability Skills

Variables	N	Mean	SD	R	p-value	Decision
Industry-Based Training	88	4.04	0.56			
Employability Skills	88	3.72	0.58	.684	<.001	Reject H01

Table 4 shows a strong positive relationship between industry-based training and employability skills, $r = .684$, $p < .001$. Since the p-value is less than .05, the null hypothesis was rejected.

Hypothesis 2

H02: There is no significant difference in the employability-skill outcomes of Automobile Technology students who have undergone industry-based training and those who have not.

Table 5: Independent-Samples t-Test of IBT and Non-IBT Students

Group	N	Mean	SD	t	Df	p-value	Decision
IBT students	44	4.15	0.43				
Non-IBT students	44	3.18	0.51	9.65	86	<.001	Reject H02

Table 5 shows a statistically significant difference between the employability-skill outcomes of students who underwent IBT and those who did not, $t(86) = 9.65$, $p < .001$. The null hypothesis was therefore rejected.

Discussion of Findings

The first finding showed that industry-based training (IBT) was associated with high levels of employability-skill development among Automobile Technology students, particularly in practical repair and maintenance, fault diagnosis, diagnostic equipment use, and workplace safety. This suggests that authentic workplace exposure provides students with opportunities to apply theoretical knowledge to real automobile-related tasks. The high score for practical repair and maintenance (4.25) and fault diagnosis (4.21) may be attributed to the repeated hands-on activities that characterize automobile workshops, where students encounter actual vehicles, faults, tools, equipment, and repair problems. This provides experiences that are difficult to reproduce fully in classroom settings. However, technical communication recorded a comparatively lower mean of 3.82. This difference suggests that workplace exposure may naturally emphasize technical performance more than communication-related competencies. Although students interact with technicians, supervisors, customers, and colleagues, communication may not always be taught or assessed as an explicit component of industrial training. This implies that IBT programmes should deliberately include technical communication, teamwork, reporting, customer interaction, and professional conduct among workplace learning outcomes. The finding supports Human Capital Theory (Schultz, 1961; Becker, 1964), which views relevant training as an investment that improves productive competencies. It is also consistent with Akpokiniovo et al. (2025) and Okoye and Edokpolor (2021), who reported positive contributions of industry-based training and industrial work experience to employability development. Kolb's Experiential Learning Theory (1984) further explains that students develop competencies through concrete experiences, reflection, and application of knowledge to new situations.

The second finding revealed a substantial difference in employability-skill outcomes between students who had undergone IBT and those who had not. Students with IBT recorded a higher overall mean of 4.15 compared with 3.18 for students without IBT. The significant difference indicates that workplace exposure provides additional opportunities for repeated practice, problem-solving, equipment operation, interaction with experienced technicians, and exposure to authentic workplace demands. Students without such exposure may depend more heavily on institutional workshops, where access to operational vehicles, current diagnostic technologies, and real customer-related problems may be limited. The finding reinforces Human Capital Theory by demonstrating the value of additional practical training and aligns with Experiential Learning Theory because IBT allows students to connect theoretical knowledge with actual workplace experiences. The result also supports Nigerian evidence that industrial attachment and work-based learning can strengthen employability competencies and facilitate school-to-work transition. The third finding identified inadequate workshop facilities (4.25), inadequate funding (4.20), limited modern diagnostic equipment (4.12), weak institution-industry collaboration (4.10), and inadequate monitoring (4.06) as the major challenges affecting IBT. The ranking indicates that these challenges are directly related to the practical requirements of Automobile Technology. Inadequate workshop facilities can restrict opportunities for students to practise essential technical skills, while insufficient funding may limit equipment acquisition, workshop maintenance, consumables, student placement, and monitoring activities. Limited modern diagnostic equipment is particularly important because contemporary automobiles increasingly depend on electronic control systems, sensors, computerized engine-management systems, electronic braking systems, and other advanced technologies. Students trained mainly with outdated equipment may therefore develop competencies that do not adequately correspond with current industry requirements. Weak institution-industry collaboration may further reduce the quality of workplace learning by limiting

appropriate placement, supervision, feedback, and exposure to relevant tasks. Similarly, inadequate monitoring can make it difficult for institutions to determine whether students are receiving meaningful and programme-relevant workplace experiences.

Overall, the findings demonstrate that effective IBT depends not simply on placing students in industry but on the quality and structure of their workplace experiences and the institutional conditions supporting them. Human Capital Theory explains the importance of investing in relevant training and resources, while Experiential Learning Theory explains how meaningful practical experiences contribute to competence development. Colleges of Education should therefore strengthen institution-industry partnerships, modernize automobile workshops and diagnostic equipment, provide adequate funding, establish clear workplace learning outcomes, and strengthen monitoring and feedback mechanisms to ensure that IBT develops the technical and transferable skills required by the contemporary automobile industry.

Conclusion

The study found that industry-based training (IBT) was positively associated with employability skills among Automobile Technology students in Colleges of Education in North Central Nigeria. Students exposed to IBT reported higher employability outcomes, particularly in repair and maintenance, fault diagnosis, diagnostic-equipment use, problem-solving, and workplace safety. However, inadequate workshop facilities, insufficient funding, limited modern diagnostic equipment, weak institution-industry collaboration, and inadequate monitoring constrained effective IBT implementation. The findings suggest that well-structured, supervised, adequately resourced, and industry-aligned IBT may contribute to students' preparation for employment and self-employment.

Recommendations

Based on the findings, the following recommendations are made:

1. Colleges of Education should strengthen formal partnerships with automobile industries to provide students with meaningful and structured workplace experiences.
2. Government and institutional authorities should improve funding for Automobile Technology programmes to support effective IBT implementation.
3. Automobile Technology workshops should be equipped with modern diagnostic equipment, particularly equipment reflecting contemporary vehicle technologies.
4. Industry supervisors should be involved in student assessment so that workplace performance contributes meaningfully to students' training outcomes.
5. Lecturers should regularly monitor students during IBT placements rather than relying solely on students' final reports.

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