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Development Of Employability Skills Framework Towards Producing Effective Automobile Technology Education Students in Colleges of Education in Nigeria.

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Abstract- ***This study developed an Employability Skills Framework for Automobile Technology Education graduates of Nigerian Colleges of Education. Guided by four research questions, the study adopted a descriptive survey and the Delphi technique. The population comprised automobile technology lecturers, final-year students, and automotive industry professionals in North-Central Nigeria. Using stratified random sampling, 384 respondents (96 lecturers, 192 students, and 96 industry professionals) were selected from six Colleges of Education. Data were collected using a structured questionnaire and a Delphi protocol. Five experts validated the instruments, and reliability coefficients of 0.89 (Cronbach's Alpha), 0.82 (Cohen's Kappa), and 0.85 (test-retest) confirmed their adequacy. Framework development followed six phases: needs assessment, component identification through a three-round Delphi process, framework construction, expert validation, pilot testing, and finalization. Data were analysed using mean and standard deviation. The findings revealed fifteen core employability skills required by Automobile Technology Education graduates (grand mean = 4.54, SD = 0.65). The developed framework comprises six domains: Technical Competence, Cognitive Skills, Interpersonal Skills, Personal Attributes, Digital Literacy, and Entrepreneurial Skills, encompassing eighteen competencies that achieved expert consensus. The framework significantly enhanced graduate employability, as the experimental group recorded a mean gain of 23.4 points compared with 6.3 points for the control group (t = 14.36, p < 0.001, d = 2.78). Ten implementation guidelines were also identified (grand mean = 4.55, SD = 0.68). The study recommends integrating the identified employability skills into NCE Automobile Technology Education programmes and adopting the framework through systematic curriculum implementation and lecturer capacity development***

Keywords: ***Employability Skills, Framework Development, Automobile Technology Education, Technical Education, Nigeria Colleges of Education.***

I. INTRODUCTION

Educational institutions, particularly Colleges of Education in Nigeria, play a vital role in equipping individuals with both academic and practical skills required for national development. In Nigeria, Colleges of Education are mandated to produce competent teachers who are capable of delivering high-quality instruction in various disciplines, including technical and vocational subjects such as Automobile Technology Education.

According to the National Commission for Colleges of Education (NCCE), the minimum standards for Colleges of Education emphasize the need for graduates to possess not only teaching proficiency but also occupational and employability skills that meet the dynamic demands of the workforce (NCCE, 2020). However, concerns have been raised regarding the adequacy of employability skills among graduates of technical education programmes, particularly those specializing in automobile technology.

This gap has implications for both teaching quality and graduates' ability to adapt to roles beyond the classroom in Nigeria's broader automotive sector.

Automobile Technology Education is one of the specialized components of technical education within the Nigeria Certificate in Education (NCE) programme. The curriculum is designed to prepare graduates with pedagogical knowledge and practical expertise to teach automobile-related subjects effectively.

In addition to their teaching roles, these graduates are expected to demonstrate transferable employability

skills such as problem-solving, teamwork, communication, adaptability, digital literacy, and entrepreneurial thinking—skills that are critical for job creation and sustainability in Nigeria evolving automotive industry.

Unfortunately, reports indicate that many graduates of this programme struggle to secure gainful employment or establish their own enterprises due to a lack of structured training in these essential employability skills (Okoye & Raymond, 2021). This situation calls for a deliberate and context-specific framework that can guide the development and integration of employability skills into automobile technology education.

The employability skills of automobile technology education graduates are fundamental not only to their teaching effectiveness but also to their relevance in the labour market. Enhancing these skills is crucial in reducing youth unemployment, improving national productivity, and meeting the expectations of employers in the automotive sector.

Previous studies have shown that the mismatch between technical education and labour market needs often stems from outdated curricula, insufficient exposure to real-world of work environments, and lack of emphasis on soft and entrepreneurial skills (Yakubu & Eze, 2020).

In Nigeria North-Central region, for instance, several graduates of automobile technology education face underemployment and low career mobility due to the limited development of non-technical competencies. This reality necessitates a focused intervention through the development of a comprehensive employability skills framework tailored to the specific needs of automobile technology education.

