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Modelling the Integration of Core Competencies among Students of Technical Colleges through Work-Based Learning in North-Western States, Nigeria

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Abstract: ***The significance of core competencies has been recognized in many industries, and as a result, many firms consider these skills when hiring and evaluating employees. The purpose of this study was to ascertain how academic alignment and employer engagement relationships affected the core competencies integration among students at technical colleges. The study adopted the survey research design. In light of the diverse and complicated community from which the survey was drawn, the stratified technique of random selection was employed to sample 273 technical instructors from a population size of 342 in the sample area. The academic alignment and employer engagement questionnaire (AAEEQ) was the tool utilized to gather information from the respondents. The questionnaire was evaluated by three Technical and Vocational specialists. For the reliability of the instrument, the data were analyzed using the Cronbach Alpha coefficient with the Statistical Package of Social Science (SPSS) version 25. The computed values for the constructs of the study were: Academic Alignment (Career Awareness Activities (CAA) .953, Career Exploration Activities (CEA) .926, Career Preparation Activities (CPA) .967), Employer Engagement (EET) .895, and Core Competencies Integration (CCM) .911. The same tool was employed for the exploratory factor analysis to put the items into the required dimensions. Confirmatory factor analysis, a crucial part of structural equation modelling (SEM) was carried out by the use of Analysis of Moment Structures (AMOS) version 23 to address the research questions and their corresponding hypothesis at a 0.05 level of significance. To address the model identification issues that researchers face in the handling of each distinct measurement model throughout the confirmatory factor analysis (CFA) process, the pooled-CFA approach was used for this analysis through analysis of moment of structures (AMOS) to create the chi-square values, modification indices, and standardized estimates. Specifically, the study used a second-order confirmatory factor analysis. The structural equation modeling (SEM) analysis technique was employed through AMOS to determine the model's fundamental relationship. The results of the study showed that work-based learning (WBL) academic alignment and employer engagement all significantly improved students' core competencies at technical colleges. Based on the study's outcomes: i) The government should create a supportive environment that encourages appropriate work-based learning activities to enhance the integration of core competencies; ii) To effectively develop core competencies, technical educators should employ the WBL identified elements in the implementation of the WBL programme at technical colleges.***

Keywords: Core Competencies, Structural Equation Modelling (SEM), Technical Colleges, Work-Based Learning.

I. INTRODUCTION

The significance of core competencies in boosting the job prospects of graduates cannot be stressed enough. Core competencies are all the skills that are not directly related to a particular job but are crucial across various aspects of human activities as they largely influence the job readiness of graduates [1]. Usually, core competencies work in conjunction with technical skills; they are notably the capacity to perform various tasks or activities. Core competencies are also crucial as they aid graduates in achieving success in their personal and professional spheres, making them essential for anyone seeking employment.

Consequently, enhancing the employability of students is attracting considerable interest from a variety of groups within the education sector and beyond. The process of globalization, along with the transition from an economy dominated by manufacturing and technology to one focused on information and knowledge, has fundamentally altered the competencies required for employment in the 21st century. Simply possessing technical skills upon graduation is insufficient for securing employment and achieving success in the workforce [2]. Companies face challenges with recent graduates because they often lack core competencies such as problem-solving, collaboration, information and communication technology (ICT) skills, communication skills, analytical thinking, and resource management skills among others [3]; therefore, students must acquire both hard and core competencies.

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In recent times, educational institutions have shifted their emphasis towards teaching methods that promote active student engagement in the learning process to enhance the incorporation of core competencies.

Producing students who are capable of contributing effectively to the workforce upon graduation presents a significant hurdle for technical colleges in Nigeria [4]. Nigerian technical colleges, therefore, are criticized for lacking significant efforts in developing core competencies among their students, leading to a shortage of graduates with work-ready skills [5]. It has also been noted that these schools prioritize the teaching of technical skills, often overlooking the importance of core competencies. Many experts believe this issue is fueled by the current programme content, which focuses heavily on the understanding of technical skills at the cost of developing core competencies. Moreover, some scholars have criticized educators for adopting traditional teaching approaches that are centered on the teacher rather than the student [6]. Therefore, this has resulted to the well-known worldwide situation where the skills imparted in schools do not always align with the skills required by employers, for complex reasons. Hence, this skills gap is one of the factors influencing the recent growth of work-based learning programmes.

Employability among graduates is correlated with the success of a technical college, industry, and the student. Strong collaborations among these three groups would enhance productive work environments for achieving the required core competencies among graduates. To prepare graduates for the modern workforce, technical colleges must integrate the necessary knowledge and skills [7]. The employability of Nigerian technical college graduates is fast declining, particularly in critical thinking, problem-solving, communication, interpersonal, leadership, and information management [8]. Giving students the education and skills they need to become economically employable or self-sufficient is one of the primary goals of the nation's technical colleges [9].

Unfortunately, Nigeria's unemployment rate is increasing annually, and graduates are particularly affected because they lack employable skills. One of the primary causes of the high unemployment rate among graduates is the mismatch between the skills that students learn and the skills that employers demand in the modern workforce [10]. There is no way to argue that the persistent output of graduates with poor employability skills is not the cause of this pattern of unemployment. This necessitates the use of dynamic teaching and learning techniques, such as the WBL approach, which can help students develop the required core competencies.

