



Analysis of Transversal Green Skills Model for Graduates of Technical Colleges in Nigeria

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ABSTRACT

It is a clear fact that technology education requires the needed attention of every stakeholder in developing countries like Nigeria. Therefore, the main aim of this study is to develop an analytical model of transversal green skills for technical college graduates in Nigeria. Descriptive survey research design was used for this study. 18 technical colleges and 6 firms were sampled via cluster sampling techniques Nigeria. The data was collected using survey questionnaire from the target population of 68 respondents from 5 categories of respondents involving of; all the 15 technology administrators; 14 technology teachers; 16 technology instructors; 14 technology professionals; and 9 Craftsmen. An 11-item validated questionnaire with the reliability coefficient of 0.87 was used for data collection. Structural Equation Modelling (SEM) via Confirmatory Factor analysis (CFA) was used to analyse the data which was used for the development of the proposed green transversal skills model. The model covers identified significant areas of green transversal skills for technical college graduates. Findings of this study include among others reflective thinking skills, Media and information literacy skills, Self-discipline, perseverance, self-motivation, and commitment. The study recommends that Federal and state Governments adopt and ensure proper implementation of this model for technology graduates with a view of transforming them for the recent development in technology education.

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INTRODUCTION

The technological advancement and relevance in the world of any country depend largely on its achievement in technical and vocational education and training (TVET). TVET is a comprehensive term referring to those aspects of the educational process involving, in addition to general education, the study of technologies and related sciences, and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupants in various sectors of economic and social life (UNESCO, 2012a). It is on this notes Zolkifli, Kamin, Abdul Latib, Buntat, and Awang (2016) pointed out that despite the differences in

definitions, the thrust of TVET is on skill development and the world of work. This implies that TVET is geared towards the acquisition of necessary skills needed for the workplace.

Skills can be hard to describe and measure at an aggregate level because they are a socially constructed concept, intangible and often unobservable (European Centre for the Development of Vocational Training CEDEFOP, 2012). Consequently, Shuaibu (2014) noted that workers in the 21st century need a variety of skills to face realities which advancement in information and communication technology brought; concepts such as globalisation, deregulation and sustainability among others.

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Taking sustainability into cognisance, it is all about the prospect of the society, for current industries and businesses as well as commercial success. Sustainability as a state in which humankind is living within the carrying capacity of the earth has the capacity to accommodate the needs of existing populations in a sustainable way and is therefore also able to provide for future generations. (World Commission on Environment and Development WCED, 1987).

Predisposing green skills to technology, it is sufficient to define green skills as technical skills, knowledge, values and attitude needed in the technology graduates industries to develop and support sustainable social, economic and environmental outcomes in the technology graduates industry. Consequent upon, factors like world economic downturn and ecological problem in which technology is one of the contributing factors to the later pose many countries in the world to adopt the transition to a greener economy by embedding green skills into various occupations. More so, as a result of the realities follows the consensus on green economy by global leaders during Rio + in June 2012, Nhamo (2014) reported that the world is set to apply green economy as a model for achieving sustainable development, eradicate poverty, and inequality and create a job.

More precisely, it is pertinent to note that, technology's objective is geared towards creating skilled, competent, employable and sustainable technology graduates that can favourably fit into present green skills demanding labour market. Hence, that is what this study will accomplish by developing a conceptual model for integrating green skills into technology curriculum. Courses undertaken at those technical colleges include Technology Graduates Trade (technology), Auto mechanic trade (AMT), Metal Work Trade (MWT) and Electrical/Electronic Trade (EET).

It is a clear fact that the curriculum of technology is primarily aimed at giving training and imparting the necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant (National Board for Technical

Education NBTE, 2001). Craftsmen in the industry play a very crucial role in the survival and growth of the industry as they are mostly engaged in the practical realisation of graduate's projects. This clearly indicates that, on successful graduation, technology graduates are expected to acquire the necessary skills needed for the world of work. For the Pavlova (2011), the essence of technology education (which of course include technology graduates) is to involve students in learning through designing and making products and systems within the model of sustainable development.

In furtherance to UNESCO's assertion, Acedo (2014) demonstrate that there can be no sustainable development without education and without appropriate green skills for employability especially in the technology graduates sector. Nigeria, as a developing country remains inactive on issues on sustainability. To support this assertion Dania, Larsen, and Yao (2013) maintained that Nigeria is lagging behind world developments associated with sustainability within the graduates sector and beyond. In this regards, skills development that increases employability, in the form of technical and vocational education and training (TVET), and that supports the greening of economies, has a key role to play since TVET prepares learners for fields of work and business such as graduates, waste management (UNESCO, 2012b). In a careful examination of the UNESCO's assertion, it can be deduced that there is an urgent need of integrating green skills into the field trades curriculum such as technology being one of the core arms of TVET to enhance the nation's sustainable development.

