Assessment of Skill Acquisition Techniques for Architectural Training Using Students Industrial Work Experience Scheme in Kaduna Polytechnic-Nigeria.

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Abstract
Over the years, industries and the general public have expressed concern on the low capacity of graduates in exhibiting the requisite skill for life of work after their training. This paper assessed the use of Students Industrial Work Experience Scheme (SIWES) towards enhancing skill acquisition techniques for architectural training and practice. The methodology adopted for the research was qualitative which included the use of interviews and structured questionnaires for data collection, while the SPSS statistical tool was used for the descriptive analysis of data collected. The population comprised of SIWES institutional and industry supervisors and graduates from department of architecture Kaduna polytechnic. The research established that enhancing skill acquisition technique for architectural training and practice using the Students Industrial Work Experience Scheme in Kaduna Polytechnic has a slightest mean response of 2.72 and 3.29 as the significant mean respond. The research finding amongst others has implication on the effect of SIWES on skill acquisition in the Department of Architecture in Kaduna Polytechnic. This is with respect to financing SIWES trainee, management/office procedure, good work ethics and score in and the need for enhanced entrepreneur appetite by trainees including tools and facilities applications. The paper concludes that enhancing skill acquisition techniques for architectural training and practice using Students Industrial Work Experience Scheme in Kaduna Polytechnic is significant and quite relevant to employability and real life of work in architecture.

Keywords: Architectural Training, Industrial Experience, Kaduna Polytechnic, Practice, Skill Acquisition.

Introduction
The opportunity provided to students of higher learning through the Student Work Experience Scheme (SIWES), a mode of industrial skill acquisition and a training avenue for the seamless transition to work life is quite central to employability of graduates of all fields; particularly Technical and Vocational Education and Training (TVET) base courses (Aswaju, 1972; Abubakar & Mohammed, 1999; Abubakar, 2001; Industrial Training Fund, 2002; Bukar, 2011; Dangana, 2011; Nse 2012). For accelerated development in Africa to occur, pragmatic technical and technological base education must lead the way rather than the idealist education style that has been the trend (Bukar, 2011; Dangana, 2011; Umar, 2011).

Ugwuanyi and Ezema (2010) asserted that practical knowledge relates to doing, and that practical knowledge is learning without which mastery of an area of knowledge may be too difficult to achieve. However, it is obvious that no society can achieve meaningful progress, without encouraging its youth to acquire necessary practical skills and it is such skills that enable them to harness available resources

towards meeting the needs of society. Therefore, against this background SIWES otherwise referred to as Industrial Training (IT), was introduced in Nigerian tertiary institutions. SIWES being a skill development program was designed to prepare students of universities, polytechnics/monotechnics, and colleges of education for switch from the school environment to the field of labour (Akerejola 2008). Oyedele (1990) and Ugwuanyi and Ezema (2010) also did affirm that work experiences are educational programs in which students participate in work activities while attending school.

The Student Industrial Work Experience Scheme (SIWES) therefore, is a central part to the basic training requirement of architectural technicians and technologists in the Nigerian Polytechnic (as cited in National Board for Technical Education [NBTE], 2009). Essentially SIWES serves as a medium to enhance a seamless transition from training to work. A careful observation seems to suggest that students' rated performance during SIWES training is not really a direct reflection of aptitudes being demonstrated by the students on graduation or when employed (Wodi & Dokubo, 2009; Okolocha & Okolocha, 2012). This state of affairs is creating a great deal of concern as variously asserted by (Wodi & Dokubo, 2009).

The problem of trained architectural graduates' capacity in the industry based on acquired skill and actual work competency demonstrated is a cause for serious concern. Once this challenge is tackled frontally there would be a momentous impact on the general world of learning and the quality of trained graduates of Architectural Technology specifically. The various architectural firms and construction companies will also gain quality workforce and the nation would be better developed.

The paper essentially identifies required skills for architectural training and practice; established suitable techniques for skill acquisition in architectural training and practice through establishing whether SIWES training enhances TVET skill acquisition techniques in the Department of Architecture, Kaduna Polytechnic and making recommendation for skill acquisition in architectural training and practice through industry based collaboration.