Work-based learning (WBL) is simply an effort to welcome the community as a source of learning in the classroom. Amish defined WBL as the establishment of a hands-on educational programme to integrate the work environment as a vital element of the curriculum [11]. It is a structurally organized learning system that simultaneously exposes students to work and learning contexts. In other words, it is a term used to describe student learning that is aided by learning strategies and methods that occur in a real-world setting under structured supervision and are geared toward meeting course learning objectives.

These hands-on experiences in professional environments help students develop core competencies for the 21st century, including critical thinking, problem-solving, teamwork, effective communication, and initiative, among others. Such core competencies are crucial for employment; however, they are often overlooked in traditional educational settings due to the restricted time teachers have to cover material beyond the regular curriculum [12]. There is a common belief that the lack of these skills is fueling the increasing demand for work-based learning programmes. Chances are provided to students in WBL to absorb practical information to help close the gap between theoretical and practical knowledge.

Carefully crafted learning experiences are provided to students through the cooperation of workplace and educational institutions via WBL [13]. Recognizing the importance of collaborative modelling of the learning atmosphere to enable learners to acquire pertinent skills, [14] highlighted some key educational principles and criteria that are crucial for achieving success in work-based learning, which include, but are not limited to, academic alignment, active employer engagement, and oversight. They further noted that partnerships in work-based learning enhance its value by transforming the prevailing business mindset from viewing learning as an expense to considering it as an investment.

Jackson, Rowbottom, Ferns, and McLaren investigated to understand how employers view Work-Based Learning (WBL), the reasons behind their participation, and the challenges they encounter during the WBL process [15]. This exploration is significant as there is a growing push to enhance WBL, given its considerable benefits in equipping students for their transition into the workforce. The study was carried out by four publicly funded universities in Western Australia, in partnership with the Chamber of Commerce and Industry of Western Australia, with a specific focus on internships for business students. A combination of quantitative and qualitative research techniques was utilized, gathering data through surveys from employers (N = 112) and conversations in focus groups (N = 17). The findings indicate that employers had a limited understanding of the Work-Based Learning programmes provided by the four Business Schools. Even though most firms acknowledged the importance of student internships for their sectors, several obstacles prevented them from taking advantage of work-based learning. Findings revealed that relevant projects and assignments for students, hiring qualified applicants, and worries about the students' performance and capacity to coach or supervise were some of these difficulties. The study makes several recommendations for how to get past these barriers, improving the WBL experience for all parties and guaranteeing its continuous growth in the education industry.

On the other hand, [16] looked at two programmes that are part of the same school district and give students WBL course credit. The quality of employment possibilities provided to students in these programmes and the connection between curriculum involvement and academic achievement (e.g., effects on academic work, social connections, etc.) were the two main topics of the study. They discovered that students evaluate their work

experiences as being quite comparable across programmes because of variations in the sort of work done and some institutional characteristics of these services. Additionally, they discovered that both systems had shortcomings in establishing connections between job and education and that students' work hours have a detrimental effect on some facets of their academic performance (e.g., their capacity to find time to do assignments, their decision to stay in school, etc.). However, considering the expenses of system planning, implementation, and in certain situations, participation, the results cast doubt on WBL's additional value. Besides, students who work seem to benefit financially, yet occasionally they pay a price in terms of education, hence, previous research has questioned whether work adds value to students' education [17].

Relating students' work to what they are learning in the classroom can be challenging, but it may help them develop essential skills. There are many advantages of work-based learning (WBL), however, technical institutions frequently lose out on this potentially rich educational opportunity because of poor pedagogical practices [18]. To maximize these advantages, particularly for students at technical colleges, the basic educational tenets and standards required for successful work-based learning, such as academic alignment and employer engagement will be explored in this study. These constructs were selected because they provide a sufficient description of the WBL features required to successfully integrate core competencies across technical college students. Furthermore, the measures have been selected as a fundamental foundation for offering students excellent work-based learning practices, though; they are not all-encompassing.

II. CONCEPTUAL FRAMEWORK OF THE STUDY

Based on the literature reviewed, the conceptual framework of this study is designed using some selected WBL components academic (alignment and employer engagement) essential for core competencies development. The selection of alignment and employer engagement as constructs of this study is based on their appropriateness for core competencies development among students at technical colleges [19]. Academic alignment (AAT), which is a second-order construct in this study, has three sub-constructs (first-order constructs); career awareness activities (CAA); career exploration activities (CEA); and career preparation activities (CPA). Employer engagement (EET), is the second independent variable, while core competencies integration (CCM) is the dependent variable of the study.

Academic alignment can be understood as a concept that refers to collaboration where the members share similar academic skills, abilities, and objectives. In a similar vein, Rintala [20] clarified that academic alignment in work-based learning (WBL) involves a designed collaboration of school and workplace learning to: 1) provide students with mentors and teachers in the workplace; 2) enable students to apply their academic, technical, and job-related skills in real work environments; and 3) equip students with the skills required for highly sought-after jobs. Hermawan and Farozin [21] state that career awareness, career exploration, and career preparation activities are how these objectives are accomplished. They also asserted that career awareness practices assist students in exploring different professions, comprehending the training and education required for these occupations, and identifying the usual career paths for entering and progressing in the industries. Career awareness activities expose students to a wide range of jobs in the public, private, and nonprofit sectors; Career Exploration activities let students see and talk to workers in the workplace to learn the skills needed for specific careers; while Career Preparation activities integrate academic and career skills learned in the classroom with knowledge and skills from work experiences. When choosing their future courses of study and training, many students find these exercises to be helpful.

