# Interconnections Between Essential Elements and Fundamental Components of Blended Learning for Integration in Automobile Technology

**Abubakar Shuaibu Chiroma, Mohd Safarin Nordin, V. V. Apugu**

*Abstract: The study implored survey research design method data collection the study also implored descriptive statistics and structural equation modelling (SEM) to analyse the data collected with t-test p<0.05 with a population of 574. The finding of the study was presented based on the stated objective and research questions. In developing the framework, six blended learning element was considered which include Online elements, Teaching and learning, Leadership element, Professional development, Content, Learning outcome element. However, upon collection and analysis of the data, the study shows that the blended learning integration in to our tertiary institution is a welcome idea as the parameters or variables obtained by (SEM) is Within the acceptable limits. Therefore, it is recommended for both technology lecturers and students.*

*Index Terms: About four key words or phrases in alphabetical order, separated by commas.*

## I. INTRODUCTION

Blended learning has been defined as a way to provide opportunities in a number of ways by a number of people but the common definition has always been unclear (Graham, 2006; Oliver &Trigwell, 2005). In essence, blended learning does not involve blending the educational objectives such as cognitive, psychomotor and affective domains, but rather it means the blending of online teaching approach with the face to face teaching in school setting. To this end, in experience of mixed learning, there found only few studies that have evidences of the ways how student approach towards learning technology may fluctuate qualitatively: few adopt approaches towards technologies without looking at the educational objective and utilize them to deepen and broaden their understandings of subject matters they study, whereas others adopt surface approach towards technologies as well as try to limit their use of technology without considering the objectives (Aubrey & Dahl, 2014).

In line with the above, blended learning approaches are described in various ways in the literature, however, they are generally understood as combination of face-to-face and online learning opportunities which are build on the strengths of each other's learning modules (Ellis & Bliuc,

2015). Additionally, the combination of various pedagogical approaches and the combination of face to face and online instruction seems to provide opportunity to both teachers and students to use synchronous and asynchronous e-learning tool, discussion groups, podcast and self-assessment tool to support traditional teaching methodsuch as lecture, discussion, seminar or tutorials (Kashefi, Ismail, & Yusof, 2012). However, blended skill on the other hand is a form of acquiring or obtaining skill in engineering, science or technology as an important element in communication among engineers, scientists, technologists and other professionals in educational institutions apart from having a wide range of discipline to communicate, merging the theory and practicalskills to form a single skill called blended learning skills. This merger often can be done by the use of information and communication technology (ICT) and hence that students are introduced to the engineering and technology courses to prepare them with basic skills and knowledge, especially via ICT.

More so, the emphasis for both students and teachers in many developing and developed countries are to make them understand the application of computer in information technology and in ICT technology that translates effectiveness and efficiency in business and people management. In Nigeria, the main objective of technology education is to adequately prepare students for world of work which is nowadays based on computer literacy. One of the core courses in the Nigerian technology education programme at tertiary institutions that requires computer application is Automobile technology education. For this reason, there is need for integrating blended learning in tertiary institutions for Automobile technology to transform the students' ability to blend the theory and the practical skills in to a single skill called blended learning skill.However, Automobile students face the difficulties of applying the theory learnt in the classroom in to practical work in the workshop where it requires the student to interpret the knowledge learnt in the classroom. In today's complex world of rapid technology change and information overflow, automobile technologists are faced with many issues, theories and concepts which they need to know as how to do it before they are able to know how to diagnose faults (Kihoza, Zlotnikova, Bada, &Kalegele, 2016).

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The following research questions generated from the research objectives were addressed in this study, thus;

a) What are the interconnections between the significant areas of essential elements and fundamental components of blended learning which are regarded as suitable for integration in automobile technology program at tertiary institutions in Nigeria?

b) What is the nature of the framework based on the identified essential elements and fundamental components of blended learning which are considered suitable for integration in automobile technology program at tertiary institutions in Nigeria?

## II. MATERIAL AND METHODS

This research employed survey research design, the study adopted a descriptive survey research design. Musa, (2013), defined descriptive survey as a study that entails the systematic collection and presentation of data to give a clear picture of a particular situation. According to (Gallagher, Dobrosielski-Vergona, Wingard, & Williams, 2005) and (Ahmed et al., 2013) survey is a method of data collection using questionnaires to collect data from a sample that has been selected to represent a population to which the findings of the study can be generalized. The design was considered suitable since it allows the researcher to collect a sufficient number of responses to gain a fairly comprehensive view of the purpose of the study. In line with this method, the quantitative data for this study was collected by the use of questionnaire.

