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## SCAFFOLDING TEACHING A PATHWAY TO IMPROVING STUDENTS' ACADEMIC ACHIEVEMENT AND RETENTION IN WELDING AND FABRICATION TRADE IN TECHNICAL COLLEGE IN NORTH-CENTRAL NIGERIA.

OLATUNDE, ENIOLA OLUWAFEMI, ATSUMBE, BERNARD NUMGWO AND SABA,  
TSWANYA MOSES

*Department of Industrial and Technology Education, Federal University of  
Technology Minna, Niger State, Nigeria*

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### ABSTRACT

*The study investigated the effect of scaffolding teaching technique on students' academic achievement and retention in welding and fabrication trade in technical colleges in North-Central Nigeria. Two research question formulated to guide this study. The study adopted quasi-experimental research design. The population of the study was 54 students from four technical colleges in Niger and Kogi state, and the sample size was manageable. The instrument for data collection was 40 multichoice questions in line with the lesson plan that was used to train the student developed by the researcher. The instruments were validated by 3 experts. Cronbach alpha was used to determine the internal consistency of the instrument and a reliability index of 0.75 was obtained. Data collected was analyzed using SPSS, mean average was used to answer the research question. The findings of the study revealed that the students had the highest performance when they were taught with scaffolding teaching technique. As it was further revealed that the students taught with scaffolding teaching technique retained more than other students. It was recommended amidst others that attention should be given to teaching technique that involves student-centered learning like scaffolding teaching techniques in welding and fabrication trades and other vocational subjects.*

*Keywords: scaffolding, modelling, achievement, retention.*

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### Introduction

Institutions of all kinds are built to train, engage and train her students such that upon graduation they all can be equipped, qualified and essential people to their selves, homes, community and the society at large. Technical Colleges are

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designed to equip the beneficiaries for self-employment, economic self-sufficiency and employment generation through short or long-term training. This has led most African countries including Nigeria to realize that training in Technical colleges is necessary to alleviate poverty through acquisition of skills (Edmond, Stephen, & Obed, 2016). Welding and fabrication one amidst the trades taught in technical colleges is the building, shaping and assembling of a metal product, equipment, or machine from raw metal stock into processed products for use by people or companies of various kinds. This trade is taught to make the students better and infuse in them the necessary skills needed for efficient livelihood in their community and the nation at large. However, to accomplish this task the need for appropriate teaching technique can't be over emphasized. Over the years the conventional teaching technique is what has been used to teach and train student of all fields and various occupations and trades, this has proven to be questionable because not everyone can learn at the same rate also not all subjects or trades have the same requirements. This has prompted the researcher to look into the comparative effect of scaffolding and modeling teaching techniques as elements of cognitive apprenticeship on how it can affect the students' achievement in the study of Welding and Fabrication Trade practice.

The concept of cognitive apprenticeship over the years has been looked into, although modified at some extent to suit the need at each trade. As stated by Brown and Stefaniak 2016, cognitive apprenticeship is a framework outlining the methodology for teaching complex cognitive tasks through guided learning, outlined elements of cognitive apprenticeship are modeling, coaching, scaffolding, articulation, reflection and exploration. Scaffolding is a metaphor for a structure that is put in place to help learners reach their goals and withdrawn gradually as sees fit (Ueno & Miyazawa 2017). Scaffolding teaching technique consists of teaching new skills by engaging students collaboratively in tasks that would be too difficult for them to complete on their own, teacher initially provides extensive instructional support, or scaffolding to continually assist the students in building their understanding of new content and process. Once the students internalize the content and or process, they assume full responsibility for controlling the progress of a given task. The temporary scaffolding provided by the teacher is gradually removed to reveal impressive permanent structure of student understanding of the content.

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Modeling another element of cognitive apprenticeship is best described as when a subject observes someone (a model) and then repeat/practice alone what they have seen learnt from the model observed. In the view of Markovych and Bazhanova (2017), modeling is a technique of serving as a model. They stressed further that a model is a tangible embodiment of an idea or ideal (a product). Similarly, modeling is a form of demonstration followed by imitation, and in a way, it's a means of helping the learner progress through the teaching and learning process (Endeley 2014). Donnelly and Karsten (2017) showed that modeling is a more efficient way for meaningful learning than trial and error. Using modeling technique as a teaching technique is seen where the observer/student gets' to observe the learner the teacher or instructor put into practice what they know and from there gain the basic knowledge of what the skill or operation entails and from such, the learner then imitate the teacher/instructor in doing what they have observed in doing so they gain and over time have mastery over such skills and are then become expert in such fields. Academic achievement can be defined as excellence in all academic disciplines, in class as well as extracurricular activities. Evaluation of educational achievement is indispensable for effective formal and even non-formal education|| (Kpolovie, Joe, & Okoto, 2014). Academic achievement is the outcome of education as it indicates the extent to which the student, teacher, curricular and indeed the educational institution has achieved the 'predetermined educational goals. Academic achievement and retention need to work hand in hand for students to be more productive in their fields especially welding and fabrication course.