Employer engagement is a lively participation of employers to address societal issues of promoting students' entry into the workforce. In other words, [22] defined employer engagement as advancement in work-based learning that empowers students by increasing their potential to get employment in the long run with high-quality education and training. In situations where competition and market pressures are high, there's a significant increase in the need for more structured relationships between employers and job applicants, including greater opportunities for work-based learning [23]. According to [24], this technique through the entire apprenticeship undertaking in work-based learning aligns the employer engagement activities with those across the institution in the following comportments: Perform a thorough evaluation of the learner's previous learning, skills, and experience against the apprenticeship standard to guarantee that the institution does not cover learning outcomes the learner has already demonstrated; Verify if the learner possesses the essential learning skills to meet the requirements of their traineeship; Arrange any extra learning support necessary to help the learner complete all aspects of their training in work-based learning; Develop a Personal Training Plan (PTP) for each learner to ensure they can meet the preparation requirements and prove competency in their role.

Besides, numerous discussions and supporting research on employer-driven programmes have shown a variety of advantages for recent graduates entering the workforce [25]. These benefits encompass, among others: the formation of a professional identity; enhanced understanding of the job market; learning early in their careers to find ways to follow their chosen career path; and the development of students' critical thinking skills and confidence in understanding work processes, practices, and realities, and how to improve them.

There is common agreement among various nations worldwide that employer engagement and other forms of work-based learning can aid young individuals in their transition from education to employment and increasingly contribute to the up-skilling and reskilling of learners. This Policy describes the methods employed by these institutions to collaborate with employers, potential apprentices (students), educational institutions, instructors, families, and alumni to emphasize the benefits of experiential learning and to enhance awareness and participation. Recently, employer engagement has been understood in light of the diverse roles that employers play, depending on different

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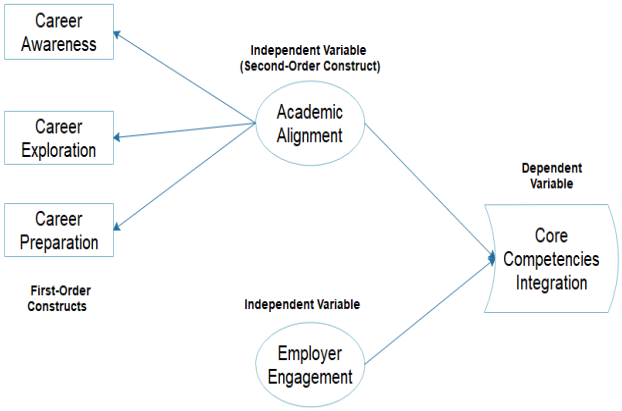
strategic frameworks and contexts. For example, employers may act as either 'clients' or 'co-producers' of public employment initiatives [26]. Employer engagement as a component of work-based learning has been considered as the latter in this study.

Based on the interrelated aspects of the aforementioned variables the conceptual framework shown in Figure 1 illustrates the harmonious relationship of these aspects for effective development of core competencies among students at technical colleges. Hence, the top of the framework represents the congruent relationship of the independent variables which give rise to the effective elements of core competencies development among students at technical colleges. Besides, the research objectives, research questions, and hypotheses in this investigation were structured according to these aspects.



[Fig.1: Conceptual Framework Underpinning the Study]

This study, therefore, explores the essential ingredients of academic alignment and employer engagement in work-based learning for the effective incorporation of core competencies among students at technical colleges. The study is inspired by the following objectives: i) determine work-based learning patterns suitable for enhancing the incorporation of core competencies among students at technical colleges; ii) determine the association among the work-based learning constructs that make up the structural framework; iii) determine the appropriate WBL framework for integrating core competencies among students at technical colleges. The following proposed hypotheses outline the anticipated relationship between the independent and dependent variables of the research: i) there is a significant relationship between academic alignment and the integration incorporation of core competencies among students at technical colleges; ii) there is a significant relationship between employer engagement and the incorporation of core competencies among students at technical colleges.

III. METHODOLOGY

A. Participants and Procedure

The focus group for this study comprised technical educators from technical colleges located in north-western Nigeria. Data gathering from these specified technical colleges took place during the academic term in September 2024. Technical educators were considered suitable respondents for this study due to their extensive experience as instructors who have received thorough training in learning theories, various instructional strategies, and the fundamental principles for applying various teaching methods. Consequently, they possess valuable expertise in identifying and offering meaningful learning experiences for students in practical work settings. Furthermore, technical educators are tasked with the organization, monitoring, and oversight of students participating in Work-Based Learning (WBL) programmes in Nigeria. The research sample was formed by 273 technical teachers from 22 government-run technical colleges based on the sample size determination table [27].

The mixed characteristics of the population required the implementation of a stratified random sampling method to select the 273 individuals for the research. The benefits of this method, which offers greater precision compared to a simple random sample of equivalent size, justified its use in this study [28]. After reviewing the completed questionnaires, 268 responses were kept after excluding those with missing data and other issues, resulting in a response rate of 98.2 percent. In guiding the research, three objectives were established, and two hypotheses were evaluated at a significance level of 0.05.