Student Industrial Work Experience Scheme (SIWES)

Traditional education system emphasised dignity of labour, hard work, moral instruction including emphasis on traditions, culture, beliefs, attitudes and peoples' religion (Katola, 2014). Dangana (2011) and Umar (2011) did affirm that apart from the traditional educational system, there are several other factors that affected teaching and learning in Nigeria that include, the Islamic, Christian missionaries' influences and then the colonial heritage from the British.

According United Nations Conference on Trade and Development [UNCTAD] (2012), Nigeria educational systems have been laden with internal/societal economic imbalances considering the dynamics of growth, development and change. Therefore, for proper economic development in the country our educational component must include; requirement for economic growth and socio-cultural development, resource supplies of the economy, long production cycle of education and educational change cum quality for entrepreneurship (Wheeler, 1968; Asiwaju, 1972; Fabunmi, 2005; Dangana, 2011; Umar, 2011; Azike, 2013).

The lack of adequate practical skills preparatory for employment in industries by Nigerian graduates of tertiary institutions informed the establishment of SIWES by the ITF in 1973 (SIWES, 2002). The scheme allows students to gain industry based skills necessary for transition from classroom to the world of work and affords them the opportunity of being familiarised and experienced in handling machinery and equipment (ITF,

2002; Chodozie, 2009). It can be adduced from Mafe (2009) that there are two basic forms of learning; education and training, both of which are indispensable to the productive world of work and the functioning of society today.

Skill Acquisition and Productive Performance in Technical Vocational Education and Training (TVET)

Skill acquisition is a process of utilising one's cognitive skills (thinking) alongside physical abilities to learn how to execute actions that were previously unknown in a gradual developmental process (Huitt, 2011). TVET is concerned with acquisition of knowledge and skills for the world of work to increase opportunities for productive work, sustainable livelihoods, personal empowerment and socio-economic development in knowledge economics. Contemporary needs for employment requires meeting demands of societies, thus the need for a combination of knowledge, practical and social skills that includes positive attitudes and the ability to adopt to rapidly changing work environments (Amasa, 1995; Krönner, 2006; Dangana, 2011; Nse 2012). There is need to examine important matters relating to changing world of work; the extent of appraisal process effectiveness and the relationship of the rating tools to the specific field of study/vocation being trained for post-graduation assimilation (as cited in UNESCO, 2004).

Technical Vocational Education and Training (TVET) Skill Acquisition in Architectural Training and its Relevance.

Professionally, an architect's decisions affect public safety, and thus an architect or architect technologist must undergo specialised training consisting of advanced education and a *practicum* (or *internship*) for practical experience to earn a license to practice architecture at whatever level of proficiency. The practical, technical and academic requirements for becoming an architect vary by jurisdiction (Architect Act, 2006;). For this research, it is the place of technical-practical skills on academic learning environment that is the desire of this inquiry.

The definition of Architecture according to the Architects Registration Council of Nigeria (ARCON) amended decree section 13 of 1990 states:
"Architecture as the art and science in theory and practice of design, erection, commissioning, maintenance, management and coordinating of allied professionals thereto of buildings or parts thereof and the layout and master plan of such building or groups of building forming a comprehensive institution establishment or any other neighbourhood as well as any other organized space, enclosed or opened, required for human and other activities." (as cited in Federal Government of Nigeria [FGN], 1990).

Architecture does not only involve teaching theory, but it is a verb 'doing word' which requires training to apply the assumptions being taught. Historically and from the definitions above, it is clear that the training of architects is centred on demonstration of the trainee's practical competency in actual work environment and not only the acquisitions of certificates as has been variously affirmed (FGN, 1990; Doshu, 2005;).

The strategic place of Technical Vocational Education and Training (TVET) for National development cannot be attained without an appropriate curriculum (Abubakar & Mohammed, 1999; Abubakar, 2001; Maigida, *et al.*, 2013). NBTE (2009) further clearly stated that curriculum of all National Diploma (ND) and Higher National Diploma (HND) programmes are consisting of four main components that include; General Studies/Education, Foundation Courses, Professional Courses and Supervised Industrial Work Experience Scheme, this is however being currently reviewed. TVET is a concept that has reassessed the blooms taxonomy of learning from its noun to verb form where more active form of thinking is emphasised (Harrow, 1972; Krathwohl, *et*

al., 1973; Huitt, 2011). It has set the basics for review of the current curriculum on architectural technological training under NBTE guidance.