. For transversal skills referred to as "literacy and numeracy skills necessary for getting work that pays enough to meet daily needs (UNESCO, 2012b). Evidently, Technology graduates could be linked to the green skills concept in various ways such as site selection and preparation, graduates, operation/use and renovation/demolition in order to enhance sustainability using the trade by constructing and managing sustainable graduates. In essence, Aliagha, Adnan, Baba, Ali, and Eluwa (2015)

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posit that passive design takes into consideration technology orientation and layout to reduce the absorption of heat from the sun, enhance inflow of daylight, provision of sun shading devices and wall greenery. This clearly indicated that there is a growing gap between demand for quality installations in technology and the skilled and qualified labour required to do the work.

Furthermore, the German Federal Ministry for Economic Cooperation and Development (BMZ) (Ed.) (2013) denotes that green skills are skills, abilities and the willingness to recognise and to assess the direct and indirect effects of occupational activities on the environment as well as on the living and working conditions of other human beings (of present and future generations) and to avoid negative effects as much as possible. On the same vein, defines green skills as “the knowledge, abilities, values and attitudes needed to live in, develop and support a sustainable and resource-efficient society”. Looking conscientiously at all the three dimensions of sustainability it appears that the importance of green skills in enhancing environmental protection, social well-being and economic prosperity of any developing country like Nigeria cannot be over emphasize.

In line with the above, it was reported by Federal Republic of Nigeria FRN (2015) that the need for integrating the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources in a bid to achieve the goal number 7 in the Millennium Development goals (MDG). Additionally, UNESCO (2013) reported that Nigeria is gearing up to spend money on green graduates, green energy and resource efficiency for example by erecting wind turbines and solar panels as well as by constructing and refurbishing environmentally friendly technology. The report further emphasised that the challenge for TVET is to reorient and redirect its curricula and training programmes and elaborate training methodologies to get graduates with skills fitting the needs of a green economy.

Technology from the above, Subsequent upon the world economic recession

which Nigeria is not an exception, the Director of ILO Country Office, Abuja, on Monday 11th July 2016, met the Honourable Minister of Environment of the Federal Government of Nigeria, to explore the possibilities of working together to promote the creation of green job opportunities in Nigeria. The Minister pointed at capacity gaps that needed to be addressed and requested ILO's support in putting together a three-year programme that would contribute to the creation of green jobs in Nigeria. The director highlighted the fact that ILO worked on green economy and green jobs especially in creating decent job opportunities in areas such as graduates sector with green jobs concept, renewable energy, afforestation, waste management including e-waste (International Labour Organisation ILO, 2016c). Positive realisation of this programme, however, will of course require green skilled personnel that will facilitate the smooth running of the programme, especially in the technology graduates sector in the country.

To this end, for long, concerted effort has been made by the Nigerian government and the educational institutions to ensure that graduates of technical institutions possessed adequate skills to get fit into the world of work irrespective of the changing technologies. The projection is that if Nigerian graduates are adequately prepared through skills oriented academic system of technical-vocational education and training (TVET) programs, many skills outlets would be nurtured and developed in the students for paid jobs or self-gainful engagements. This would reduce the rate of the search for government paid labour (Okoye & Okwelle, 2014).

With all the foregoing calls to integrate green skills in Nigeria technical colleges curriculum due to climate change, economic recession, green job creation, and environmental problems, unfortunately, concepts of green skills are not included in the technology curriculum at the technical colleges of Nigeria and no any research known to the researcher was conducted in due course. This, in turn, gave room for the existence of green skills shortage for graduates'

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industries jobs as the graduates to be specific that of technology are not acquainted with the skills during their school time. In addition, this is happening despite the fact that the curriculum of technology is primarily aimed at giving students adequate training and necessary skills for them to become artisans, technicians and other skilled personnel who will be enterprising and self-reliant in line with the current labour market demand in the graduates industries. It is against the above background, the researcher deems it very important to develop a proposed conceptual model for the integration of green skills into the technology curriculum.

To this effect, Damina et al (2013) reported that Nigeria appears to be lagging behind in its pursuit of the sustainability agenda. In essence, Awe, Stephenson, and Griffith (2010) linked skill labour shortage in the graduates industries in Nigeria to defective curricular with too much emphasis on paper qualifications at the expense of skills acquisition. Yet academic work related to green skill issue is relatively sparse and in particular, none is known of the consequences of such situations with reference to Nigeria. This clearly indicated if measures are not taken on the curriculum, graduates industries will remain short skilled which in turn will continue to delay or rather bedevilled the effort of government in achieving millennium development goals on sustainable development. In respect of the aforementioned, therefore, this research focused on developing a model of transversal green skills in technology as a remedy to environmental sustainability.