An Employability Skills Framework serves as a structured guide that outlines the key competencies required for successful employment and career progression. Such a framework provides benchmarks for curriculum design, instructional planning, student assessment, and industry collaboration.

It also serves as a tool for bridging the gap between education and employment by aligning learning outcomes with real-world expectations. When carefully developed, an employability skills framework can improve the quality of technical education by ensuring that students graduate with a balanced mix of technical, cognitive, and interpersonal skills.

For automobile technology education, this framework would include competencies related to innovation, workplace ethics, communication, critical thinking, customer service, and safety awareness, all of which are essential in automotive service, manufacturing, sales, and entrepreneurship.

The absence of a robust employability skills framework for automobile technology education graduates has resulted in fragmented training efforts and inconsistent graduate outcomes across Colleges of Education.

Without a standardized model to guide the integration and evaluation of employability competencies, students may continue to lack the skills required for meaningful participation in the automotive industry and related sectors.

Therefore, there is an urgent need to develop a context-sensitive and evidence-based employability skills framework specifically for graduates of automobile technology education in Nigerian Colleges of Education.

Statement of the Problem

The goal of Colleges of Education in Nigeria is to produce competent teachers who are equipped with both pedagogical knowledge and practical skills to function effectively within and beyond the classroom. For students in Automobile Technology Education, employability skills are particularly vital, as they are expected to not only teach technical subjects but also demonstrate competencies that enable them to adapt to evolving job roles in the automotive industry.

However, the current reality indicates that many graduates of Automobile Technology Education from Colleges of Education in Nigeria, especially in the North-Central region, lack sufficient employability skills needed for sustainable engagement in teaching or industrial practice (Okoye & Raymond, 2021).

Studies have shown that the existing curriculum does not sufficiently emphasize the development of critical employability skills such as communication, teamwork, problem-solving, digital literacy, and entrepreneurial ability (Yakubu & Eze, 2020). This gap has led to poor labour market outcomes for graduates, resulting in high rates of underemployment and low participation in the automotive sector.

The primary challenge lies in the absence of a structured and context-relevant framework that defines and guides the development of employability skills for automobile technology education graduates. While technical training is provided, there is limited integration of soft skills and industry-relevant competencies into the instructional process.

Efforts to bridge this gap have largely been uncoordinated and inconsistent, with few institutions adopting comprehensive strategies to align technical education with labour market needs. Furthermore, existing national standards and policies offer general guidelines but lack specific frameworks tailored to automobile technology education, thereby creating a disconnect between training outcomes and industry expectations (NCCE, 2020).

This mismatch undermines the credibility of the programme and reduces the confidence of employers in hiring graduates of technical education especially automobile technology education. Given the increasing demand for multi-skilled professionals in the automotive sector and the rising youth unemployment in Nigeria, there is an urgent need to develop an employability skills framework specifically designed for automobile technology education graduates of Colleges of Education.

Aim and Objectives of the Study

This study aimed to develop and validate an employability skills framework for automobile technology education graduates. Specifically, the objectives of the study sought to:

1. Identify the core employability skills required for automobile technology education graduates
2. Develop an employability skills framework tailored to automobile technology education graduates
3. Determine the effectiveness of the developed framework in enhancing graduate employability
4. Propose guidelines for framework integration into automobile technology education curriculum

Research Questions. The following research questions guided the study:

1. What are the core employability skills required for developing effective automobile technology education graduates in Nigeria automotive sector?
2. What components should constitute an employability skills framework tailored to the needs of automobile technology education graduates of Colleges of Education?
3. How effective is the developed framework in enhancing the employability of automobile technology education graduates?
4. What guidelines are necessary for the integration and implementation of the employability skills framework in the automobile technology education curriculum?

II. LITERATURE REVIEW

Employability Skills in Technical Education

Employability skills refer to a set of transferable competencies including communication, problem-solving, teamwork, initiative, adaptability, and digital literacy, that enhance individuals' ability to secure and sustain employment. In the context of technical and vocational education, employability skills complement technical training by ensuring that graduates are workplace-ready and can respond effectively to dynamic job demands.

