

Developing Soft Skills through Project-Based Learning in Technical and Vocational Institutions

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Abstract: Soft skills have become critical in the preparation of employable graduates. The education system must, therefore, aim to ensure quality training for the production of employable graduates. Soft skills are personal abilities that one retains and can adequately be nurtured through active participation of students in the teaching and learning process. It is validated by researchers that the prevalent employability skills deficiencies have been one of the main causes of unemployment globally. Consequently, soft skills have all the potentials for equipping graduates with adequate employability skills. Thus, this study investigated the effect of project-based learning on the development of soft skills among technical students at technical and vocational colleges, Kaduna State, Nigeria Smart PLS software was used to test the developed model. As the sample size for this study was relatively small, the researchers were not certain to have normally distributed data. Subsequently, Smart PLS is appropriate for non-normally distributed data and therefore, it was used to simultaneously evaluate the measurement model, structural models and to confirm the convergent and discriminant validity of the measure. The study revealed that collaborative skills construct have a significant positive relationship with soft skills of technical students at technical and vocational colleges, while communication skills, initiative skills, and problem-solving skills have a positive insignificant relationship with soft skills of technical students at technical and vocational colleges. The findings of this study suggest that the curriculum of technical programs in Nigerian technical colleges need to be reviewed and geared more towards activity-based teaching and learning to enable technical students effectively develop soft skills for employment.

Keywords: Project-Based Learning, Soft Skills, Smart PLS, Technical and Vocational Education

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I. INTRODUCTION

Soft skills are interpersonal skills that have become critical to the development of graduates' employability as a result of the rapid changes in the 21st-century workplaces. Numerous studies have been carried out to provide credibility for the significance of interpersonal skills required in the world of work [1], [2]. Emphases are now, therefore, placed on teaching methods that encourage students' active involvement in the teaching-learning process for the gaining of skills in both specific academic qualification areas and those known as soft or non-technical skills. Therefore, developing the employability of students through the acquisition of interpersonal skills has continued to fascinate ample attention from diverse stakeholders in the educational sector and the labour market globally [3]. This change could be as a result of various grievances advanced by employers of labor, that current institutions hardly produce graduates with required interpersonal skills of the 21st-century workplace [4]. The need to minimize the existing skills gap requires increasing the 21st-century workforce with graduates that have skills for a global, competitive and technological workplace hence, teachers responsible for the teaching and preparing of potential technical college graduates should alter their teaching methods to conform to the 21st-century knowledge-based economy.

Keller, Parker & Chan [5] posited that it is not adequate for graduates to have only technical content knowledge and skills in their occupation to secure jobs and develop in the workplace; hence, a graduate should possess soft skills. In addition, Usoro & Ugbuanya [6] observed that the value of graduates of technical colleges in Nigeria is swiftly decreasing, particularly with regards to soft skills such as; problem-solving skills, communication skills, teamwork skills, collaborative skills, interpersonal skills, social, resource management skills, conceptual and analytical capacity. Dabalen & Oni [7] further observed that the lack of soft skills amongst graduates in Nigeria is more passionate in oral, teamwork, problem-solving, interpersonal skills, critical thinking, and written communications than in related technical skills. Therefore, teachers of technical colleges are admonished to adopt the essential teaching methods and mechanisms that will improve the effective achievement of the essential skills of both technical and soft skills among graduates.

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It is pertinent to note that TVE institutions are faced with the challenges of not responding to the ever-changing skills demands of the economy, which therefore requires the impartation of the knowledge of desired skills to prospective graduates as many graduates rarely possess the required skills to succeed in the workplace [9]. Consequently, companies are now having challenges with graduates' deficit in soft skills such as communications skills, problem-solving skills, teamwork skills, interpersonal skills, among others [10], [11]. Besides, employers of labor in Nigeria are not comfortable with graduates of technical colleges as they rarely get adequate' training. Therefore, they are relatively irrelevant without further training [12]. A study conducted by Abdulatif, Oke & Inti [13] shows that most graduates of technical colleges lack basic employability skills needed for the 21st-century knowledge-based economy.

By this development, technical colleges are therefore dared to rise up to the demands of employers regarding preparing students with soft skills in addition to technical knowledge and skills of their occupations. Therefore, teachers of Technical Colleges should adopt the necessary teaching methods and mechanisms that will enhance the effective acquisition of the required skills for the production of employable graduates with both technical and soft or generic skills. Instilling soft skills in students of technical colleges will lead to the production of employable graduates, thereby increasing their chances of being employed [8].