B. Measures

Before the 34-item standardized questionnaire was utilized to gather data from respondents, technical and vocational education experts carefully examined it for face and content validity. The three independent variables are: Academic alignment (AAT), which is a second-order construct in this study, has three sub-constructs (first-order constructs): career awareness activities (CAA), which are seven items; career exploration activities (CEA), which are six items; and career preparation activities (CPA), which are eight items. Employer engagement (EET), the second independent variable, contains six items, while core competencies integration (CCM), the dependent variable, has seven. The study used a 5-point Likert-type scale, with 1 being the lowest and 5 representing the highest. The internal accuracy of the questionnaire items was evaluated using Cronbach's method of alpha consistency, which yielded an adequate score of 0.87 [29]. The rationale behind using a survey study design is that information about the activities required to improve the development of core competencies through the specified essential components of work-based learning among technical college students was gathered via a questionnaire.

C. Analyzing of Data

Since it is essential for self-made instruments, the exploratory-factor analysis (EFA) procedure has been used to evaluate the construct validity of the recently established instruments of the study. Based on the commonality cut-off value (>0.5), the data collected from a sample of 295 technical instructors was adequate to conduct an exploratory-factor analysis [30]. With a result of 0.90, the Kaiser-Meyer-Olkin (KMO) test showed that the study's sampling was sufficient, while Bartlett's test (Chi-Square =18937.046, $p<0.05$) was ideal for a full

variable analysis [31]. The Scale was shown to be appropriate for exploratory-factor analysis based on the correlation matrix output ($p<0.05$) (Table I). The EFA was used in this investigation for two reasons: Plotting the suggested objects into five dimensions was its primary goal. Second, the principal components analysis (PCA), which is less difficult than factor analysis, was used to load each item onto each dimension [32].

Table 1: Exploratory Factor Analysis Output of the WBL Constructs

Rotated Component Matrix					
	Component				
	1	2	3	4	5
CPA8	.917				
CPA7	.907				
CPA1	.906				
CPA5	.900				
CPA4	.898				
CPA2	.895				
CPA3	.886				
CPA6	.879				
CAA1		.897			
CAA2		.891			
CAA6		.886			
CAA7		.877			
CAA5		.873			
CAA4		.855			
CAA3		.839			
CCM6			.862		
CCM1			.854		
CCM7			.852		
CCM3			.830		
CCM2			.826		
CCM5			.794		
CCM4			.676		
CEA6				.908	
CEA1				.885	
CEA3				.848	
CEA5				.828	
CEA2				.816	
CEA4				.793	
EET3					.878
EET5					.827
EET4					.815
EET6					.774
EET2					.763
EET1					.742

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

Subsequently, Analysis Moment of Structures (AMOS) version 23, a multivariate statistical analysis technique called structural equation modeling (SEM) was used to ascertain the structural links between the study's constructs [33]. AMOS employed several goodness-of-fit indexes to obtain Maximum Likelihood Estimation (MLE) from a covariance matrix. Throughout this review, a suggested set of goodness-of-fit indicators by [34] was employed to identify a suggested model. Several factors, including relative fit indices and an absolute misfit, were used to evaluate the fit model. The estimated root mean square error (RMSEA) and relative performance indices like the Tucker-Lewis index and the collective match indexes were among the real misfit indices: CFI, TLI, and IFI [35]. If the indices indicate that: i) the CMIN/df value is between 1 and 5; (ii) the CFI, IFI, and TLI indices are roughly 1.00; and (iii) the RMSEA index of 0.08 or below, it indicates a good error and is sufficient, then the model is deemed acceptable [36].

IV. FINDINGS / RESULTS

When the objects are in a different framework before the use of SEM, it is crucial to determine the measures of the structures, specifically the measure's unidimensionality [37]. The report gathered and used the findings of exploratory factor analysis (with varimax rotation) for the 34 items. All components had factor loadings of more than 0.5, which was considered good and statistically significant [38]. To categorize significant loadings, the following general guideline was used in this study: ±0.30 = minimum, ±0.40 = important, and ±0.50 = practically relevant [39]. Furthermore, the Kaiser-Meyer-Olkin (KMO) and Bartlett's test results for this study show a KMO value of 0.898 that is consistent with the expected KMO value of > 0.5, and Bartlett's test (Chi=18937.046, $p<0.05$) is suitable for a thorough examination of the variables [40]. To ascertain how independent variables affected the study's dependent variable, SEM was employed. SEM's ability to model multivariate relationships and measure the direct and indirect effects of test variables, as well as its provisions for taking a confirmatory methodology to data exploration by specifying the association between variables and its strategies for combining non-observed and observed variables, provide a logical basis for its adoption in this work [41].

A. Theorized Relationship Model among The Study's Constructs

In contrast to the structural model, the measurement model characterizes a crucial step necessary for effectively analyzing data with AMOS. Sani Isah et al. [42] regarded the measurement model as discriminating validity, which often denotes the construct's validity. To ensure the accuracy of the constructs in this situation, the items in each construct must be closely related to one another. This way, any redundant items in the constructs would be eliminated or restricted for the complex variables that were observed. Some essential components of the requirements for the quality of a fit structure are included in the estimate's description. To address the model identification issues that researchers face for each distinct measurement model throughout the CFA process, the pooled CFA approach was used for this analysis [43]. Specifically, the study utilized second-order confirmatory factor analysis. According to Awang, the coupled structures would increase the degree of independence of the model.

The study constructs linkages of academic alignment, employer engagement, and core competencies integration are defined by the theoretical original measurement model (pooled CFA model) in Figure 2. The original model estimates yielded the following values: Chi-Square = 517, Ratio = 3.873, P<.001, CFI =.921, GFI =.842, TLI =.914, RMSEA =.068. According to the results obtained, the model did not meet the conforming fit criterion goodness. Consequently, the model has to be improved to meet the requirements for the matching feature.