Welding is a way of joining two or more pieces of metal together permanently. Welding is act, specifically comprising a wide range of bonding techniques. Welding is a process of permanent joining two materials (usually metals) through localized coalescence resulting from a suitable combination of temperature, pressure and metallurgical conditions (Olubode 2009). Also, fabrication is the evolutionary process of creating a metal product, from layout and design to formation and finishing (Kaempff & Harris 2016). In conjunction welding and fabrication is the process of creating and producing new metal products through the process of joining two materials together especially metal products for the making and development of new materials that are beneficial for man and humanity at large.

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## Statement of the Research Problem.

Manufacturing and production of various metal products and machines have been essential necessity for good economic development, this can be attained through equipping graduates with all the required and needed technical know how they require to be productive and this can attained by efficient training of technical college students' such that upon graduation they can be gainfully employed or outrightly become employers of labour. However, students' performance has experienced major setbacks in the recent past in Nigeria. As noted in the NABTEB Chief Examiner's Report (2016), student's performance has been very poor, especially in metalwork related courses such as welding and fabrication, fitting and machining, foundry, and other related areas. This has resulted in graduation ineffective craftsmen from technical institutions, several factors, that could be responsible for the poor performance of students in this field and lack of sellable skills to enable them become gainfully employed or even employers of labour, some researchers clearly point out what could have caused this. Atsumbe and Raymond (2012), Umar and Ma'aji (2010) attributed poor students' performance to lack of training facilities, teacher competency and subject delivery system. They however stressed that prominent among these factors is methodology of subject content delivery. From the above drop it is in this light that the researcher seeks to investigate the effect of scaffolding on students' academic achievement and retention in welding and fabrication trade course.

## Review of Literature

Alake and Ogunseemi (2013) conducted a research on effects of using scaffolding strategy on the academic achievement of students in integrated science in the Junior Secondary School (JSS). With the objective of determining the relative effectiveness of scaffolding strategy on the academic achievements of JSS 2 students in two Local Government Areas of Ekiti State. The Findings of the study revealed that students exposed to scaffolding strategy performed significantly better than their counterparts who were exposed to traditional method. Also, students of schools in urban locations had better academic achievement than their counterparts in rural locations. Sarkin and Mohammed (2016), studied effects of scaffolding technique on academic performance of students in peace education in Colleges of Education in Nasarawa State, Nigeria. The study was aimed at inculcating in learners the right type of attitude, knowledge, and skills

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to help them resolve conflicts using non-violent approach. From the study of Sarkin and Mohammed it was revealed that: Scaffolding Technique is effective and more superior to the conventional teaching approach in the teaching of peace education. Also, Scaffolding enhances students' academic performance through cooperative, autonomous, and independent learning. These report points out that scaffolding teaching technique is effective and has good influence on the students' academic achievement this will help them become effective and successful in their endavours especially welding and fabrication trade course.

Ubah (2013) researched on the effects of film-modeling and direct-teaching techniques on self-concept of schooling adolescents. Ubah sought to specifically determine the effects of Film modeling and direct teaching as counseling techniques on Physical self-concept of schooling adolescents, Moral self- concept of schooling adolescents and Social self- concept of schooling adolescents. Ubah discovered that the students exposed to direct teaching technique and film modelling techniques each performed better than the control group on the acquisition of physical, moral and social self-concept. Further, it was discovered from the results that film modelling technique proved more effective than direct teaching for improvement of moral self-concepts of schooling adolescents.