In addition, technical colleges in Nigeria are accused of placing slight or no efforts concerning soft skills development, and as a result, it is rarely possible for them to produce work-ready graduates [6]. In the same vein, Gibbon & Hachen [14] in their distinct studies observed that institutions of learning in Nigeria only stressed the learning of technical skills and undervalued the significance of soft (generic) skills. Some researchers attributed the problem to the existing curriculum contents which placed much emphasis on technical content knowledge at the disadvantage of soft skills [15]. This finding was buttressed by Lawrence & William [16] who observed that soft skills are not effectively taught at technical colleges in Nigeria. Additionally, some scholars are accusing teachers of embracing teacher-centered methods of teaching instead of learner-centered teaching methods [15], [17].

However, one of the effective approaches that will help to produce graduates with suitable employability skills is the idea to develop a project-based learning model to serve as a guide for developing soft skills among building technology students at the Technical Colleges in Nigeria. Project-Based Learning is an activity-based teaching method where students gain knowledge and skills by working for a lengthy period to examine and react to genuine, engaging, and complex question or challenge. The conventional model of inactively learning facts and rehearsing them out of context is out-dated and not efficient to adequately prepare students to succeed in today's world of work. Project-based learning emphasizes developing students in the areas of critical thinking, problem-solving skills, teamwork skills, communication skills, and interpersonal skills for gainful living in a knowledge-based society.

Several studies have testified to the fact that PjBL is

exceptionally efficient in the following common ways: incorporates knowledge with practice [18]; cultivates the capability to examine problems, categorise and obtain knowledge and skills required to deal with realistic situations [19]; prepare students to be insightful and evaluate their own and others' work, [22]. Project-based learning (PjBL), is a critical teaching method in the world of education which is often depicted as an outstanding substitute for inactive learning and rote memorization [21].

Project-based learning (PjBL) is known for creating a learning environment where projects stimulate learning, hence, it has been effectively used in several courses in the educational programs of diverse disciplines. Project-based learning is an active method of teaching in which students discover real-world challenges and concurrently developing co-curricular skills while working in small collaborative groups. Therefore, with project-based learning, students learn how to be initiative, be accountable and build a true attitude. Students learn to build their confidence, resolve problems, work in teams, and communicate concepts efficiently. Several researchers have emphasized the use of PjBL as it usually averts absenteeism and encourages prompt attendance of students, enhances cooperative learning skills, and improve students' achievement in schools [18]. The literature review revealed that no foremost study has been carried out in Nigeria to determine the potential of PjBL approach for effective development of students' generic skills at technical colleges. This gap established the justification for this study. Hence, this study aims to determine the effect of project-based learning on the development of soft skills among technical students in technical and vocational colleges, Kaduna State, Nigeria.

II. METHODOLOGY

The population for this research consists of teachers at technical colleges in Kaduna State, Nigeria. The sample of the study consists of 114 technical teachers, teachers of other aspects of education were not part of the sample. The survey questionnaires were distributed to the teachers by the researchers and retrieved after two weeks. A 5-point Likert scale of strongly agree (5), agree (4), not sure (3), agree (2) and strongly disagree (1) was adopted. Before carrying out the final survey, a pre-test was piloted to adjust the questionnaire and its wording appropriately. Structural Equation Modelling (SEM) is a second-generation multivariate statistical analysis measure that clusters the idea of factor analysis and multi regression analysis [24], hence it was adopted here to determine the appropriate factors by the exploratory and confirmatory factor analysis method.

As the sample size for this study was relatively small, the researchers were not certain to have normally distributed data. Consequently, Smart PLS is appropriate for non-normally distributed data therefore, it was adopted for this study. Statistical Package for Social Sciences (SPSS) version 23 was used initially and later used Smart PLS version 3 to simultaneously evaluate the measurement model,

structural models and to confirm the convergent and discriminant validity of the measure.