The architectural technologist is supposed to be complimentary to the university graduates and not competing or struggling in a conflicting role definition. It is quite important to establish possible variance in required training skill depending on the institutional objectives. Specifically, these greatly determine the nature and form of the SIWES experience required of each trainee accordingly. Polytechnic trained graduates in architecture are supposed to acquire practical skills in drafting, model making, perspective drawing and data collection, while having an understanding of organisational pattern and functional system of an architectural-based establishment. They should also be familiar with general office procedures in the establishment, appreciate basic building site organisation and operations, including production of a technical report on the specific experience during the SIWES (adapted from NBTE, 2009:150). Currently there are no definite differences in assessment of university and polytechnic or colleges of education trainees; this greatly negates the individual institutions mandates and their specific objectives.

The current observed skill capacity of most polytechnic graduates and above all the attitudes of those that have successfully undergone SIWES training in addition to the other relevant educational requirements has become a source for concern. The scored performance of the generality of students does not seem to be a reflection of the exact reality of the competency acquired by the individual after the requisite training. It has been variously demonstrated that most of the firms have in place requisite equipment and qualified industry base supervisors to expose the students on methods and techniques in handling equipment and machinery in the industry (Doshu, 2005). The challenge of this study is the appropriateness and effectiveness of rating of activities vice-a-vice, the high scores and the constant public and professional concern on the poor skill acquired by graduates of architecture at all levels. In other words, how the rating of SIWES does during architectural attachment relates to actual meaning and essence of architecture as defined by ARCON.

SIWES and indeed TVET based programs have to be responsive to the emerging needs, concerns and issues for employment, since without TVET being relevant and responsive to skills needs in the workplace, there is the danger of learners completing their education and training without employable skills and knowledge. Hence, it is common practice in a number of countries to undertake periodic reviews of their TVET system (Adapted from Vocational Education Research [VOCED], 2012). It is in this light that current efforts by NBTE to review curriculum of all courses to conform to broad and specific goals needs that can guarantee true competency is commendable.

Strategies for Enhanced Performance of SIWES Skill Acquisition Techniques on TVET Programs.

In recent years there seems to be a paradigm shift towards practical skills training and also craving for innovation, hence the need to make TVET more attractive, effective and efficient (Abban & Quarshie, 1996; Bhuwanee, 2006; Anaele, 2014). According to African Union (2007) it is expected that TVET will promote skill acquisition through competency-based training. Hence the strategic place of trainees' proficiency in any particular chosen field of endeavour. TVET system and programmes need to remain relevant therefore should continually be renewed to the changing demands of the workplace and adaptable to the contemporary challenges of training in the relevant field of studies. Also the technological innovations and dynamics of employment must always be at the centre of all

strategies for enhanced performance (Aswaju, 1972; Chidozie, 2009; Dasmani, 2011). While evaluating makes judgments about the values of ideas or materials; creating that is advocated by TVET builds a structure or pattern from diverse elements. This diversity is the current crux of thinking, innovation and change in all fields globally (Pohl, 2000). This concept being central to TVET should be adapted into our education and training of Architecture technologist.

"While education is the key to any development process, TVET is the 'Master Key' that can transform the world of work and the economy, alleviate poverty, save the environment and improve the quality of life" (UNESCO, 2009).

Whatever policy and practice changes are adopted for TVET, the following comments seem pertinent because TVET institutions, like others, cannot be operated in isolation: Recognising that the vast majority of the worldwide labour force, including knowledge workers, require technical and vocational skills throughout life; the skills development leading to age-appropriate TVET are integral to education at all levels, and can no longer be regarded as optional or marginal. It is especially important to integrate skills development in Education for All (EFA) programmes and to satisfy TVET demand created by learners completing basis education.

The Relevance of SIWES to TVET Programs and Architectural Training and Practice.

Practical skill acquisition can be hampered by inadequate supply of instructional materials, large class size, inadequate training facilities and the glaring weak linkage of training institutions with local industries for hands-on-experience for both instructors and the trainees. This had entrenched the ineffective and inefficient training of students on TVET programs, thereby leading to more emphasis on passing final exams only (Dasmani, 2011).