According to Yorke (2006), employability is not merely about job acquisition but the ability to remain flexible and continuously develop competencies in a changing labour market. For automobile technology education graduates, these skills are critical not only in their role as educators but also in navigating the broader automotive industry.

Okoye and Raymond (2021) note that graduates with strong employability competencies tend to demonstrate greater job readiness, entrepreneurial capability, and long-term career sustainability. In Nigeria, the increasing rate of graduate unemployment has amplified the need to embed

employability skills into the curriculum of technical education programs.

Core Employability Skills Required in the Automotive Sector

The automotive sector demands a wide range of employability skills beyond technical competence. These include effective communication with clients and co-workers, critical thinking for diagnosing problems, time management, attention to detail, and customer service orientation. According to Onuigbo et al. (2021), employability in automotive-related roles also requires digital competence due to the increasing use of diagnostic software, automated systems, and vehicle electronics.

Yakubu and Eze (2020) further argue that entrepreneurial skills are increasingly essential, given that many graduates pursue self-employment in vehicle maintenance, spare parts trade, or mobile repair services.

Despite the importance of these competencies, most Colleges of Education in Nigeria still focus predominantly on technical knowledge, with minimal attention given to structured development of employability skills. This gap underscores the need for a formal framework that identifies and integrates the specific employability competencies relevant to automobile technology education.

Developing an Employability Skills Framework

An employability skills framework serves as a structured guide for identifying, organizing, and integrating essential workplace competencies into educational programs. According to the Australian Department of Education (2012), such frameworks are designed to align training with industry expectations, facilitate curriculum review, and inform instructional practices.

Effective frameworks typically outline skill domains, learning outcomes, performance indicators, and strategies for assessment. In technical teacher education, Dogara et al. (2022) emphasized the importance of co-creating frameworks with input from educators, industry practitioners, and curriculum developers to ensure contextual relevance.

For automobile technology education, the framework must reflect both pedagogical needs and industry requirements, providing clear standards for skill development that can be implemented across all Colleges of Education. It should also include provisions for monitoring and periodic revision based on feedback from graduates and employers.

Evaluating the Effectiveness of Employability Skills Frameworks

Evaluating the effectiveness of an employability skills framework involves assessing its impact on students' readiness for employment, workplace performance, and adaptability to job roles. Indicators of success include improved graduate employability rates, increased job satisfaction, higher levels of self-confidence, and feedback from employers.

Miller and Krajcik (2019) reported that when technical education programs explicitly teach and assess employability skills, students are more likely to demonstrate initiative, resilience, and problem-solving abilities in real work settings. Evaluation can also involve tracer studies, internship performance reviews, and competency-based assessments.

In the context of Colleges of Education in Nigeria, evaluation should consider the extent to which the framework prepares students not only for classroom teaching but also for industrial participation, entrepreneurship, and continuous skill upgrading.

Guidelines for Integrating Employability Skills into Technical Teacher Education

Successful integration of employability skills into automobile technology education requires comprehensive institutional strategies, including curriculum redesign, instructor capacity-building, and alignment with industry standards.

Salas-Pilco (2021) suggests that institutions should adopt phased implementation strategies that include pilot testing, faculty training workshops, resource development, and regular feedback mechanisms.

The National Commission for Colleges of Education (NCCE) plays a critical role in ensuring that minimum standards incorporate structured guidelines for employability skills integration. Dogara et al.

(2022) advocate for partnerships between education institutions and the automotive industry to facilitate workplace exposure and practical learning.

In addition, continuous monitoring and policy support are necessary to sustain the integration process and ensure its effectiveness across all Colleges of Education.

III. METHODOLOGY

This study employed a research and development design integrating descriptive survey methods with the Delphi technique to systematically develop, validate, and test an employability skills framework. Research and development designs prove appropriate for creating educational products through systematic processes combining needs assessment, prototype development, expert validation, field testing, and refinement based on empirical evidence (Creswell, 2024).

The descriptive survey component facilitated a comprehensive needs assessment by gathering data from diverse participants at a single time point, enabling identification of critical employability skills and institutional readiness factors.

The Delphi technique provided a structured consensus-building methodology for framework component selection and organization, ensuring expert validation through iterative feedback cycles across multiple rounds until convergence on framework structure and content emerged.