III. DATA ANALYSIS

Preceding to SEM process, evaluating the measures of the constructs, principally, the one-dimensionality of the scale is critical in order to determine if the items come together to distinct constructs [25]. The results of exploratory factor analysis (EFA) of the variables for this study were obtained and utilized: collaborative skills, problem-solving skills, teamwork skills, communication skills, initiative skills, information and communication technology skills, and resource management skills as independent variables and soft skills as the dependent variable. The principal component analysis (EFA) with varimax normalized rotation was applied to the 48 items of the study. Consequently, the factor loading value of each of the 48 items was above 0.5, therefore, they are considered statistically significant and suitable. According to Hair et al., [24] these loadings are categorized by means of another rule of thumb as ± 0.30 =minimal, ± 0.40 =important, and ± 0.50 =practically significant. Additionally, validity of the data and sampling consistency using Kaiser-Meyer-Olkin (KMO) and Bartlett's test portrayed the value of KMO to be 0.789 which surpass the suggested KMO value of > 0.5 and Bartlett's test ($\chi^2=9596.013, p < 0.05$), and therefore, was appropriate to continue with the factor analysis [26].

A. Measurement Model

Precisely, a path mode is normally evaluated at three levels: the worth of the measurement model; the value of the structural model and the individual structural regression equation used in the structural model. The worth of the measurement model was verified through evaluating the separate items and measure reliability, then next, by assessing the convergent and discriminant validity of constructs' measures. Firstly the associations were shown among the constructs of project-based learning and soft skills. The measurement model of Project-based learning on technical students' soft skills was defined by eight individual factors: collaborative skills, problem-solving skills, teamwork skills, communication skills, initiative skills, information and communication technology skills, and resource management skills as independent variables and soft skills as the dependent variable. Subsequently, the PLS algorithm was applied and the resultant relationships, coefficients, and values of loadings are presented in Figure 1.

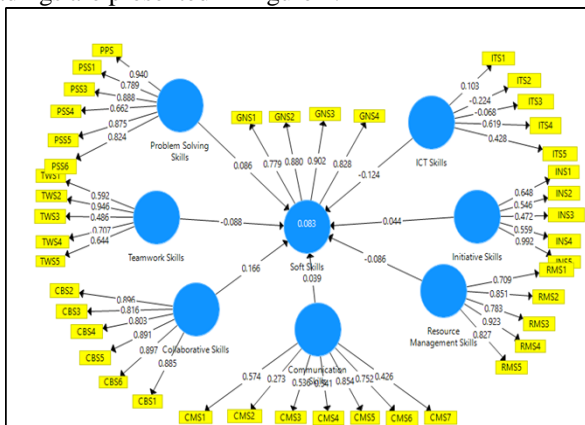


Figure 1: Initial Path Model of Project-Based Learning

Learning on Technical Students' Soft Skills

The Factors were measured with thirty-eight (38) items. In the process of validating the model, item TWS3 was dropped from teamwork skills factor, INS3 was dropped from initiative skills factor, items ITS2 and ITS3 were dropped from information and communication technology skills factor, while item CMS2 was dropped from communication skills factor of the model. The items that were dropped was as a result of their low factor loading in order to achieve the composite reliability and average variance extracted. As shown in Figure 2.

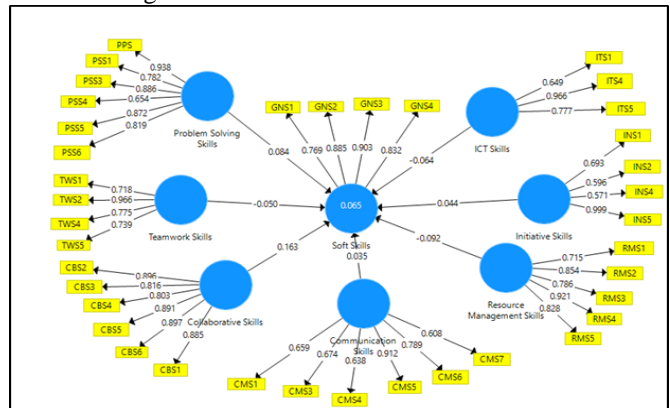


Figure 2: Final Path Model of Project-Based Learning on Technical Students' Soft Skills

B. Composite Reliability

The Project-Based Learning reflective measurement model's Composite reliability (internal consistency) on soft skills teaching and learning of technical students was computed as seen in Figure 1 and Table 1, the satisfactory range for this statistics is typically from 0 to 1, additionally, values greater than 0.6 are considered appropriate in exploratory studies [24]. However, analyzing the composite reliability, the model had forty-two (42) items made out of nine (9) Factors; problem-solving skills, teamwork skills, communication skills, personal skills, initiative skills, information and communication technology skills, and resource management skills as independent (exogenous) variables and soft skills as the dependent (endogenous) variable. The measurement model, therefore, has appropriate internal consistency reliability with values ranging from 0.816 to 0.947 which exceeds the threshold value of 0.6. This measure is chosen over Cronbach's alpha since it explains the superior estimate of the variance shared by the indicators and besides, it uses the item loadings found within the homological system [24]. Consequently, the result signifies that the items of the constructs have acceptable internal consistency reliability (Table 1).