Objectives of the Study

The main objective of this study is to develop a model of transversal green skills for graduates in Nigeria technical colleges. Specifically, the following objectives guided this research:

- i. To determine the important areas of transversal green skills elements considered suitable for the model.
- ii. To find out the relationship between the data samples and important areas of transversal

green skills elements considered suitable for the model.

- iii. To develop and validate model of transversal green skills for technical college graduates

Hypothesis

The following alternative hypothesis was formulated based on the research question 2 above and tested at 0.05 confidence level:

There exists relationship between the research sample and important areas of green skills elements considered appropriate for effective integration in technology at Nigerian technical colleges.

LITERATURE REVIEW

Transversal skills or skills for sustainability are the future-oriented skills for sustainability, (e.g. thinking, process and change agent skills; 'habits of mind'), that can help build desirable graduate attributes such as resilience and adaptability in an unpredictable and changing work world and climate Knibb and Paci (2016). In addition according to them (Knibb and Paci) transversal skills are considered to be key skills for the 21st Century workplace and 'career capital, they complement, and can be integrated into, existing models for generic skills, essential employability skills, or so-called 'soft' skills and require 'deep' learning. Examples: systems thinking, capacity to solve complex problems, civic responsibility, accountability for the consequences of one's actions, ethical/moral decision-making, the capacity to work in intergenerational, culturally diverse environments. Transversal skills refer to foundation skills, at their most fundamental, as "literacy and numeracy skills necessary for getting work that pays enough to meet daily needs (UNESCO, 2012b).

Additionally, for Sterling (2012) transversal skills prepare people to cope with, manage and shape social, economic and ecological conditions characterised by change, uncertainty, risk and complexity. In the same vein, Asia-Pacific Education Research Institutes Network (ERI-Net) (2013) sees the term transversal skills which they termed as non-

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cognitive skills as part of holistic development of learners, often not taught explicitly in classrooms and not assessed in conventional exams and upon which they classified transversal skills into critical and innovative thinking; interpersonal skills; intrapersonal skills; and global citizenship. According to this report, critical and innovative thinking involves creativity, entrepreneurship, resourcefulness, application skills, reflective thinking, and reasoned decision-making.

Interpersonal skills include presentation and communication skills, leadership, organisational skills, teamwork, collaboration, initiative, sociability, collegiality. While Self-discipline, enthusiasm, perseverance, self-motivation, compassion, integrity, commitment falls under intra-personal skills. Finally, Global citizenship encompasses awareness, tolerance, openness, and respect for diversity, intercultural understanding, and ability to resolve conflicts, civic/political participation, conflict resolution, and respect for the environment. In looking conscientiously to the above categories of transversal skills and aligning them with the sustainability issue that attracts the attention of the world for decades, it will be of great significance to the member countries to embed the transversal skills into the curriculum of their schools at different level most especially TVET institutions.

In addition to the above skills, practical support measures should be developed to assist the implementation of transversal skills education in TVET institutions. National guidelines alone are not sufficient to make transversal skills education effective unless these are complemented by measures, such as targeted teacher training, development and sharing of best practices, development and use of practical manuals and incentives for employer engagements; policies outlining such measures can be included in a comprehensive national strategy for the development of transversal skills education in TVET (UNESCO, 2015b). With regard to this European Union (2011) maintained that employability of individuals is not only based on specific skills, but transversal skills that range from problem-solving to interpersonal skills are

considered important because having these skills, which can be transferred from one context to another, is a good basis for accumulation of specific skills required by a given job.

METHODOLOGY

This section outlines the methodology employed for the collection, organization, analysis, and interpretation of data in this study. Both descriptive and inferential research designs were utilized, with a focus on quantitative research as an approach for testing objective theories by examining relationships among variables. The research design, a type of inquiry within the quantitative approach, provides specific guidance for procedures in research (Denzin & Lincoln, 2011). Data were collected quantitatively using a structured questionnaire, which was then analyzed and interpreted

The target population for this study comprised 68 respondents from five categories: 15 technology administrators, 14 technology teachers, 16 technology instructors, 14 technology professionals, and 9 craftsmen. Due to the manageable size of the population, the entire group was included in the study. In the quantitative section, a 12-item structured questionnaire was administered to all categories of respondents, structured on a 6-point scale.

To ensure the reliability of the quantitative instrument (questionnaire), a pilot study was conducted using respondents with similar characteristics to the target group, who did not participate in the main study. The pilot study yielded a Cronbach's Alpha value of .87, indicating satisfactory reliability.

Quantitative data obtained from this study were analyzed using descriptive statistics such as frequency, percentage, mean, and standard deviation, along with confirmatory factor analysis (CFA) and Structural Equation Modeling (SEM). IBM-SPSS version 21 and IBM-SPSS-AMOS version 24 statistical software packages were utilized for analysis.