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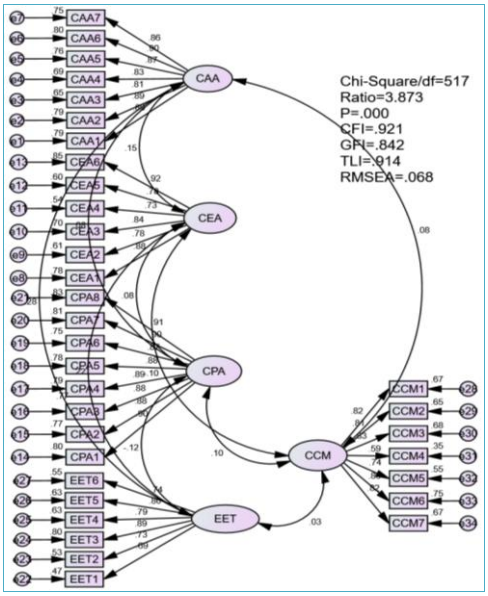
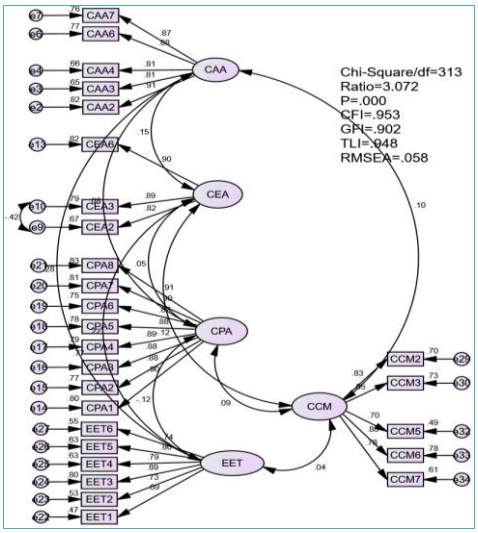


[Fig.2: Research Constructs' Theorized Original Measurement Model (Pooled CFA) of Relationship]

The model could be further adjusted to enhance its quality, according to the model's fit quality (Figure 2). After that, the model was examined to find variables with modification indexes (MI) greater than 15, factor loading less than 0.5, and error terms less than 25 for improvement procedures [44]. All variables had good factor loadings, according to the analysis; nevertheless, some had modification indices greater than 15. In this instance, the model's fitness indices significantly improved after variables CCA, CCA5, CEA, CEA1, CEA5, CCM1, and CCM6 were eliminated one after the other following the principle of deleting problematic variables with values of modification indices above 15 (rerunning the analysis after the deletion of any variable with high MI) [45]. The necessary fitness indices for the model were then attained after items CEA3 and CEA2 were found to have MI values greater than 15 and were set as free parameters. Therefore, the values shown in Figure 3 (Revised Pooled Measurement Model) are as follows: Chi-Square=313, Ratio=3.072, P<001, CFI=.953, GFI=.902, TLI=.948, RMSEA=.058; the requirements met in Figure 3 meet the corresponding suit criterion goodness since they are following the criteria established [46].



[Fig.3: Theorized Relationship among the Research Constructs Revised Measurement Model (Pooled CFA)]

To mitigate multicollinearity issues, the discriminating validity of the latent constructs was examined. The degree to which the measurement model structures are devoid of redundant indicators is demonstrated by discriminant validity. Moreover, a model is considered to achieve discriminating validity if the correlation between independent variables is less than 0.85 [47]. Awang et al. [48] state that to achieve discriminant validity for research constructs, the AVE values in the diagonal axis of the correlation matrix should be greater than those in the columns and rows. Consequently, the discriminating validity of those constructs has been attained, as indicated in Table II.

Table 2: Summary of Discriminant Validity Index for the Constructs

	CCM	EET	CPA	CEA	CAA
CCM	0.354				
EET	0.015	0.381			
CPA	0.048	-0.064	0.784		
CEA	-0.04	0.079	0.027	0.336	
CAA	0.038	0.114	0.047	0.059	0.426

B. Factors Loading, Composite Reliability, Average Variance Extracted, and Convergent Validity

The primary latent construct measurement error is caused by AVE, which is the metric that is analyzed to show the cumulative sum of the variance of the measured variable [49]. It is a measure of convergent validity, which is the extent to which a latent construct explains the variance of its indicators. It is computed as the average of each indicator's squared loadings related to a construct. Table 2 displays the CR and AVE of every reflective structure that was determined by carefully examining the data using exploratory factor analysis (EFA). The AVE for all reflective constructs ranges from 0.655 to 0.788, which is significantly higher than the recommended threshold of 0.50 [50]. Furthermore, the CR values of 0.904-0.967 for all reflective variables of the study are higher than the suggested value of 0.6 and are thus appropriate for exploratory research [51].

Convergent validity is said to have been attained when two different theoretical evaluations of the same idea show a positive relationship. The average of the squared loading values for all indicators linked to a particular latent construct, or AVE, must therefore be greater than 0.50 for a latent variable to exhibit convergent validity. Average Variance Extracted (AVE) statistics were used in this study to assess the convergent validity of the scale's items. If a construct's AVE is 0.5 or higher, it is said to exhibit convergent validity. Consequently, all of the study's variables had AVE values greater than 0.50, with Table 3 displaying values ranging from 0.655 to 0.788. This suggests that the goal of convergent validity has been accomplished. Besides, this criterion implies that a latent variable must explain at least half of the variation in its indicators [52]. According to their parameter estimations, the structures at p>0.5) are therefore statistically significant, according to the measurement model result shown in Table III.