C. Convergent Validity

When two theoretical measures of the same construct are positively correlated then convergent validity is established [27]. The convergent validity of the scale items in this study was measured by the use of the Average Variance Extracted (AVE) statistics. According to Alkwalani & Abdullah [28], the recommended threshold of Average Variance Extracted (AVE) for each construct must be above 0.50.

Developing Soft Skills through Project-Based Learning in Technical and Vocational Institutions

Grounded on this requirement, the creation of a latent variable ought to explain at least 50% of the variance in each of its indicators [24]. Therefore, the AVE which is the mean of the square loading values of all the indicators related with a certain latent construct should be greater than 0.50 in order for a latent variable to have convergent validity. Hence, all the AVE of the project-based learning constructs on soft skills of technical students at technical colleges were > 0.5 ranging from 0.520 to 0.749 as indicated in Table 1. This, therefore, signifies that convergent validity is accomplished.

Table 1: Reliability and validity of project-based learning constructs on the soft skills of technical students at technical colleges.

	Composite Reliability	Average Variance Extracted (AVE)
Collaborative Skills	0.947	0.749
Communication Skills	0.864	0.520
ICT Skills	0.846	0.653
Initiative Skills	0.816	0.540
Problem Solving Skills	0.929	0.689
Resource Management Skills	0.913	0.678
Soft Skills	0.911	0.720
Teamwork Skills	0.879	0.649

D. Discriminant Validity

The level to which the measure is unique and not just a duplication of other variables is known as discriminant validity. Generally, this happens when two measurement scales obviously measuring diverse constructs which share a low correlation. The discriminant validity assessment is intended to ensure that a reflective construct has the optimal relationship with its own indicators, for example, when compared with any other construct in the PLS path model [24]. Nevertheless, the current study adopts the use of Heterotrit-Monotrait ratio of correlation (HTMT) as suggested by Henseler et al., [29] to evaluate the discriminant validity of the project-based learning constructs on soft skills of technical students at technical and vocational colleges. Heterotrit-Monotrait ratio is used in this study as a criterion to evaluate the discriminant validity where it is usually concluded that there is lack of discriminant validity if the value of the HTMT is higher than the threshold of 0.90, [29]. Table 2 shows the discriminant validity of project-based learning constructs on the soft skills of technical students at technical and vocational colleges with HTMT value < 0.90. Consequently, the values of < 0.90 as having discriminant validity in this study is, therefore, achieved.

Table 2: Discriminant validity of project-based learning constructs for soft skills of technical students at technical colleges.

	Collaborative Skills	Communication Skills	ICT Skills	Initiative Skills	Problem Solving Skills	Resource Management Skills	Soft Skills	Teamwork Skills
Collaborative Skills								
Communication Skills	0.226							
ICT Skills	0.079	0.668						
Initiative Skills	0.052	0.103	0.202					
Problem Solving Skills	0.226	0.104	0.086	0.134				
Resource Management Skills	0.085	0.13	0.152	0.162	0.116			
Soft Skills	0.19	0.052	0.075	0.062	0.072	0.102		
Teamwork Skills	0.067	0.118	0.32	0.105	0.226	0.328	0.049	

A. Structural Model Assessment

At this stage, we assessed the structural model (inner model) for exploring the hypothesized relationships between constructs in the project-based learning for soft skills of technical students at technical and vocational colleges. The path coefficients of the relationships were first considered and verified in order to define their significance through t-values established from the bootstrapping method. Likewise, the coefficient of determination (R^2) which quantify the model's predictive correctness was found to be 0.065 for the independent variable; signifying that the predictive accuracy of the model is reasonable. According to Cohen [30], R^2 values of 0.26, 0.13 and 0.02 as substantial, moderate, and weak respectively for endogenous latent variables.

On the other hand, the determination of effect size (f^2) was made in order to find out the practical impact of each specific independent latent construct on the dependent latent construct [30]. Cohen suggested that the effect size is large when f^2 is 0.35, medium when f^2 is 0.15, and small when f^2 is 0.03. As shown in Table 2 from the SEM calculations, the effect sizes of 0.23, and 0.008 for communication skills and problem-based learning respectively signify small effect on soft skills of technical students at technical colleges. The significance of the regression weights was analyzed by running 5000 bootstrapped samples from the 114 cases.