The CFA was conducted to test the correlational structure of the data against the hypothesized structure and assess the goodness of fit. Finally, SEM, following the approach

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outlined by Schreiber, Nora, Stage, Barlow, and King (2006), was employed to determine the level of relationship between the samples and the relevant elements of transversal green skills considered suitable for the framework for technology graduates.

In presenting the results of the analysis in this paper, tables were utilized. Each table corresponds to the research objectives, research questions, and corresponding hypotheses set out in Chapter One. A brief explanation or discussion based on numerical values presented in the tables is provided. Additionally, structural representations of the AMOS output for both the initial and modified measurement models are included.

DATA ANALYSIS AND FINDINGS

In analysing the data that deal with appropriate areas of transversal green skills, the draft copy of the questionnaire passed the content validity via experts' review and the pilot test. Consequently, the final developed questionnaire was administered on the research respondents for quantitative data collection. Complete sets of 68 questionnaires were administered and the 68 sets were retrieved accounting to 100% response rate.

In this study, data screening was done to exclude questionnaires with missing values; conduct tests for normality and outliers through skewness and kurtosis indicators. Accordingly, from the retrieved questionnaires, no sets of the questionnaires were removed due to missing value on some items; and no sets of responded questionnaires and or items that were excluded due to very extreme values and outliers without any logic. According to Kline (2005), responded questionnaires with incomplete data should be excluded if they had missing values on items involved in particular computations. With this, 68 questionnaire and 12 items were used in the data analysis. Finally, the final values of skew and kurtosis showed that the distribution of scores of the 12 items questionnaire in this study did not exceed the absolute values of 2 for skewness and 7 for kurtosis indices. These results showed that the data set was considerably moderate with

normal distribution and hence, maximum likelihood estimation could be used.

Reliability Analyses for the Measurement Scales

The entire 12 items that measured transversal green skills were involved in this analysis. The outcome of the reliability analysis indicated that the Cronbach's alpha values of all the variables were more than 0.7. According to Hair, Black, Babin, Anderson, and Tatham (2006), any measurement instrument should have a reliability value more than 0.60. Therefore, the reliability of this instrument was accepted as its Cronbach's value exceeded the minimum standard levels.

Development and Validity Testing of the Proposed Model of Transversal Green Skills

This section of the research tested the hypothesis. To develop and test the proposed model SEM has been used via the application of CFA. In line with this, testing the research proposed model was based on the testing of measurement model (individual), third-order measurement model, pool model and structural model testing. In this regard, the measurement model testing include the first order CFA measurement model for the 3 latent constructs (TRSN1, TRSN2 & TRSN3: generated through EFA process); the second order CFA measurement model of the one latent constructs; and 3 second-order latent construct of sustainability dimension for transversal green skills model. On the other hand, the structural model tested the pooled (overall) measurement model.

Additionally, each model was evaluated using the 3 categories of fit indices as suggested by (Awang, 2012). These categories of goodness-of-fit measures are: Absolute fit measures (that include Chi-Square, RMSEA and GFI); Incremental Fit measures (that involve AGFI, CFI, TLI, and NFI), and Parsimonious Fit measures (that consist of Chisq/df also called as relative or normed Chi-square) as presented with their level of acceptance. More so, in establishing the validity and reliability of each of the models in

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this study, CFA was used as a confirmatory method that provided means for validating of each of the measurement models (second-order, latent constructs) by assessing the Unidimensionality, Validity and Reliability of these latent constructs. The Unidimensionality in each of the model in this research was achieved as the entire measuring items have acceptable factor loadings of above 0.5 for the respective latent construct. For the validity of the models, 3 types (Convergent Validity, Construct Validity and Discriminant Validity) of validity as recommended by Awang (2012) were tested for each of the third order latent constructs measurement model and the pooled measurement model.

Confirmatory Factor Analysis (CFA) of Green Skills

In this section of the analysis, as mentioned earlier, Analysis of Moment of Structure (AMOS) was used to achieve research objective three, provided answer to (RQ3) and tested the hypothesis (H). Both RQ3 and the hypothesis (H) were further sub-divided into 11 sub-questions each with the aim to identifying the important areas of green skills; and determined the relationship between research data sample and the important areas of green skills elements considered important for integration into the curriculum of technology at technical colleges in Nigeria.

Research question and its corresponding hypothesis were answered and tested using Analysis of Moment Structures (AMOS) software version 24. Although, EFA computed earlier identified the important areas of green skills considered suitable for effective integration in technology; the extent to which the areas relate to the research data sample has not been determined. Therefore, to determine the relationship between the research data sample and the important areas considered suitable for the effective integration technology, the data

collected was further analysed using AMOS analysis.