Okoronkwo (2016) carried out a study on the effects of modeling and self-management techniques on quarrelsome behaviour of secondary school students. the aim of Okoronkwo study was to determine the effects of modeling and self-management techniques on quarrelsome behaviours of secondary school students in the Federal Capital Territory, Abuja. The findings discovered from Okoronkwo study was that secondary school students with quarrelsome behaviour that were exposed to modeling and self-management strategies had significant mean reduction in their quarreling behaviours after the treatment while students with quarrelsome behaviour that were exposed to convectional counselling did not have significant mean reduction in their quarrelling behaviour. It is imperative from the study carried out by other researchers that modelling teaching technique is also an effective teaching technique which will greatly improve the achievement of the students once they are exposed to such and this will make them better in their endavours. However, it is necessary to differentiate which amidst these two-teaching technique is best for training students of welding and fabrication trade, especially in the North-Central region of Nigeria.

### Research Questions

The following research questions were raised to guide the study:

1. What is the effect of scaffolding and modelling teaching technique on students' achievement in welding and fabrication?
2. What is the effect of scaffolding and modelling teaching technique on students' retention in welding and fabrication?

### Research Methodology

The study adopted experimental research design, specifically quasi-experimental research. In view of Mitchell (2015) quasi-experimental research seeks to isolate and control every relevant condition which determines the events investigated and then observes the effects when the conditions are manipulated. Quasi-experimental, specifically, the pre-test, post-test, non-equivalent control group was adopted. The study was carried out in North-Central Nigeria, specifically Kogi and Niger State. The population of the study was 54 which made up of 4 technical colleges 2 in Niger state and 2 in Kogi state, the schools were Federal Science and Technical College Kuta, Government Technical College Minna, Government Technical College Obboroke, Government Technical College Mopa. All the students offering welding and fabrication trade course from pre-test to determine their initial knowledge and then the lesson plan which had the Scaffolding teaching technique was used to teach the student for the space of five (5) weeks after which achievement test was conducted. Data was collected using a structured welding and fabrication achievement test (WFAT) and Welding and fabrication retention test (WFRT). Statistical Package for Social Sciences (SPSS) version 20 was used to analyse the data. The data that was collected from respondents was analysed using the pre-test, post-test mean gain of the treatment group was computed to determine the effect of the teaching techniques on students' academic achievement and retention. The mean statistics was used to answer the research questions while ANCOVA was employed to test the null hypotheses at 0.05 level of significance.

### RESULT

#### Research Question One

What is the effect of scaffolding on students' achievement in welding and fabrication?

Table 1: Mean of Pre-test and Post-test scores of Scaffolding and Modeling teaching techniques on students' achievement in Welding and Fabrication Trade

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| S/N | Teaching Methods | N  | Pre-test | Post-test | Mean Diff. |
|-----|------------------|----|----------|-----------|------------|
| 1   | Scaffolding      | 54 | 15.35    | 34.09     | 18.74      |
| 2   | Modeling         | 54 | 15.54    | 33.85     | 18.31      |

Table 1 shows the achievement score of students on Welding and Fabrication using Scaffolding and Modeling teaching techniques. Data on modeling technique had achievement scores (pre-test 15.54 and post-test 33.85) with achievement difference of 18.31. Data on Scaffolding technique had achievement scores (pre-test 15.35 and post-test 34.09) with achievement difference of 18.74. From these results each teaching techniques indicated significant increased achievement of the students. Scaffolding had the highest performance.

## Research Question Two

What is the effect of modeling and scaffolding on students' retention in welding and fabrication?

Table 2: Mean of post-test and Retention scores of Modeling and Scaffolding teaching techniques on students' retention in studying Welding and Fabrication Trade.

| S/N | Teaching Methods | N  | Post-test | Test for Retention | Mean Diff. |
|-----|------------------|----|-----------|--------------------|------------|
| 1   | Scaffolding      | 54 | 34.09     | 31.67              | 2.42       |
| 2   | Modeling         | 54 | 33.85     | 30.57              | 3.28       |

Table shows the retention scores of students taught welding and fabrication trade using Modelling and Scaffolding teaching techniques. Data showed that on modeling technique had achievement score of 33.85 in the post-test and 30.57 in the test for retention of learning. Data on Scaffolding teaching technique had achievement score of 34.09 and 31.67 in the test for retention of learning. From the results each teaching technique indicated significant increased retention of learning students scaffolding retained their learning slightly better than modeling teaching technique.