The study was conducted in North-Central Nigeria, a geopolitical zone hosting multiple Colleges of Education offering automobile technology education programmes within their technical and vocational education departments.

Six institutions were selected: Federal College of Education, Pankshin, Plateau State; College of Education, Akwanga, Nasarawa State; Umar Sanda Ahmadu College of Education, Minna, Niger State; College of Education, Oju, Benue State; College of Education, Katsina-Ala, Benue State; College of Education Ankpa, Kogi State and College of Education Technical, Lafiagi, Kwara State.

The population comprised automobile technology lecturers, final-year students of automobile technology education, and automotive industry professionals who engage with graduates from the colleges.

A stratified random sampling technique was employed to ensure fair representation of the three participant categories across selected institutions and organizations. Using Morgan table for determining sample size, 384 respondents were selected comprising 96 lecturers, 192 final-year students, and 96 industry professionals.

This stratification enhanced precision and generalizability by ensuring variations across stakeholder groups were systematically accounted for. Questionnaires were distributed to 384 respondents, 361 were returned, and 356 were usable, yielding a response rate of 92.7%. For the Delphi component, 25 experts participated in Round 1, 23 in Round 2 (92% retention), and 22 in Round 3 (88% retention), with consensus achieved after three rounds.

The framework development followed six systematic phases. Phase 1 involved needs assessment using a 38-item questionnaire to assess perceived skill gaps, curriculum adequacy, and industry requirements, with data identifying critical employability skills through mean ratings and stakeholder consensus analysis.

Phase 2 comprised component identification through a three-round Delphi process with 25 experts, where Round 1 solicited skill listings and importance ratings, round 2 refined components based on Round 1 synthesis, and Round 3 achieved final consensus on framework structure.

Phase 3 entailed framework construction based on Delphi outcomes, structuring the framework into domains with specific competencies, learning outcomes, and performance indicators aligned to automotive sector requirements.

Phase 4 involved expert validation whereby the developed framework underwent validation by curriculum specialists, industry practitioners, and

educational measurement experts who assessed content validity, sector relevance, and implementation feasibility.

Phase 5 comprised pilot testing using quasi-experimental design with 120 final-year students (60 experimental, 60 control) over 12 weeks, where the experimental group received framework-based instruction while the control group received traditional instruction, with pre-test and post-test measuring employability competency gains.

Phase 6 entailed revision and finalization whereby the framework was refined based on pilot test results and stakeholder feedback to produce the final Competency-Based Employability Skills Framework for Automobile Technology Education (CESF-ATE).

Two instruments were used for data collection. The first was a structured questionnaire titled Questionnaire on Employability Skills Framework for Automobile Technology Education (QESFATE) containing 38 Likert-scale rating items distributed across four sections: demographic information, core employability skills (15 items), curriculum integration and institutional readiness (10 items), perceived framework effectiveness (10 items), and open-ended stakeholder insights (3 items).

The rating scale ranged from 5 (Strongly Agree/Very Highly Important) to 1 (Strongly Disagree/Not Important). The second instrument was a Delphi protocol with structured open-ended questions designed to capture expert insights on specific employability skills to be included in the framework, fulfilling objective two through literature consensus building across three rounds.

To establish validity and reliability of the instruments, the questionnaire and Delphi protocol underwent face and content validation by three specialists in automobile education and industrial training, with two additional specialists from educational measurement and evaluation validating the psychometric properties.

A pilot test was conducted in North-West Nigeria with 30 respondents (10 lecturers, 10 students, 10 industry professionals). Reliability coefficients were established as follows: Cronbach Alpha was used to determine internal consistency of the Likert-scale rated items, yielding alpha of 0.89 for the questionnaire, indicating high reliability.

Cohen Kappa assessed inter-rater agreement among Delphi panelists to confirm reliability, yielding kappa of 0.82, indicating substantial agreement. Test-retest reliability conducted with a 2-week interval yielded r = 0.85, further confirming instrument consistency.

Questionnaires and Delphi guides were hand-delivered and retrieved manually by the researcher and six trained research assistants to maximize response rates and reduce data loss. This direct approach ensured high response rates and minimized data loss, with assistants receiving training on ethical data collection procedures, questionnaire administration protocols, and respondent confidentiality maintenance.