Measurement Model of Transversal Green Skills

This section of the data analysis tested the measurement model of transversal skills which addressed the research question and tested hypothesis at >0.05 . Based on the results of EFA for the areas of transversal skills elements, the variable of transversal skills (TRSVSKILL) was observed as a second-order latent construct identified by three first-order latent constructs. Additionally, among the initial 11 measurement items of TRSVSKILL; TRV2 and TRV8 were deleted after the EFA, and the remaining 9 items were extracted into three factors (1, 2, and 3). Technology on the above, in CFA, the factor 2 of TRSVSKILL in EFA as a first-order latent construct of TRSVSKILL was named TRSV1 which consisted of three items TRV4, TRV5 and TRV3; the factor 3 of TRSVSKILL in EFA, also a first-order latent construct of TRSVSKILL, was named TRSV2 which consisted of two items TRV1, and TRV9; the last factor 1 of TRSVSKILL in EFA as a first-order latent construct of TRSVSKILL, was named TRSV3 which consisted of four items TRV6, TRV10, TRV12, and TRV11.

In CFA of Transversal skills via Amos 24, the computed values for model fit indices on measurement model (initial model) for important areas of transversal green skills integration in the proposed model. The results showed that the measurement model does not satisfy the goodness of fit indices; with 3.118 for $(\chi^2)/DF$ (normed CMIN), GFI (.957), TLI (.910), CFI (.940), AGFI (.919), RMSEA (.077) and $P < 0.05$. This has resulted in the modification of the initial model by removing variables that contributes less to the model goodness of fit as recommended by (Awang, 2012). Figure 1 shows the structure of the measurement model.

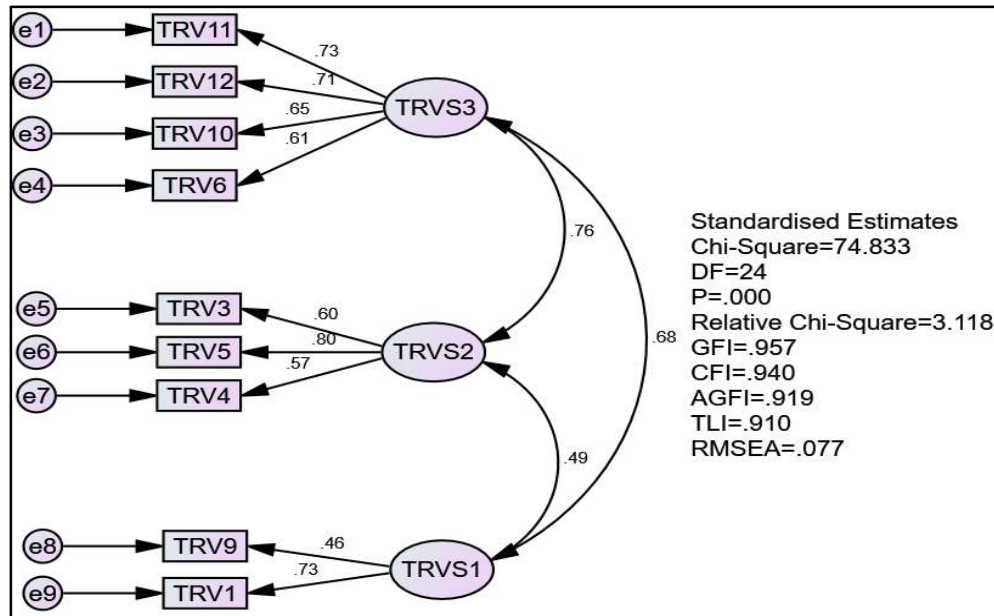


Figure 1: Measurement Model of Transversal Green Skills

Figure 1 shows a total of nine important areas of TRSVSKILL: TRV1 (*Reflective thinking skills*); TRV9 (*Application of numeracy and information technology skills.*); TRV4 (*Ability to resolve conflicts*); TRV5 (*Media and information literacy skills*); TRV3 (*Self-discipline, perseverance, self-motivation, and commitment.*); TRV6 (*Self-management and creativity skills*); TRV10 (*Obtain and analyse information through ICT*); TRV12 (*Express ideas through media and ICT*); and TRV11 (*Resourcefulness and application skills*) that were measured to determine their relationship with data samples for integration in the proposed model. The model revealed that e2 (TRV12) <-> e9 (TRV1) had modification index (MI) value of 21.636 greater than threshold value of 15 which contributed to the unfit of the model. Therefore, to further run the model analysis, upon re-examining the contents of TRV12 items was excluded in CFA.