IV. HYPOTHESES TESTING

The Structural equation modeling was employed using Smart-PLS3 (SEM-PLS3) in order to determine the hypothesized relationship between the exogenous variable (project-based learning) and the endogenous variable (soft skills of technical students). Byrne, Flood, & Willis (2004) suggested the standard decision rule for a relationship between constructs to be significant as: (t-value ≥ 1.96 and p-value is ≤ 0.05). This was adopted here to determine the significance of the path coefficient between independent variables and dependent variable based on the obtained data. The result of the path analysis (Table 3) shows that collaborative skills construct have a significant direct positive relationship with the soft skills of technical students at technical and vocational colleges. The relationship is positive with path coefficients



($\beta = 0.163, t \geq \pm 1.96$).

While Communication skills, initiative skills, and problem-solving skills have a positive insignificant relationship with soft skills of technical students at technical and vocational colleges. The relationship is positive with path coefficients ($\beta = 0.035, t \geq \pm 1.96$), ($\beta = 0.044, t \geq \pm 1.96$) and ($\beta = 0.084, t \geq \pm 1.96$) respectively. Nevertheless, ICT skills, resource management skills, teamwork skills both have an insignificant negative relationship with the soft skills of technical students at technical and vocational colleges. The relationship is insignificantly negative with path coefficients ($\beta = -0.064, t \geq \pm 1.96$), ($\beta = -0.092, t \geq \pm 1.96$) and ($\beta = -0.050, t \geq \pm 1.96$) respectively. Hence, project-based learning accounts for 0.065% on soft skills of technical students at technical and vocational colleges.

Table 3: T- Statistics and P-Values of project-based learning on the soft skills of technical students at technical colleges.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Collaborative Skills -> Soft Skills	0.163	0.183	0.063	2.584	0.010
Communication Skills -> Soft Skills	0.035	-0.007	0.108	0.323	0.747
ICT Skills -> Soft Skills	-0.064	-0.051	0.103	0.621	0.535
Initiative Skills -> Soft Skills	0.044	0.039	0.100	0.438	0.662
Problem Solving Skills -> Soft Skills	0.084	0.016	0.136	0.619	0.536
Resource Management Skills -> Soft Skills	-0.092	-0.093	0.107	0.864	0.388
Teamwork Skills -> Soft Skills	-0.050	-0.018	0.119	0.416	0.678

V. FINDINGS AND DISCUSSION

The effect of the independent variables on the dependent variable was determined from the hypotheses tested. The collaborative skills construct have a significant positive relationship with soft skills of technical students at technical and vocational colleges, while communication skills, initiative skills, and problem-solving skills have a positive insignificant relationship with soft skills of technical students at technical and vocational colleges. According to Samat [32], communication skills are significantly linked to the development of soft skills. However, ICT skills, resource management skills, teamwork skills both have an insignificant negative relationship with the soft skills of technical students at technical and vocational colleges. Therefore, the findings of this study are in line with the outcome of the earlier study by Othman, M. Hamzah, T. Singh, Abdul Wahab, & Ismail [8] which included collaborative and problem-solving skills in their list of top ten skills that enhance the acquisition of soft skills. Basically, the findings of this study signified that the application of project-based learning would enhance the development of soft skills among technical student at technical colleges.

VI. CONCLUSION

The purpose of this study was to examine the structural relationship among project-based learning elements and soft skills of technical students at technical and vocational colleges by exploring the hypothesized model i.e. “project-based learning model for the development of soft

skills at technical colleges”. Validity and reliability of the procedures engaged in this study were observed and the results established good convergent and discriminant validities.

Project-based learning is an active teaching method in which students discover real-world challenges while working in small collaborative groups however, simultaneously developing co-curricular skills. Thus, students learn how to be initiative with project-based learning, be accountable and build a true attitude. Students learn to build trust, solve problems, work in teams, and effectively communicate concepts. Therefore, the study determined the effect of project-based learning on soft skill development among technical students in technical and vocational colleges.

Consequently, the findings of this study suggest that the curriculum of technical programs in Nigerian technical colleges need to be reviewed and geared more towards activity-based teaching and learning to enable technical students to effectively develop soft skills for employment. In addition, technical teachers should engage activity-based teaching-learning methods in order to effectively foster soft skills among technical students at technical colleges.

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