Basically there are available various training options for TVET programs, that may include, ministry or agency supervised institutions, workplace based training and currently most suitable the combined multiple type training that includes sandwich and dual systems. Monitoring and evaluating TVET performance and identifying the possibilities for improving its quality and coverage require an understanding of the nature of TVET, its functions, goals including key characteristics. This is where the SIWES clearly comes to play and a suitable adaptation in all sectors of TVET will be most advisable for a guarantee development.

Methodology

The research adopted the use of historical and descriptive survey designs, this is because both past researches and the opinion of people on the subject under study was required (Awotunde & Ugoduluwa, 2004; Bukar, 2005; Centre for Innovation in Research & Teaching [CIRT], 2012). The study was conducted at the Department of Architecture College of Environmental Studies, Kaduna Polytechnic, Barnawa-Kaduna. The College of Environmental Studies is one of the five colleges in Kaduna Polytechnic, made up of two schools namely the School of Environmental Design and School of Geodesy and Land Administration with total of eight departments in all. Department of Architecture is one of the four departments in the School of Environmental Design.

The major subject or respondents of this study included the National Diploma (ND) students in the Department of Architecture of Kaduna Polytechnic which is about 247 (ND2-85; HND1-78; HND2-84) from (Departmental Admission and Registration Records, 2014), the institutional (departmental) supervisors that are thirty two (32) from staff disposition list of the department and 15 industry/firm base supervisors within Kaduna metropolis that had supervised some ND students or graduates from the Department of Architecture during their SIWES programme.

The study adopted the stratified random sampling to collect data from the three major strata of the students that have undergone SIWES program at various levels, academic staff that have supervised SIWES students and the industry base supervisors from building industry firms that are within Kaduna metropolis and had supervised ND architectural technology students from Kaduna Polytechnic. This sampling technique was adopted to allow proportionate representation from each of the groups being studied (Awotunde & Ugodulunwa, 2004; Bell, 2010). According to Barttett (2001) assuming a confidence level of ninety-five percent (95%) and confidence interval of five percent (5%) the sample size for the student's respondents to be used is one hundred and thirty two (132) respondents. However, considering the limited number of the population of the institutional and industry base supervisors, about half of them were used as the sample towards ensuring adequate and varied responses. It is worthy to state here that only industries where these Kaduna Polytechnic students of Architecture had undergone SIWES training under their supervision were considered amongst the firms/industries within Kaduna metropolis.

Structured questionnaire was used for the research and it clearly covered the various effects of TVET skills acquisition techniques adapted during SIWES training; suitable techniques for skill acquisition in architectural training and practice. Personal experiences and discussion with industry base supervisors, SIWES unit of the institution and departmental SIWES officer also formed part of data collected. The modified Likert scale of four points was used and preferred towards ensuring specific response that are explicit and illuminating (Dallas, 2006:292).

The research instrument was validated first on its face value with respect to the SIWES component and general appropriateness with the SIWES unit of the Polytechnic and the departmental SIWES officer. The specific content validity of the questionnaire was by experience experts in the field of architectural training and practice including a competent and experienced statistician respectively. The research used the reliability coefficient of 0.7 or more as basis to confirm the instruments reliability. In administering the research instrument, research assistants were employed and liaised with accordingly, right from the commencement of the research study up until when the data was collected. All data collected from the study was analysed using descriptive statistical analysis through tables and chart with the aid of the Excel package and Statistical Package for Social Science (SPSS) package 20. The four-point rating scale was used which shows that response 1 is Highly Insignificant, 2-Insignificant, 3-Significant and 4-Higly Significant.

Findings

From Table 1 it was identified by most respondents with respect to General Skills that SIWES enhances Good Work Ethics at significant mean response of 3.36 while the least influenced of TVET skill acquisition techniques during SIWES is particularly Basic Literacy being at a significant mean response of 2.97. Both the least and highest mean responses showed that the identified parameters on TVET skill acquisition stated above which were enhanced using SIWES are mostly considered as being significant.