After the second run of the CFA via Amos 24, the validity inspection of measurement model of TRSVSKILL indicated that the level of

model fit was satisfied as the results of the standardised estimates (figure 2) indicated that the value of CMIN was 42.221 with 17 DF. Although the p value associated with this result was significant at $p < 0.005$, since the sample size in this study for CFA was quite large ($N=361$), a significant p-value could be expected (Hair, Black, Babin, Anderson, & Tatham, 2006b). In addition, the normed CMIN (2.484) was accepted (between 1 and 3). More so, a good value of normal CMIN (less than 3) was enough to indicate a good model fit (Hair, 2010). The GFI (0.972) and AGFI (0.940) were both greater than 0.9; the CFI (0.961), TLI (0.936) were also greater than 0.9; and specifically the RMSEA value of 0.064 (i.e., a measure of less than 0.08) established the goodness-of-fit analysis. These results suggest that the modified model of transversal skills revealed a satisfactorily good fit. Therefore, the hypothesis of significant relationship between the data samples and important areas of transversal skills was hereby upheld at < 0.05 and Figure 2 was generated.

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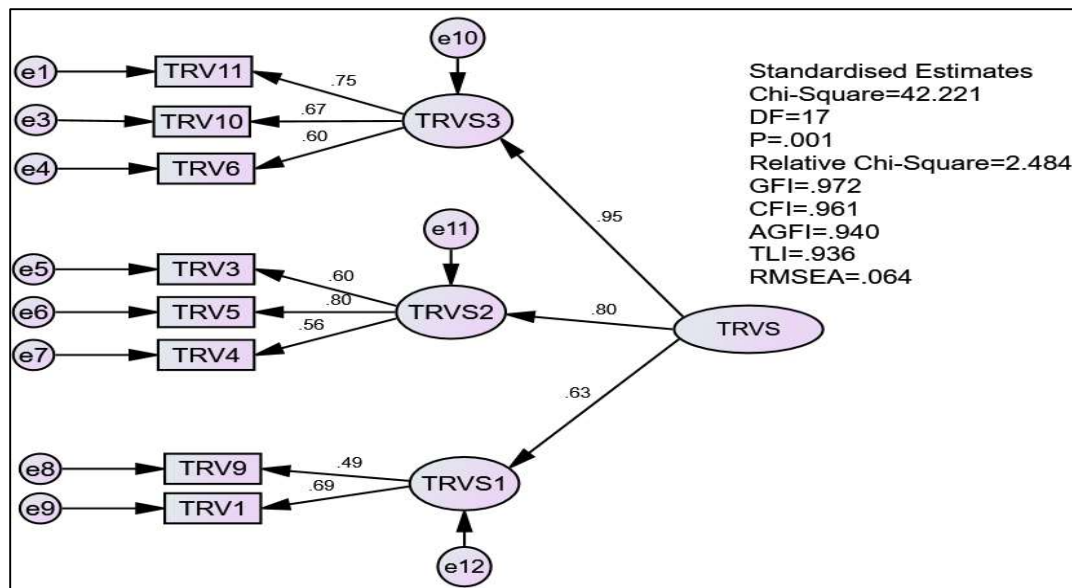


Figure 2: Modified Measurement Model Transversal Green Skills

Figure 2 shows a structural model of the significant relationship between the data samples and the 8 areas of transversal skills considered important for integration in to the model. Therefore, from the modified model

(Figure 2) it can be concluded that for suitable integration of transversal green skills into the model these important areas of transversal skills need to be put into consideration.

Table 1 Quantitative Findings

S/N	SKILLS IDENTIFIED
1.	TRV1: Reflective thinking skills
2.	TRV5: Media and information literacy skills
3.	TRV3: Self-discipline, perseverance, self-motivation, and commitment
4.	TRV10: Obtain and analyse information through ICT.
5.	TRV11: Resourcefulness and application skills

DISCUSSION

On the green skills areas of importance in transversal skills for social sustainability, experts agreed on inclusion of reflective thinking, resourcefulness and application skills that involved self-discipline, perseverance, self-motivation and commitment. Report of Asia-Pacific Education Research Institutes Network (ERI-Net) (2013) is in congruence with this finding that transversal skills as part of whole development of learners, mostly not taught explicitly in classrooms and not evaluated in traditional exams; it is categorized into

resourcefulness, application skills and reflective thinking. On the same vein, Kemp, Parto, and Gibson (2005) and Loorbach (2007) pointed out that for long, many countries have made commitments to sustainable development but faced the challenges of appropriate approaches to this; which clearly indicated the need for commitment to that respect. Modebelu, M., & Ugwuanyi, S. (2014) recommended that innate abilities and intelligent skills manifest as self-awareness, self-discipline, and perseverance. Taking all these recommendations together, it is sufficient to note that these areas of transversal

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skills as identified by this study would play a vital role in the curriculum of technology students.