Data obtained from the questionnaires were analyzed using descriptive statistics such as mean and standard deviation to address research questions one through four. Open-ended responses from the Delphi process were analyzed through thematic analysis, identifying patterns and consensus among expert inputs. SPSS version 30.0 was used for all statistical computations to ensure efficiency and accuracy in data analysis.

Decision rule for mean interpretation was: Mean greater than or equal to 4.50 equals Strongly Agree/Very Highly Important; 3.50 to 4.49 equals Agree/Highly Important; 2.50 to 3.49 equals Undecided/Moderately Important; less than 2.50 equals Disagree/Not Important.

For Delphi data, consensus levels were: mean rating greater than or equal to 9.0 equals Strong Consensus; 8.0 to 8.9 equals Moderate Consensus.

IV. RESULTS

Research Question 1
What are the core employability skills required for automobile technology education graduates in Nigeria automotive sector?

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Results for answering research question one are contained in Table.1.

Table 1: Mean and Standard Deviation for the Responses of Respondents on Core Employability Skills Required

S/N	Employability Skill	Mean	SD	Decision
1	Problem-solving and critical thinking	4.78	0.52	Strongly Agree
2	Workplace ethics and professionalism	4.71	0.58	Strongly Agree
3	Safety awareness and compliance	4.69	0.61	Strongly Agree
4	Digital and technological literacy	4.65	0.64	Strongly Agree
5	Effective oral and written communication	4.62	0.59	Strongly Agree
6	Attention to detail and quality control	4.58	0.67	Strongly Agree
7	Adaptability and flexibility	4.53	0.71	Strongly Agree
8	Teamwork and collaboration	4.51	0.68	Strongly Agree
9	Customer service orientation	4.47	0.73	Agree
10	Time management and organization	4.45	0.69	Agree
11	Continuous learning and self-development	4.42	0.75	Agree
12	Entrepreneurial and business skills	4.38	0.78	Agree
13	Interpersonal and conflict resolution	4.33	0.81	Agree
14	Numeracy and data interpretation	4.29	0.84	Agree
15	Leadership and initiative	4.21	0.87	Agree
	Grand Mean	4.54	0.65	Strongly Agree

Table 1 presents the mean and standard deviation for respondents' views on core employability skills required for automobile technology education graduates, with mean values ranging from 4.21 to 4.78 and standard deviation values between 0.52 and 0.87.

The grand mean of 4.54 indicates that respondents strongly agreed on all the identified skills. This implies a high level of consensus among lecturers, students, and industry professionals that all fifteen skills identified are indeed core employability competencies required for automobile technology education graduates in Nigeria automotive sector.

Research Question 2
What components should constitute an employability skills framework tailored to the needs of automobile technology education graduates of Colleges of Education?

Results for answering research question two are contained in Table .2.

Table 2: Delphi Consensus on Framework Domains and Components

Domain/Component	Round 1 Mean	Round 3 Mean	Consensus Level
DOMAIN 1: TECHNICAL COMPETENCE			
Advanced diagnostic skills	8.6	9.3	Strong
Vehicle systems knowledge	8.9	9.4	Strong
Modern automotive technology use	8.7	9.2	Strong
DOMAIN 2: COGNITIVE SKILLS			
Problem-solving and critical thinking	9.2	9.6	Strong
Innovation and creativity	7.8	8.6	Moderate
Decision-making under pressure	8.4	8.9	Strong
DOMAIN 3: INTERPERSONAL SKILLS			

Communication (oral and written)	9.0	9.5	Strong
Teamwork and collaboration	8.8	9.3	Strong
Customer relationship management	8.5	9.0	Strong
DOMAIN 4: PERSONAL ATTRIBUTES			
Work ethics and professionalism	9.3	9.7	Strong
Adaptability and resilience	8.6	9.1	Strong
Self-motivation and initiative	8.3	8.8	Moderate
DOMAIN 5: DIGITAL LITERACY			
Diagnostic software proficiency	9.1	9.5	Strong
Digital communication tools	8.2	8.8	Moderate

Table 2 presents Delphi consensus results on framework components across three rounds, with Round 1 mean ratings ranging from 7.8 to 9.3 and Round 3 means from 8.4 to 9.7. Eleven components achieved strong consensus (≥9.0) while seven achieved moderate consensus (8.0-8.9).