*Participants*

The participants in the study comprises of 571 (50 full-time automobile technology education teachers/instructors and 521 students) from ModibboAdama University of Technology (MAUTECH), Yola, AbubakarTafawaBalewa University (ATBU), Bauchi, Federal College of Education (Technical), Gombe, Federal College of Education (Technical), Potiskum, College of Education (COE) Hong, College of Education (COE), Zing, AbubakarTatari Ali Polytechnic (ATAP), Bauchi and Adamawa State Polytechnic Yola (ASPY). Stratified random sampling procedure was used in selecting the sample for this study.

*Instrument*

The instrument used for data collection was a structured questionnaire. Questionnaire is the most common instrument used in collecting quantitative data. The questionnaire for this study is categorized into two sections. Section I captured required demographic information of the respondents and section II captured vital information on technology education and blended learning under eight headings namely: technology elements measured using five items, online elements measured using twelve items, teaching and learning elements measured using five elements, professional development measured using ten items, content elements measured using six items, operational elements measured using five items, leadership elements measured using six items and learning outcome measured using four items as presented in appendix A. All the items in section II were measured using five point likert scale as follows: SA= Strongly Agree (5); A= Agree (4); M= Moderately agreed (3); D= Disagree (2); SD= Strongly Disagree (1).

*Validity of the quantitative instrument*

Validity is a fundamental requirement in research. It assesses the extent to which items measure a particular phenomenon. In modelling terms, validity is the capacity of items on the instrument to measure the underlying construct (Awang, 2014). In research, validity issues are minimal when items used in the instruments are obtained from referenced sources. Since this study involves modelling, three forms of validity namely: discriminant, construct and convergent validities were assessed. Discriminant validity is a form of validity that assesses measures and ensure that they are not much associated with measures of other constructs under study as recommended by (Zikmund, Babin, Carr, & Griffin, 2013).

Reliability of the Quantitative Instrument

This study assessed the reliability of the quantitative items using Cronbach's Alpha via pilot study. The items measuring the eight factors under study were assed in line with the recommendation of (Hair, Black, Babin, & Anderson, 2014) states that, instrument is said to be reliable when it is able to achieve a minimum reliability coefficient of 0.6 and above.

Quantitative Data Analysis

Analysis is an integral process of the research cycle. Data collected using both questionnaire and interview were subjected to both quantitative and qualitative analyses respectively. The quantitative data collected from questionnaire underwent several statistical analyses namely: descriptive, normality test, Confirmatory Factor Analysis (CFA). Under the Confirmatory Factor Analysis, the measurement models of the eight factors, pooled measurement model and the structural model were all assessed using some set of indicators. The analyses involved the use of two statistical packages namely: Statistical Package for Social Sciences (SPSS 20.0) and AMOS software.

## III. EDITORIAL POLICY

The result of this study as discuss in the proceeding section of materials and methodology is presented in the form of inferential statistics using structural equation modelling. The findings are presented based on research question in the following order

Research Question 1: What are the interconnections between the significant areas of essential elements and fundamental components of blended learning regarded suitable for integration in automobile technology program at tertiary institutions in Nigeria?

The final re-specified model has achieved the requirements of fitness indices. Therefore, the model is presented in Figure 4.17. To show the interconnection between the significant areas of the essential element and

the fundamental components suitable for integration in automobile technology program at our tertiary institutions. The final re-specified model showing the interconnection between the essential element.

*Measurement Model*

Since all the individual measurement models of the eight constructs under study have achieved the requirements of factor loadings. The next stage of analysis is to conduct the Confirmatory Factor Analysis (CFA) for pooled measurement model comprising of all the individual measurement models of the study. This was done in order to determine the extent of the relationship between the constructs. The pooled measurement model of the study is presented in Figure 4.18.