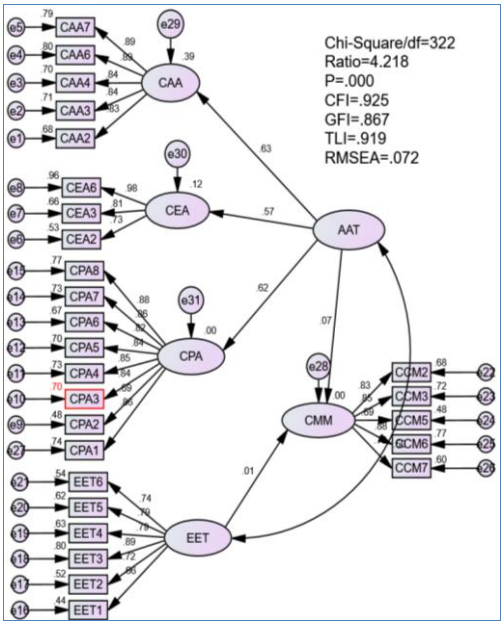
Table 3: CFA Results of the Measurement Model for First and Second-Order Constructs

Construct	Code	Item	Factor Loading	CR (>0.6)	AVE (> 0.5)
Academic Alignment	AAT	Career Awareness	0.63	0.917	0.787
		Career Exploration	0.57		
		Career Preparation	0.62		
Career Awareness	CAA2	The program is created by teachers and business partners to expand students' understanding by introducing a broad spectrum of jobs and professions.	0.91	0.932	0.73
	CAA3	The program is molded by teachers and business partners to expand students' understanding by introducing a broad spectrum of jobs and professions.	0.81		
	CAA4	The program gives details on various career options, the individuals within them, their roles, and the necessary education and training for these careers.	0.81		
	CAA6	Students get chances to think about what they've learned and start to figure out potential interests for further investigation.	0.88		
	CAA7	Students can all gain from career awareness activities, as long as these activities are customized to fit the specific grade level.	0.87		
Career Exploration	CEA2	These interactions are typically brief, lasting only one time or one day.	0.82	0.904	0.758
	CEA3	Learners actively participate in choosing the activities, tailored to their personal preferences.	0.89		
	CEA6	Learners are provided with chances for in-depth reflection to help in the refinement of their decisions regarding future schooling and vocational training.	0.90		
Career Preparation	CPA1	More in-depth and hands-on experiences at the preparation stage enhance interests developed during career awareness and exploration activities.	0.89	0.967	0.788
	CPA2	Students have one-on-one interactions with professionals in a particular field or sector for an extended duration.	0.88		
	CPA3	Students participate in activities that offer career growth benefits beyond academic achievements.	0.88		
	CPA4	Both students and employers gain from this experience.	0.88		
	CPA5	Employers assess the performance of students.	0.88		
	CPA6	The activities are linked to both academic and career/technical education programs.	0.87		
	CPA7	They are long enough and comprehensive to allow students to acquire specific knowledge and abilities.	0.90		
	CPA8	They are comprehensive enough to allow students to make effective choices about further education and career paths.	0.91		
Employer Engagement	EET1	Surveyed employers agreeing that relationships with educational institutions will lead to clear benefits to their enterprise	0.88	0.919	0.655

	EET2	Surveyed college leaders agreed that relationships with employers lead to clear benefits for educational institutions	0.73		
	EET3	Surveyed employers agreeing with the statement that it is easy to work with colleges – whether engaging directly with the school or college or through a broker	0.89		
	EET4	Surveyed colleges agree with the statement that it is easy to work with employers – whether engaging directly with the employer or through a broker	0.79		
	EET5	Employer Engagement enhances the formation of a professional identity	0.80		
	EET6	Students are helped to learn to find ways to follow their chosen career path through employer engagement	0.74		
Core Competencies Integration	CCM2	Critical thinking skills		0.905	0.657
	CCM3	Communication skills			
	CCM5	Interpersonal skills			
	CCM6	Teamwork skills			
	CCM7	Numerical skills			

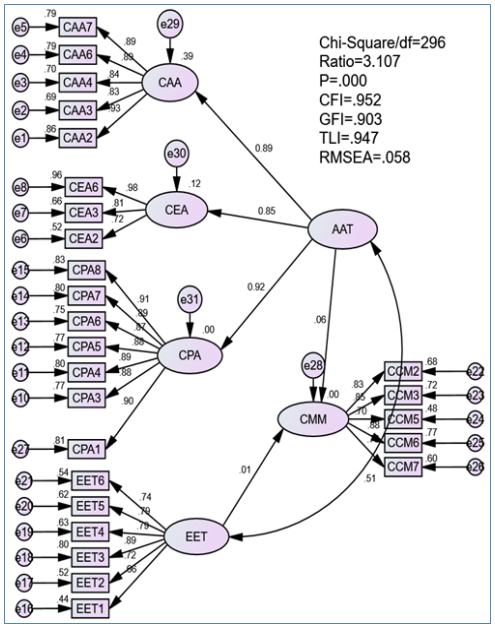
C. Proposed Model Of The Impact Of Independent Variables On The Dependent Variable

To establish the structural framework and clarify the relationship between the constructs, structural equation modelling techniques must be used. The basic structural analysis that shows how the independent variable affects the dependent variable is depicted in Figure 4. It shows the fit metrics for the latent variables in the model. However, the initial structural model achieved the following metrics after the models were found to be valid and reliable: Chi-Square/df=322, Ratio=4.218, P<0.001, CFI=.926, GFI=.867, TLI=.919 and RMSEA=.072. Since the model did not match the conformance standards set by the results, it became necessary to modify it in such a situation.