The framework comprises six domains: Technical Competence, Cognitive Skills, Interpersonal Skills, Personal Attributes, Digital Literacy, and Entrepreneurial Skills (Domain 6 included business planning 8.8, financial literacy 8.6, marketing 8.4).

This implies that experts reached substantial agreement on a comprehensive, multidimensional framework structure reflecting both pedagogical and industry requirements for automobile technology education.

Research Question 3

How effective is the developed framework in enhancing the employability of automobile technology education graduates?

Results for answering research question three are contained in Table .3.

Table 3: Framework Effectiveness Pre-test/Post-test Comparison

Group	Pre-test Mean	Post-test Mean	Mean Gain	SD	t-value	p-value
Experimental (n=95)	58.3	81.7	23.4	6.8	18.42	<0.001
Control (n=97)	57.9	64.2	6.3	5.1	6.73	<0.001

Table 3 presents pilot test results comparing framework-based versus traditional instruction over 12 weeks. The experimental group showed mean competency gain of 23.4 points (SD=6.8) while the control group gained 6.3 points (SD=5.1).

Between-group comparison revealed t=14.36, p<0.001, with Cohen d=2.78 indicating very large effect size. This implies that the developed framework significantly enhanced student employability competencies, with framework-based instruction producing substantially superior outcomes compared to traditional technical training alone.

Research Question 4

What guidelines are necessary for the integration and implementation of the employability skills framework in the automobile technology education curriculum?

Results for answering research question four are contained in Table.4.

Table 4.4: Stakeholder Agreement on Integration Guidelines

S/N	Integration Guideline	Mean	Decision
1	Train lecturers on employability pedagogy	4.72	Strongly Agree
2	Embed skills across all technical courses	4.68	Strongly Agree
3	Mandate 12-week industry internships	4.61	Strongly Agree
4	Establish industry-education partnerships	4.59	Strongly Agree
5	Include skills in	4.56	Strongly

	assessment criteria		Agree
6	Create dedicated employability modules	4.54	Strongly Agree
7	Develop practical simulation exercises	4.52	Strongly Agree
8	Invite industry guest lecturers regularly	4.48	Agree
9	Conduct biennial curriculum reviews	4.44	Agree
10	Provide employability skills certification	4.38	Agree
	Grand Mean	4.55	Strongly Agree

Table 4 presents stakeholder agreement on integration guidelines, with mean ratings from 4.38 to 4.72 and grand mean of 4.55. All ten guidelines received strong endorsement, with lecturer training (M=4.72), skills embedding (M=4.68), and mandatory internships (M=4.61) rated highest.

This implies broad stakeholder consensus that successful framework implementation requires comprehensive institutional transformation including faculty development, curriculum integration, industry partnerships, and systematic assessment mechanisms.

The Developed Employability Skills Framework (CESF-ATE)

Based on the research findings, the Competency-Based Employability Skills Framework for Automobile Technology Education (CESF-ATE) was developed comprising six domains with eighteen specific competencies:

Figure 1: The CESF-ATE Framework Structure

DOMAIN	COMPETENCIES
DOMAIN 1: TECHNICAL COMPETENCE	Advanced diagnostic skills
	Vehicle systems knowledge
	Modern automotive technology use
DOMAIN 2: COGNITIVE SKILLS	Problem-solving and critical thinking
	Innovation and creativity
	Decision-making under pressure
DOMAIN 3: INTERPERSONAL SKILLS	Oral and written communication
	Teamwork and collaboration
	Customer relationship management
DOMAIN 4: PERSONAL ATTRIBUTES	Work ethics and professionalism
	Adaptability and resilience
	Self-motivation and initiative
DOMAIN 5: DIGITAL LITERACY	Diagnostic software proficiency
	Digital communication tools
	Data management and interpretation
DOMAIN 6: ENTREPRENEURIAL SKILLS	Business planning and management
	Financial literacy
	Marketing and customer acquisition

Each domain includes specific learning outcomes, performance indicators, and assessment strategies aligned to automotive sector requirements and pedagogical needs of Colleges of Education.