The final re-specified model has achieved the requirements of fitness indices. Therefore, the model is presented in Figure 4.19.
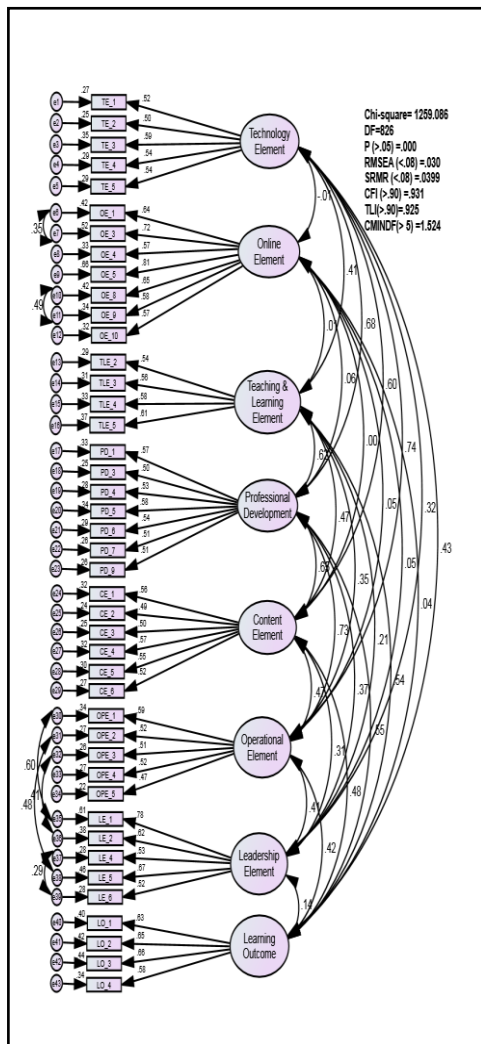


This stage of analysis focuses on the correlation between constructs and fitness indices for the purpose of validating the pooled measurement model. Based on the model presented in Figure 4.19 above, the relationship between the eight constructs under study is presented in Table 4.39. It is interesting that the correlation between the constructs is not above the maximum acceptable limit of 0.80. This signifies that the eight constructs under study are related and not the same.

Findings of the study showed that the pooled measurement model indicated that, it was able to achieve the requirement of the three different categories of fitness indices: **absolute fit**, **incremental fit,** and **parsimonious fit**. The measurement model was able to achieve a Chi-square value of 1259.086 with a degree of freedom of 826 at p=.000. The Eyes indices used in measuring the absolute fit are: Standardized Root Mean Square Residual (SRMR) having a value of .0399 and Root Mean Square Error of Approximation (RMSEA) having achieved a value of .030. These are all within the acceptable range required. Table 4.40 below shows the results of the fitness indices from the initial to the final model that is fit with the data as illustrated in the table below.

The second category of fitness indices used in assessing the pooled measurement model is the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI). The model has achieved a CFI value of .931 and TLI value of .925. These values are all beyond the minimum acceptable value of .90.

Finally, measures of parsimonious fit used in assessing the model are Parsimony Ratio (PRATIO) and Parsimonious Comparative Fit Index (PCFI). PRATIO has achieved a value of .915, while PNFI has achieved a value of .852. These values are close to 1.0 as there is no specific cut-off point for them. Therefore, the measurement model of Blended Learning is considered fit, since all the categories of the fitness indices have achieved the requirements. As summarized in the table below.

*Structural Model*
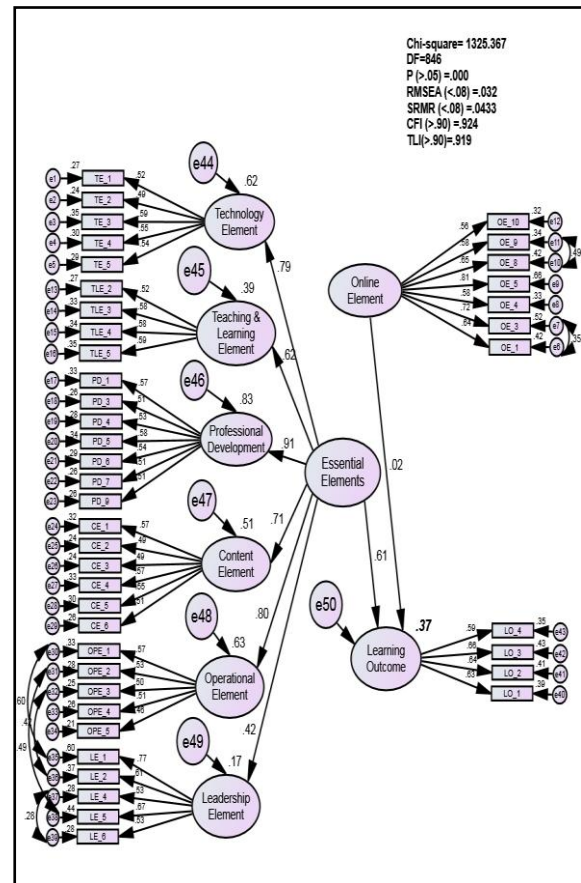
At the initial stage in this section, the fitness indices of the structural model of blended learning were assessed using the three categories of fitness indices used in assessing the pooled measurement model in the earlier section. The structural model of blended learning has achieved a Chi-Square value of 1325.367 with a degree of freedom of 846 and p-value of .000. The Standardized Root Mean Square Residual (SRMR) was able to achieve an acceptable value of .0433 and the Root Mean Square Error of Approximation (RMSEA) has also achieved an acceptable value of .032. With these results, it can be concluded that the structural model of blended learning has achieved absolute fit indices.