[Fig.4: Original Structural Model of Exogenous Variables' Effect on the Criterion Variable]

As shown in Figure 5, the research model has been updated. The factor loading for a freshly created scale must be at least 0.5 [53]. Consequently, the framework is adjusted following the SEM/AMOS recommendations to improve the indices' fit. It was essential to exclude items with modification indices (MI) greater than 15 to avoid multicollinearity problems. Therefore, item CPA2 was removed from this study since its MI value was higher than 15. After the modification, the updated framework produced the following outcomes: Chi-Square/df=296, Ratio=3.107, P<0.001, CFI=.952, GFI=.903, TLI=.947 and RMSEA=.058.



[Fig.5: Modified Structural Model of the Influence of the Exogenous Variables on the Criterion Variable]

V. HYPOTHESES TESTING

Standardized regression weights were chosen for this study because they provide a simpler description of the

relationships between the study's constructs; moreover, these weights are also employed in structural models to test or validate theories [54]. The regression coefficients and their significance throughout the structural model are disclosed and displayed in Table 4, which is consistent with the hypotheses presented at the start of this investigation.

We used SEM/AMOS version 23 to examine the interactions between the exogenous variables, academic alignment (AAT), employer engagement (EET), and core competencies integration (CCM), the endogenous variable to test the hypotheses. Hair et al. [55] suggested a t-value of 1.96 and a p-value of 0.05 as a general guideline for determining significant connections. The importance of the coefficients along the route from exogenous to endogenous factors was thus evaluated using this criterion.

According to the AMOS ratings in Table 4, which have a p-value less than 0.05 (p=.009), the route analysis results regarding hypothesis one indicate a significant link between Academic Alignment (AAT) and Core Competencies Integration (CCM) among students at technical colleges. This suggests that among technical college students, Academic Alignment (AAT) and Core Competencies Integration (CCM) are significantly positively correlated.

As demonstrated by the AMOS ratings in Table IV, the path analysis results for the second hypothesis showed a significant link between Employer Engagement (EET) and Core Competencies Integration (CCM) among Business Education students, with a p-value less than 0.05 (p=0.001). This shows that among technical college students, emotional support and basic competencies have a strong positive correlation.

Table IV: Standardized Weights of Regression and Their Significance in the Entire Path Model

			Estimate	S.E.	C.R.	P	Label
CCM	<--	AAT	.097	.037	2.596	0.009	Significant
CCM	<--	EET	0.131	0.065	11.43	0.001	Significant

VI. RESULT AND DISCUSSION

Based on the hypothesis being evaluated, the study established the relationship between the constructs and discovered how WBL activities affect technical college students' integration of core competencies. The results showed a significant positive correlation between academic alignment components of WBL and the integration of core competencies among students at technical colleges. The WBL programme is typically designed by educators and business partners to broaden students' knowledge by presenting a variety of occupations and professions; it allows students to have more in-depth and practical experiences; and it allows students to have direct conversations with professionals in a given field or job sector [56]. Through mentorship from classroom advisors and the workplace, students must be assisted in applying their academic, technical, and employability abilities in a work environment for core competencies to be integrated effectively.

This finding is consistent with [18] who state that academic alignment in work-based learning (WBL) is the process of coordinating classroom and workplace learning through career awareness, career exploration, and career preparation activities to help students develop employability and work readiness skills and to comprehend how school-based learning is applied to particular careers.

The data analysis revealed a strong positive correlation between the technical teachers' perception of employer engagement in WBL and the integration of core competencies among technical college students. Employer engagement in WBL gives students the chance to obtain practical experience, solve real-world challenges, collaborate with others, and work as a team to integrate essential competencies. Effective employer engagement has a positive impact on the aspirations and achievements of young people. According to [57] and [58], this achievement includes not only qualifications but also the development of attitudes, skills, and knowledge outside the qualification framework. To provide a variety of positive possibilities for the integration of pertinent skills, students require an enabling learning environment that is activity-based and fosters greater partnerships with employers.

Employer participation in WBL programs aims to meet the skills and competencies that students will need upon graduation. This finding is in line with [59] who claimed that governments have attempted to bridge the gap between the classroom and workplace by encouraging employers to engage in a variety of interactions with schools/colleges and their students, through work experience, career talks, mock interviews, CV workshops, mentoring, and workplace visits. Additionally, this outcome supports the findings of [60], who asserted that supportive learning environments, tools, and collaborations help students grow as individuals and involve colleagues in their own development and cultural production.

A. Limitations

There are risks and challenges associated with conducting research, but researchers need to manage these risks and limitations in a way that is objective and succinct without jeopardizing the efficacy and integrity of the study. However, every study has a specific goal at its core. At technical colleges, the Work-Based Learning (WBL) framework will serve as a guide for integrating students' core competencies. In essence, three important parties must work together to implement WBL experiences: the employer, the student, and the educational institution. However, the study only engaged the educational institutions (technical teachers) that are often in charge of making this collaboration possible. Besides, the study was restricted to technical instructors from public technical colleges in the North West area of Nigeria, which means the results might not apply to other institutions outside of this group. Other limitations of this research included the voluntary nature of participation.