## Discussion of Findings

The findings from this study as regards research question one revealed that scaffolding and modeling teaching technique significantly increase the academic achievement of the students but the students taught with scaffolding teaching technique had the highest performance in the achievement test followed by the students taught with modelling teaching technique. This is in agreement with

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Alake and Ogunseemi (2013) that discovered that the students exposed to scaffolding strategy performed significantly better than their counterparts who were exposed to traditional teaching method. Also, Sarkin and Mohammed (2016) supports that scaffolding teaching technique is effective and more superior to the conventional teaching approach also, scaffolding enhances students' academic performance through cooperative, autonomous, and independent learning. This will definitely improve the student retention ability because the students taught with scaffolding teaching technique had slightly higher retention than the students taught with modelling teaching technique.

### Conclusion

Technical education has been seen to be an essential tool that can best help transform a country from an undeveloped state to a developed state. This often brought about the need to look out for alternate teaching techniques such as scaffolding and modeling that best suit vocational trades, to teach modern techniques relevant to modern vocations appropriate/relevant for work place skill requirements of industries especially vocational industries. This study has discovered that student centered teaching method such scaffolding and modelling techniques has improved students' academic achievement and retention in welding and fabrication trade in technical colleges. Therefore, the study showed that scaffolding teaching technique is more suitable for teaching welding and fabrication students better than modelling teaching technique. This study will have a prominent influence on the students learning and retaining ability.

### References.

- Edmond, A., Stephen, A., & Obed, O. O. (2016). Assessment of the Adequacy of Material Resources for Effective Teaching of Building Technology: A Panacea for Promoting Entrepreneurial Skills in Rivers State Technical Colleges. *European American Journal*, Vol. 4(Issue 5).
- Brown, J. A. S., & Stefaniak, J. E. (2016). The Design of a Cognitive Apprenticeship to Facilitate Storytime Programming for Librarians. *Contemporary Educational Technology*, 7(4), 331-351.
- Ueno, M., & Miyazawa, Y. (2017). IRT-based adaptive hints to scaffold learning in programming. *IEEE Transactions on Learning Technologies*. v11 n4 p415-428 <http://dx.doi.org/10.1109/TLT.2017.2741960>



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- Markovych, I., & Bazhanova, N. (2017). Prerequisites and Prospects for Creation of Mutually Beneficial Trade Cooperation between Ukraine and India. *ASM's International E-Journal* pp.409-417  
<http://elartu.tntu.edu.ua/handle/lib/24803>
- Endeley, M. N. (2014). Teaching Practice in Cameroon: The Effectiveness of the University of Buea Model and Implications for Quality. *Australian Journal of Teacher Education*
- Donnelly, M. G., & Karsten, A. M. (2017). Effects of programmed teaching errors on acquisition and durability of self-care skills. *Journal of applied behavior analysis*, 50(3), 511-528. <http://dx.doi.org/10.1002/jaba.390>
- Kpolovie, P. J., Joe, A. I., & Okoto, T. (2014). Academic achievement prediction: Role of interest in learning and attitude towards school. *International Journal of Humanities Social Sciences and Education*, 1(11), 73-100.
- Olubode, M. D. (2009). Work skill needs of Fabrication and Welding craftsmen as perceived by related Industries in Kaduna state. Master degree. Department of Vocational Teacher Education. University of Nigeria, Nusuka.  
*Unpublished Thesis.*  
<http://www.unn.edu.ng/publications/files/images/Olubode,%20M.pdf>
- Kaempf O. & Harris F. (2016). Is There A Difference Between Welding and Metal Fabrication? retrieved on 8<sup>th</sup> august 2018, from <https://www.kaempfharris.com/industry-news/is-there-a-difference-between-welding-and-metal-fabrication>
- Atsumbe, B. N., & Raymond, E. (2012). Problems of Implementing Continuous Assessment in Primary Schools in Nigeria. *Journal of Education and Practice*, 3(6), 71-76.
- Umar, I. Y., & Ma'aji, A. S. (2010). Repositioning the facilities in technical college workshops for efficiency: a case study of North Central Nigeria. *Journal of STEM Teacher Education*. 47(3) pp63-85:  
<https://ir.library.illinoisstate.edu/jste/vol47/iss3/6>
- Alake, E. M., & Ogunseemi, O. E. (2013). Effects of scaffolding strategy on learners' academic achievement in integrated science at the junior secondary school level. *European Scientific Journal, ESJ*, 9(19). 149-155  
<http://eujournal.org/index.php/esj/article/viewFile/1548/1555>
- Sarkin, F. & Mohammed, A. (2016). Effects of scaffolding technique on academic performance of students in peace education in Colleges of Education in

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