Secondly, Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) are the two incremental fit indices used in assessing the structural model of blended learning. Based on the results of the model, CFI and TLI have achieved acceptable values of .924 and .919 respectively, thereby indicating the fitness of the model with the data.

The third category of fitness indices used in assessing the blended learning model is Parsimonious Ratio (PRATIO) and Parsimonious Comparative Index (PCFI), which are Parsimonious fit indices. Based on the recommendation of literature, these indices should be close to 1. PRATIO and PCFI have achieved values of .937 and .866 respectively. Both values are close to 1 as recommended by literature.

Table 4.43 presents the modification indices of the blended learning model. Based on the findings in the Table, the model is fitted with the data, because the MI values indicate no need for modification. Many institutions that deliver some form of online instruction transitioned all of its face-to-face classes to blended delivery, using a model tailored to the needs of adult learners. This article provides research supporting the ways that blended learning principles align with key principles of andragogy. The article provides insight into Brandman's implementation of blended learning across the institution to enhance effective learning on an accelerated schedule, apply sound assessment in a distributed system, and successfully integrate online tools into classes for adults' learners. In addition, the article describes the university's planning, training, and implementation processes for transitioning to a blended format.

Based on the identified essential elements and fundamental components, The perception of students and lectures on the essential element and the fundamental componentsuitable for integration for automobile teaching and learning framework is here by presented by the result of absolute and incremental fitness indexes below Discriminant validity indexThis include:

A Fitness indices
(i)RMSEA=.032
(ii)SRMR =.0433
(iii)CFI=.924
(iv)TLI=.919

BSquare Multiple Correlation ($R^2$ =.37) as presented by the model which shows the relationship or effect of the essential element suitable for integration into the teaching and learning automobile technology education programme on the learning outcome. The discriminant Validity Index Summary for all Constructs is presented in Table 4.41.

**Research Question 2:** What is the nature of the framework based on the identified essential elements and fundamental components of blended learning considered suitable for integration in automobile technology program at tertiary institutions in Nigeria?
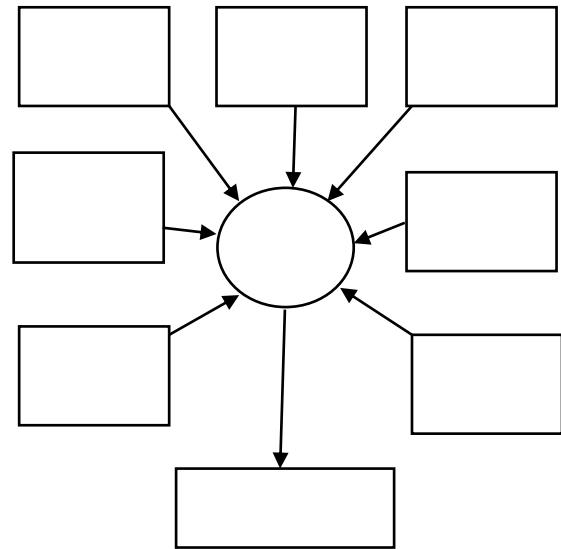


From the result of the research what constitute the framework for the study are technology, content, operation, teaching & learning, leadership, professional development, online and expected learning outcome. Technology in blended learning instructional programme is an ability to enhance learning. From the result of the quality of instruction or teaching and learning in our institutions through the use of technology. This general the role of Blended learninginstructional programme cannot be over emphasizedas it plays a significant role in Enhancingsecondary education which iscrucial to the production of efficient human capital for every nation (Yusuf, 2005a).Thesenecessity for blended learningfor Nigerian institution especially in the technology-lead millennia, is importantfor thesurvival ofIndustrialtraining and re-training of s their workers to cultivate andenhance the expertise in their various field of callingit is on this background that the following empirical studies was done with aim of drawing both teachers and studentsclose to reality, job and marketwhich in turn improve the quality of instruction and life.