VII. CONCLUSION

This study aimed to develop a work-based learning framework that would improve students' integration of core competencies in Nigerian technical colleges. CFA methods were used in the study to analyze the data. To make sure the analysis was unidimensional, all unnecessary components were eliminated or restricted during this process. All of the model's constructs had attained convergent validity,

internal consistency, and reliability at the study's end. Furthermore, based on the correlational values between the study's constructs, the discriminating validity of the model has been attained. The most correct structural model was revealed through the clarification and improvement of the nature of the relationships between the components. Based on the investigation through SEM, employer engagement and academic alignment are both essential for technical college students to successfully integrate their core competencies.

According to these results, work-based learning is a successful strategy for integrating core competencies among students at technical colleges. The study's findings will guide curriculum designers in updating technical college curricula to include the key components of work-based learning identified: academic alignment (which includes career awareness, exploration, and preparation) and employer engagement, which are critical for the successful integration of core competencies among students at technical colleges. Based on the study's outcomes: i) The government should create a supportive environment that encourages appropriate work-based learning activities to enhance the integration of core competencies; ii) To effectively develop core competencies, technical educators should employ the WBL identified elements in the implementation of the WBL programme at technical colleges.

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After aggregating input from all authors, I must verify the accuracy of the following information as the article's author.

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AUTHOR'S PROFILE

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Ponfa Mamfa Jantur was a graduate of the University of Jos, Plateau State Nigeria with a Bachelor of Science Education in Chemistry in 1992 and a Master of Science Education in Chemistry from the same University of Jos in 2005. He obtained his Doctor of Philosophy (Ph.D) from the Department of Science, Technology and Mathematics Education of Nasarawa State University Keffi, Nasarawa State Nigeria in 2016. He lectured with the Department of Chemistry, Federal College of Education Pankshin from 2006-2014 and transferred his services to the Department of Science and Technology Education, University of Jos, Plateau State Nigeria from 2014 to date. He is currently a Reader (Associate Professor) and Head of the Department of Science and Technology Education University of Jos Plateau State Nigeria. Dr. Ponfa Mamfa Jantur is a member of the Science Teachers Association of Nigeria (STAN) and the Chemical Society of Nigeria (CSN). His Research Interests in Chemistry Teaching, Chemistry Curriculum, and Pure Chemistry have been published in so many reputable journals.

Dr Yaki, A. A. is an Associate Professor in the department of science education, School of Science and Technology Education, Federal University of Technology Minna, Niger State. With a distinguished academic career spanning several years, Dr. Yaki has held various leadership positions, including Chairman and member of numerous committees within and outside the university community. A prolific scholar, Dr. Yaki has authored 48 peer-reviewed articles in esteemed local, national, and international journals. He has also contributed several book chapters on science education. His research expertise encompasses integrated STEM education, innovative instructional strategies, technology integration in science instruction, biology education, and 21st-century skills. Dr. Yaki's academic excellence has been recognized through his appointment as a Senior Research Fellow with the Connected Learning for STEM (CL4STEM) project, sponsored by the International Research Development Center Canada. He has participated in various workshops and conferences, both domestically and internationally, to stay abreast of the latest developments in his field. As an experienced science educationist, Dr. Yaki possesses a unique blend of theoretical and practical knowledge. He is well-versed in data analysis (quantitative and qualitative), research instrument development, and instructional module design. His exceptional interpersonal skills, coupled with his ability to work effectively under pressure, make him an invaluable asset to any academic or research team. Dr. Yaki is an active member of the Science Teachers Organization of Nigeria (STAN) and currently serves as the STAN Chairman for Niger State, Nigeria.

Gillian Gyeyok Ashio is a dedicated academic and researcher in the field of Technical Education and Construction Management. She is currently the Head of the Department of Technical Education at the Kaduna State College of Education, Gidan Waya, a position she has held since 2021. Before this, she worked as a lecturer in the same institution from 2006 to 2021, where she contributed significantly to teaching and supervising students. Ashio's academic background is extensive. She holds a Master of Engineering in Construction Management from Universiti Teknologi Malaysia (2020), a Postgraduate Diploma in Construction Management from Abubakar Tafawa Balewa University, Bauchi (2014), and a Postgraduate Diploma in Technical Education from the Federal University of Technology, Minna (2006). She also earned her Higher National Diploma in Architecture from Kaduna Polytechnic (2001) and a National Diploma in Architecture from Federal Polytechnic, Nasarawa (1998). A prolific researcher, Ashio has explored topics related to green construction materials, quality management practices in building construction, building collapse, and the effects of landscape on residential buildings. Her research contributions include an unpublished M.Eng. thesis on the use of green materials in construction and several journal articles, including a publication in the *International Journal of the Forum for African Women Educationalists* (FAWE) Nigeria. She has presented papers at various conferences, focusing on technical education, women empowerment, and vocational training for sustainable development in Nigeria. Ashio is a member of the Teachers Registration Council of Nigeria (TRCN) and has participated in numerous workshops and conferences to stay abreast of the latest trends in education and construction management. Her work as an external moderator for the West African Examinations Council (WAEC) involves setting examination questions and moderating technical subjects related to building construction. In addition to her academic pursuits, Ashio has a wealth of practical experience in architecture, having worked with several architectural firms, including Archimedes Associates and Ashaka Cement Plc, where she gained hands-on experience in architectural design and building maintenance. Her interests extend to reading, drawing, and listening to music, further demonstrating her commitment to both intellectual and creative growth.

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