Table 1: Mean Response on Enhancing General Skill Acquisition Techniques Using SIWES

General Skills Aspects	N	Sum	Mean
Basic Literacy	100	297	2.97
Basic Oral Communication Skills	100	306	3.06
Numeracy Skills	99	305	3.08
ICT Skills	100	324	3.24
Honesty and Integrity	100	328	3.28
Good Work Ethics	100	336	3.36
Punctuality	100	325	3.25
Adaptability and Flexibility	100	303	3.03
Team Working Spirit	99	309	3.12
Etiquettes and Good Manners	100	315	3.15
Self Confidence	100	322	3.22
Appropriate Dressing	100	304	3.04
Networking Skills	100	303	3.03
Valid N (list wise)	98		

Table 2 shows that Management Training and Office Procedures Skill Acquisition Techniques is being improved majorly in an observed definite management and organisational pattern of the industry/firm at 3.06 mean response and least enhanced during SIWES in an observed deficient skill acquisition of architectural and project management services delivery during tendering and award stage at 2.81 mean response. Both the least considerable and the most considerable parameters with respect to Management Training and being familiar with Office Procedures are here considered as significant by most respondents.

In Table 3 the mean response of 2.82 least importance was computed as response for model making skills acquired during SIWES in terms of drawing, cutting and assemblage; while the most enhanced skill acquisition techniques was considered as design/drafting skill acquired using computer during SIWES at 3.29 mean responses. Considering the overall responses, it can be adduced that practical/technological employability skill in acquiring practical skill on tools application was adjudged as being significant by most respondents.

Table 2: Mean Response Enhancing Management Training /Office Procedures Skill Acquisition Techniques Using SIWES

Management Training /Office procedures Aspects	N	Sum	Mean
Organogram that outlines hierarchy in management of the industry/firm	100	291	2.91
Observed definite management and organisational pattern in the industry/firm during SIWES	100	306	3.06
Perception of the functional management system of the architectural-based establishment during SIWES	100	296	2.96
There was observed deficient skill acquisition of architectural and project management services delivery at design stage during SIWES	100	300	3.00
There was observed deficient skill acquisition of architectural and project management services delivery at tendering and award stage during SIWES	100	281	2.81
There was observed deficient skill acquisition of architectural and project management services delivery at post construction period	100	291	2.91

during SIWES			
There was observed deficient skill acquisition of architectural and project management services delivery at post construction period during SIWES.	100	289	2.89
Valid N (list wise)	100		

Table 3: Mean Respondent Enhancing Practical/Technological Employability Skill Acquisition Techniques Using SIWES (Acquired Practical Skills in Tools Application).

Practical/Technological employability skill: Acquired practical skills in Tools Application.	**N**	Sum	Mean
Design/drafting skill acquired using computer during SIWES	100	289	2.89
Design/drafting skill acquired using computer during SIWES	100	329	3.29
Model-making skills acquired during SIWES (drawing, cutting and assemblage).	100	282	2.82
Perspective drawing/3-D computer modelling skills acquired during SIWES.	100	311	3.11
Data collection skill and analysis technique in case studies for specific design was attained during SIWES.	100	309	3.09
Data collection skill and analysis for specific design and report purposes (literature reviews and relevant sketches) during SIWES.	100	301	3.01
SIWES as an integral component of architectural training program curriculum.	100	315	3.15
Valid N (list wise)	100		

From Table 4 the computed mean response of 2.72 was the least with respect to extent of perceived aptitudes in terms of carpentry/woodwork activities and or workshop usage during SIWES. The work out figure however that was most considerate base on respondents mean response was 3.21, as being significant. From the least and most considerate response, it can be adduced that the mean response with respect to practical/technological employability skills is generally considered as significant by most respondents.

Table 4: Mean Response on Enhancing Practical/Technological Employability Skill Acquisition Techniques Using SIWES (Perceived Utilization of Critical Training Facilities).