The findings also revealed that participants stressed on the embedding presentation skills into the technology curriculum which include media and information skills. In this case, UNESCO (2014) recommended that campaigning activities of the Decade for Education and Sustainable Development achieved much media attention, schools are slow in integrating scientific, social and environmental problems into mainstream curriculum and pedagogy. This signifies that curriculum review highly needed. More so, Umar and Khamidi (2012) urged that green technology awareness depend largely on the public campaign for green technology; media relations in terms of articles, news release and community relation by providing trade show participation. In line with this also, Kibert (2008) recommended that education and transfer of information across all participants referred to the best method in ensuring that sustainable technology are erected. For McCoy, O'Brien, Novak, and Cavell (2012), appropriate content of any curriculum are significant mechanisms for creating a vital information to industry; and stakeholders must ensure their courses gives relevant and vital information to the industry of what is required to elevate the adoption of green technology skills. These supporting recommendations made it clearer that these findings in transversal skill will contribute positively in the body of knowledge especially in technology graduates segment.

CONCLUSION

The findings of this study were used to develop a conceptual model for integrating green skills in the curriculum of technology students for the attainment of sustainability in Nigeria. Important areas of 11 green skills were identified using five categories of respondents/participants made up of administrators, teachers, craftsmen, instructors and professionals. Similarly, these important areas were identified under each of strategic and leadership skills, transversal skills, adaptability and transferability skills, practical skills, technical skills, waste minimisation skills, transitioning skills, entrepreneurial skills, process

skills and innovation skills for the effective integration. The model was developed in adherence to the analysed data showing the important areas based on their level of appropriateness on each green skills elements for effective integration in to the curriculum of technology in Nigeria. Conclusively, this conceptual model has some implications on the supervisory agency (NBTE) toward ensuring that these identified areas are embedded into the curriculum and properly imparted to students. The conceptual model will be used as a guide for effective integration of green skills to help students offering technology on graduation contribute immensely towards ensuring social, environmental and economic sustainability in Nigeria.

RECOMMENDATIONS

Apparently, environmental problems become global issue as they resulted in making sustainable development unachievable in many developing countries. Research evidences indicated that technology were found to be one of the contributing factors to such problems as it was declared as number one green gas emitters and consumes nearly one-third of the total wealth in the world. This study provides a more detailed understanding of the roles of transversal green skills in assuring sustainability by developing a model that comprised of identified important areas of transversal green skills elements considered as remedy to environmental sustainability. For the effective implementation of this model, the study recommends that policy makers and administrators of education in the world in planning, organization and implementation of technology curriculum in their schools aimed at achieving environmental sustainability.

REFERENCES

- Acedo, C. (2014). Skills for inclusive and sustainable development: Perspectives from the Asia Pacific region and beyond. *Prospects*, 44(2), 137-140. doi:10.1007/s11125-014-9314-1

Corresponding author: Samaila Hamza,

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- Aliagha, G. U., Adnan, N. B., Baba, M., Ali, H. M., & Eluwa, S. E. (2015). Low Carbon Green Building Skills Requirements for Existing Buildings. *Advanced Materials Research, 1073-1076*, 1288-1292. doi:doi:10.4028/www.scientific.net/AMR.1073-1076.1288
- Asia-Pacific Education Research Institutes Network (ERI-Net). (2013). *Transversal Competencies In Education Policy & Practice (Phase I): Regional Synthesis Report*. Retrieved from Paris, France:
- Awang, Z. (2012). *SEM Made Simple, A Gentle Approach to Learning Structural Equation Modeling Using AMOS Graphic*. Selangor: MPW5 Rich Publication.
- Awe, E., Stephenson, P., & Griffith, A. (2010). *Impact of Vocational Training on Skilled Labour shortage within the Nigerian Construction Sector*. Paper presented at the W089-Special Track 18th CIB World Building Congress May 2010 Salford, United Kingdom.
- Bilau, A. A., Ajagbe, A. M., Kigbu, H., & Sholanke, A. B. (2015). Review of Shortage of Skilled Craftsmen in Small and Medium Construction Firms in Nigeria. *Journal of Environment and Earth Science, 5(15)*, 98-110.
- Dania, A. A., Larsen, G. D., & Yao, R. (2013, July 9-11, 2013). *Mainstreaming Sustainable Construction: Case Studies of An Indigenous and Multinational Firm in Nigeria*. Paper presented at the Engineering Project Organization Conference, Devil's Thumb Ranch, Colorado.
- Denzin, N. K., & Lincoln, Y. S. (2011). *The SAGE handbook of qualitative research. Southern Oak*; : Sage.
- European Centre for the Development of Vocational Training CEDEFOP. (2012). *Green skills and environmental awareness in vocational education and training (ISSN 1831-5860)*. Retrieved from Luxembourg:
- European Union. (2011). *Transferability of Skills across Economic Sectors: Role and Importance for Employment at European Level*. Retrieved from Luxembourg: Publications Office of the European Union:
- Federal Republic of Nigeria FRN. (2015). *Nigeria 2015 Millennium Development Goals End-Point Report*. Abuja, Nigeria.
- German Federal Ministry for Economic Cooperation and Development (BMZ) (Ed.). (2013). *TVET for a Green Economy*. Bonn, Berlin. .
- Hair, J. F. (2010). Black, WC, Babin, BJ, & Anderson, RE (2010). *Multivariate data analysis, Pearson Prentice Hall Upper Saddle River*.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. (2006). *Multivariate Data Analysis: Pearson Prentice Hall. Upper Saddle River, NJ*.
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006b). *Multivariate data analysis (6th ed.)*. Pearson Prentice Hall: Uppersaddle River.
- International Labour Organisation ILO. (2016c). *Promoting green jobs policies to generate decent and productive employment as well as skills needed for a greener economy were at the heart of ILO and Nigeria consultation process*. Retrieved from Abuja, Nigeria:
- Kemp, R., Parto, S., & Gibson, R. B. (2005). Governance for sustainable development: moving from theory to practice. *International Journal of Sustainable Development, 8(1-2)*, 12-30.
- Kibert, C. J. (2008). *Sustainable construction: green building design and delivery*: John Wiley & Sons.
- Kline, R. (2005). *Methodology in the social sciences: Principles and practice of structural equation modeling*, 2nd ed. New York: Guilford Press.
- Knibb, H., & Paci, C. (2016). *The Greening of Canada's College Curriculum*. A Pan-