## IV.    CONCLUSIONS AND RECOMMENDATIONS

The framework for this study include the following essential element and with their effect on each element technology, teaching and learning, professional development Content, Operation and leadership. While online element as a fundamental component showing their significance on the learning outcome is .61 and (R2.37) respectively which are above the threshold value of 0.83 effective and .26 significances on the learning outcome. Furthermore, the framework for this study is represented by ecosystem it is implemented at either global, regional or local with long and

short-term goals. The framework indirect and direct drivers of changes. Under indirect driver of blended learning, it consists of an element and fundamental components while under direct driver of blended learning the study used an element such as Teaching, Technology, Content, Operation, Professional Development, Leadership, Face to face and Online. This element and the fundamental frameworks provide services through employment such as job creation, competency, collaboration, social needs and graduate with employability skill towards attending to human wellbeing like poverty reduction, freedom of choice, social security and basic maternal for good Life.

Building on the above, this result with a significant effect or relationship underscore the importance of online learning which according to I Elian Allen et all (2007) focused primarily on the course content delivered online including face to face which is from zero to 29 % of the course content delivered online. This category of online include traditional and web facilitated course while the remaining 30—80% of the course content are delivered online as blended learning or hybrids. I Elian further stated that online enrolment has continue to grow at rate far in excess of the total higher education student population. About 3.5 million students at least taking one online courses and 9.7percent growth rate for online enrolment far exceeds the 1.5percent growth of the overall higher education students' populations Above all in US at least 20% of the student are taking course one online course in 200. suitable for integration in teaching and learning automobile are those that developed made up the framework students and lecturers stressed that blended learning if fully incorporated and implemented yields extended reach for both instructors and students there by enabling automobile blended skills to be acquired.

This is in line with the recommendation of Moskal, Dziuban, and Hartman (2013) that in BL institution-centered goals at times include the more effective use of resources in the classrooms as well as extending campus outreach. Also, Yilmaz (2016) recommended that BL contents could be developed by ensuring that all members of the class could be reached by keeping structure low; that is by being flexible in making the content. Additionally, Brew (2008) found that it is strongly emphasized that the rationale behind using distance learning network is to reach would-be students.

The significance of areas of essential elements and fundamental components of blended learning suitable for integration in automobile technology program: based on CFA, squared multiple correlations performance is ($R2$ 0.37) signifying that it is high and suitable for adoption in blended learning framework, online courses provide the exclusive experiences of many learners living in a progressively worldwide economy and therefore could be an effective medium for teaching as it cannot be underscored in teaching safety in automobile technology in our institutions . In concise with this finding also, Graham, Woodfield, and Harrison (2013) that though in face-to-face learning students are not able to use the increased flexibility in planning their schedules with BL online learning take charge of that disadvantage.

The interconnections between the significant areas of essential elements and fundamental components wasdetermined using CFA in which fitness model was achieved by three different categories of fitness indices namely: absolute fit, incremental fit, and parsimonious fit. The measurement model was able to achieve a Chi-square value of 1259.086 with a degree of freedom of 826 at p-.000. The indices used in measuring the absolute fit are: Standardized Root Mean Square Residual (SRMR) having a value of .0399 and Root Mean Square Error of Approximation (RMSEA) having achieved a value of .030. All showing high relationship between the construct there by meeting the requirement of the parametric analysis

The nature of the framework based on the identified essential elements and fundamental components suitable for integration in automobile technology program. Based on the seven essential elements of BL and one fundamental component identified for BL framework for teaching and learning automobile, a number of items were identified under each of the seven essential elements and components which constituted the final framework. This framework is essential for training automobile students for hands on careers as either mechanic or auto repair professional handle essential information, on safety, brake system, engine repair, heating and cooling system, and Automobile transmission as some of the topics cannot though practically it can only be symbolised However, items under each of the two indicators were established independently in relation to their constructs BL essential elements and components. This result is in support of research by Derek et al (2013) that worked on the effectiveness of massive open online course (MOOC) that was used as standalone introduced in Stanford University and was found to be effective. Similarly, Dikko 2016 also conducted research on face to face and online, it was discovered that online was more effective than the face to face.Nowadays, institutional administrators are challenged to position their institutions to meet connectivity thereby getting ready for blended learning program (Garrison &Kanuka, 2004) (Garrison & Cleveland-Innes, 2005) state that this is to meet the demands of prospective blended learning students for high quality instruction learning experience/outcomes considering the increasing demand for internet, information and communication technology for transforming the society, there is more reason to agree that it is a transformative innovation in higher education.

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