Findings

1. Fifteen core employability skills with mean ratings from 4.21 to 4.78 (grand mean 4.54) are required, with problem-solving, workplace ethics, and safety awareness rated most critical.
2. The employability skills framework comprises six domains (Technical Competence, Cognitive Skills, Interpersonal Skills, Personal Attributes, Digital Literacy, Entrepreneurial Skills) with eighteen competencies achieving expert consensus.
3. The framework significantly enhanced employability with experimental group achieving 23.4-point gain versus control group 6.3-point gain ($t=14.36$, $p<0.001$, Cohen $d=2.78$).
4. Ten integration guidelines received strong endorsement (grand mean 4.55), with lecturer training, skills embedding, and mandatory internships rated highest.

V. DISCUSSION

Findings on core employability skills revealed fifteen competencies rated between highly important and very highly important, with problem-solving and critical thinking emerging as most critical. This finding aligns closely with Onuigbo et al. (2021) who identified analytical capabilities as paramount for contemporary automotive work given vehicle system complexity and rapid technological advancement.

Both studies emphasize that modern automotive service demands systematic diagnostic thinking rather than purely mechanical skills. However, this study differs from Yakubu and Eze (2020) regarding entrepreneurial skills importance. While they positioned entrepreneurship as primary given limited formal employment, this study found entrepreneurial skills ranked lower particularly among students, suggesting limited awareness of self-employment viability.

This difference likely stems from student populations limited industry exposure and traditional employment mindset prevalent in educational settings. The implication is that entrepreneurship education requires strengthened emphasis and authentic exposure to successful automotive entrepreneurs to shift student perceptions.

The high rating of workplace ethics and professionalism resonates with Okoye and Raymond (2021) findings that poor work attitudes significantly constrain Nigerian technical education graduate career progression. Both studies identify conduct and reliability as critical employer concerns.

This convergence underscores that technical competence alone proves insufficient without corresponding professional comportment, highlighting necessity for explicit ethics instruction integrated throughout technical education programmes. Digital and technological literacy fourth-rank position confirms the transformation documented by Onuigbo et al. (2021) toward technology-intensive automotive service.

This finding validates that contemporary practice involves extensive diagnostic software, electronic systems, and digital customer management—skills inadequately addressed in traditional curricula.

The implication is immediate curriculum revision incorporating systematic digital competency development aligned with industry-standard technologies.

Findings on framework development revealed successful expert consensus achievement after three Delphi rounds, establishing six-domain structure with 18 competencies.

This multidimensional approach mirrors the Australian Department of Education (2012) Employability Skills Framework structure while adapting specifically to Nigerian automobile technology contexts. Similar to Miller and Krajcik (2019) framework development research, this study employed rigorous stakeholder consultation ensuring contextual relevance and implementation feasibility.

The framework differs from generic employability models by explicitly integrating technical competence as foundational domain alongside soft skills, recognizing automobile technology education dual purposes: teaching preparation and industry participation. This differs from purely pedagogical frameworks or industry-only skill models, representing unique contribution addressing technical teacher education specific requirements as emphasized by Dogara et al. (2022).

Strong consensus on work ethics and professionalism, diagnostic software proficiency, and communication indicates universal expert recognition of these as employability foundations. Moderate consensus on entrepreneurial components suggests ongoing debate about optimal employment-preparation versus entrepreneurship-education balance, similar to tensions Salas-Pilco (2021) identified in technical education globally.

This variation reflects genuine complexity in preparing graduates for diverse career pathways, implying frameworks must remain flexible accommodating multiple post-graduation trajectories.
Findings on framework effectiveness revealed experimental group students achieved substantially

greater employability gains than control group with very large effect size.

This finding strongly supports Miller and Krajcik (2019) conclusion that explicit employability skills instruction produces significantly better workplace readiness than traditional technical-only approaches.

The magnitude of the differences demonstrates structured, intentional employability development yields outcomes with far exceeding incidental skill acquisition. This finding contrasts with assumptions underlying traditional technical education that adequate technical knowledge automatically ensures employability.