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- Canadian Survey. *TVET@ Asia*(Issue 6), 1-21.
- Loorbach, D. (2007). *Transition management: new mode of governance for sustainable development*. The Netherlands: International Books, Utrecht.
- McCoy, A. P., O'Brien, P., Novak, V., & Cavell, M. (2012). Toward understanding roles for education and training in improving green jobs skills development. *International Journal of Construction Education and Research*, 8(3), 186-203.
- National Board for Technical Education NBTE. (2001). from NBTE. Retrieved Online March 27 2017
- Nhamo, G. (2014). Reviewing Some Implications of the Green Economy for Higher and Further Education Institutions. *Southern African Journal of Environmental Education*, 30(1), 79-95.
- Okoye, K., & Okwelle, P. (2014). Technical Vocational Education and Training (TVET) as Intervention Mechanism for Global Competitiveness: Perspectives from Nigeria. *Developing Country Studies*, 4(4), 86-91.
- Pavlova, M. (2011). ESD through technology education: contextualisation of approaches. *African Journal of Research in Mathematics, Science and Technology Education*, 15(3), 41-55.
- Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of educational research*, 99(6), 323-338.
- Shuaibu, B. (2014). *Conceptual Model for Integrating Information and Communication Technology in Nigeria Higher Education Institutions Offering Technical and Vocational Education*. (PhD Thesis), Universiti Teknologi Malaysia, Skudai.
- Sterling, S. (2012). The Future Fit Framework. An Introductory Guide to Teaching and Learning for Sustainability in Higher Education. Online: http://scotland.heacademy.ac.uk/assets/documents/esd/The_Future_Fit_Framework.pdf tried 23.7.2016).
- Umar, U. A., & Khamidi, M. F. (2012). *Determined the Level of Green Building Public Awareness: Application and Strategies*. Paper presented at the International Conference on Civil, Offshore and Environmental Engineering, Kuala Lumpur Malaysia. .
- UNESCO. (2012a). EFA Global Monitoring Report 2012: youth and skills, putting education to work: UNESCO.
- UNESCO. (2012b). ESD + TVET Promoting Skills for Sustainable Development. www.unesco.org/education: UNESCO.
- UNESCO. (2013). *UNESCO-UNEVOC Regional Forum, Advancing TVET for Youth Employability and Sustainable Development*. Retrieved from
- UNESCO. (2014). *Promising Practices in technical and vocational education and training (TVET) , GREEN Skills and Youth Empowerment*: UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training
- UNESCO. (2015b). *Transversal Skills in TVET: Pedagogies and Assessment*. Retrieved from Bangkok-Thailand:
- World Commission on Environment and Development WCED. (1987). *Our Common Future*. Retrieved from Oxford University Press:
- Zolkifli, H., Kamin, Y., Abdul Latib, A. B., Buntat, Y., & Awang, Z. (2016). Generic Green Skills: Industry and perspectives on technical education and vocational training (TVET): www.tvet-online.asia. (Issue 6), 1-13.

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