Practical/Technological employability skills: perceived utilization of critical training facilities during SIWES	N	Sum	**Mean**
Extent of perceived aptitude in terms of structures and materials laboratories usage during SIWES	100	273	2.73
Extent of perceived aptitudes in terms of modelling activities and or workshop usage during SIWES.	100	282	2.82
Extent of perceived aptitudes in terms of carpentry/wood activities and or workshop usage during SIWES.	100	272	2.72
Extent of perceived aptitudes in terms of block laying and concrete activities and or workshop usage during SIWES.	100	285	2.85
Extent of perceived aptitudes in terms of mechanical/electrical activities and or workshop usage during SIEWS.	100	291	2.91
Extent of perceived aptitudes in terms of architectural/computer studio activities during SIWES (using various BIM tools, i.e. AutoCAD, Revit, etc.).	100	321	3.21
Extent of perceived aptitudes in terms of photographic studio activities during SIWES (using cameras and processing the prints).	100	301	3.01
Extent of perceived aptitudes in terms of jury presentation involvement during SIWES (using traditional methods and contemporary IT tools, i.e. PPP, projector, etc.).	100	278	2.78
Extent of perceived aptitudes in terms of architectural/surveying equipment activities and or during SIWES.	100	280	2.80
Extent of perceived aptitudes in terms of duplicating/printing	100	277	2.77

facilities usage during SIWES.	
Valid N (list wise)	100

Source: Authors Field Survey (2015)

The four variables administered on enhancing TVET Skill Acquisition Techniques with respect to General Skills, Management Training, Office Procedures, Tools and Facilities Application during SIWES did indicate a mean response level as being significant by most respondents considering all parameters.

Discussions

(a) The most noteworthy aspect/factor TVET skill acquisition techniques based on general skills during SIWES was considered as Good Work Ethics, with the least important effect as Basic Literacy.

(b) The least improved TVET skill acquisition techniques during SIWES with regard to management training and office procedures is in the observed deficient skill acquisition of architectural and project management services delivery during tendering and award stage. However, the most considerable aspect is in the observed definite management and organisational pattern of the industry/firm.

(c) The least important enhanced TVET skill acquisition techniques in practical/technological employability skill for tool application was in model making skills acquired during SIWES in terms of drawing, cutting and assemblage; while the most important effect was considered as design/drafting skill acquired using computer during SIWES.

(d) The enhanced TVET skill acquisition techniques in practical/technological employability in terms of perceived utilization of critical training facilities during SIWES was most momentous in the extent of perceived aptitudes in terms of architectural/computer studio activities. It was however least considerate in the perceived aptitudes in terms of carpentry/wood work activities and workshop usages.

Conclusion

TVET skill acquisition techniques base on general skills during SIWES was considered most noteworthy in good work ethics, while for management and office procedures was most considerable in the management and organisational pattern of the industry/firm. Furthermore skill for tool application has most important effect in design/drafting skill acquired using computer during SIWES and perceived utilization of critical training facilities during SIWES was most momentous in the observed extent of perceived aptitudes in terms of architectural/computer studio activities by all respondents. In similar vein, Maigida, *et al*. (2013) as well as Abdullahi and Mohammed (1999) did appropriated enhancement of TVET training to adapting relevant component units of activities. Also Harrow (1972), Krathwohl ‘et al’, (1973) and Huitt (2011) advocates TVET building structures or pattern for various elements.

Recommendations

- The government should prioritize giving jobs to the indigenous industries so that these industries will have the willingness, opportunity, manpower and courage to accommodate students for Industry Training (IT).
- Adopt and implement policy frameworks that will foster innovation in the building sector, supporting and enabling sustainable training and practice in TVET orientated courses.
- Industries should foster changes in their production pattern and educate the students on the new methods/techniques and the benefits to ensure long-term performance and passage of the knowledge or ideas.
- The industries should help boost the practice by providing placements for

students to participate and carry out trainings.

- Well thought and mapped out objectives and training plan/goals should be provided by the industries on the training for the students in liaison with ITF for better skill acquisition technique amongst trainee.
- The polytechnic and architecture education regulator bodies that is National Board for Technical Education (NBTE), Nigeria Institute of Architects (NIA) and Architects Registration Council of Nigeria (ARCON) should ensure that the curriculum of architectural training are updated to match with international best practices, the world of work and to include leadership training and management capabilities abilities.
- Institutions should ensure that the students participate in the industrial training by paying visits to the places of attachment since the effective training of the students during those periods aids teaching and learning process. This in turn is beneficial to the student who is placed in a better pedestal for self-reliance, the institution having better products that are ready for employment and general development of the nation.
- The students should be mandated to go for SIWES on relevant skill training and should be effectively monitored and assessed by both the institutions and industries.

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