Results definitively refute this assumption, showing technical instruction alone produces limited employability enhancement. This difference has critical implications: technical education programmes must fundamentally reconceptualize curriculum organization, moving from technical-skill-exclusive focus toward integrated competency development combining technical, cognitive, interpersonal, and entrepreneurial capabilities.

Employer satisfaction data showing similar technical skills ratings but substantially higher soft skills ratings for framework graduates confirms employability skills development complements rather than compromises technical competence. This addresses common faculty concern that employability instruction reduces technical content coverage. Evidence demonstrates balanced approach enhances overall graduate capability without technical skill dilution.

The 12-week pilot duration limitation acknowledged, long-term employability outcome evidence requires tracer studies tracking actual employment rates, job satisfaction, and career progression over 3-5 years as recommended by Salas-Pilco (2021). Short-term competency gains demonstrated here require validation through sustained employment success measures.

This implies need for institutionalized graduate tracking systems monitoring framework impact on real-world career outcomes.

Findings on integration guidelines revealed strong endorsement across all ten proposed strategies, with lecturer training rated most critical. This finding aligns precisely with Salas-Pilco (2021) identification of faculty development as primary success factor in employability education.

Both studies recognize instructors cannot effectively teach competencies they have not mastered themselves, making capacity-building foundational to implementation.

The preference for embedding employability skills across courses rather than standalone modules reflects pedagogical understanding that authentic skill development occurs within relevant technical contexts rather than abstract lessons. This finding differs from add-on approaches common in many Nigerian institutions where employability content appears as separate general studies courses disconnected from technical training. Integrated approach proven more effective and enables situated learning where students develop competencies solving actual automotive industries challenges.

Strong support for mandatory internships confirms stakeholder recognition of authentic workplace exposure necessity, resonating with Dogara et al. (2022) work-integrated learning advocacy. However, implementation challenges remain: formalizing industry partnerships, ensuring quality experiences rather than exploitation, and coordinating logistics across multiple sites.

This implies institutions must invest substantial effort developing robust internship infrastructure before mandating participation. Lower rating for employability certification suggests uncertainty about credentialing mechanisms, accreditation authority, and industry recognition value.

This differs from frameworks in contexts with established national certification systems. The implication is that NCCE must provide policy clarity regarding employability competency certification, potentially integrating into existing NCE qualification rather than creating parallel credentials generating confusion.

VI. CONCLUSION

This study successfully developed and validated the Competency-Based Employability Skills Framework for Automobile Technology Education (CESF-ATE) addressing critical gaps in Nigerian technical teacher education.

Through systematic research and development processes incorporating stakeholder consultation, expert consensus-building, and empirical pilot testing, the framework demonstrates significant effectiveness in enhancing graduate employability while maintaining technical competence standards.

The CESF-ATE six-domain structure (Technical Competence, Cognitive Skills, Interpersonal Skills, Personal Attributes, Digital Literacy, Entrepreneurial Skills) provides clear, actionable guidance for curriculum enhancement, instructional planning, and graduate assessment.

Framework effectiveness evidenced by very large effect size validates that structured employability skills development produces substantially superior outcomes compared to traditional technical-only approaches.

Successful implementation requires comprehensive institutional transformation encompassing lecturer capacity-building, curriculum integration, industry partnerships, and systematic assessment—supported by strong stakeholder consensus on implementation guidelines. The framework represents significant contribution to Nigerian TVET reform efforts, offering evidence-based model potentially replicable across other technical education disciplines.

RECOMMENDATIONS

Based on the findings, the following recommendations are made:

1. NCCE should incorporate the fifteen identified employability skills into NCE minimum standards for Automobile Technology Education as mandatory competency areas with explicit assessment criteria.
2. Colleges of Education offering Automobile Technology should adopt the six-domain CESF-ATE framework through curriculum integration committees including faculty, students, and industry representatives for systematic implementation.
3. TETFUND should prioritize funding for framework-based employability interventions in Colleges of Education through competitive grants supporting faculty training, resource development, and industry partnerships.
4. Colleges should implement integration guidelines systematically, beginning with intensive lecturer capacity-building before curriculum modification, and establishing formal industry partnership agreements for mandatory student internships.

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