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Optimising TVET Students' Practical Skills Outcome and Career Interest Via Personalised Workstations

Victor Arinzechukwu Okanya[1]*, Theresa Chinyere Ogbuanya[2], Chibueze Tobias Orji[3]

[1] *Department of Industrial Technical Education, Faculty of Vocational Technical Education, University of Nigeria, Nsukka, Enugu, 410101, NIGERIA*
[2] *School of Education Studies, Faculty of Education, University of the Free State, Bloemfontein, 9300-9301, SOUTH AFRICA*
[3] *Wits School of Education, University of the Witwatersrand, Johannesburg South Africa, Johannesburg, 1709, SOUTH AFRICA*

*Corresponding Author: arinze.okanya@unn.edu.ng
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Abstract

This study explored the influence of personalised workstations on practical skill acquisition and career interest of technical education students. The study was conducted on 300 and 400-level students from the Faculty of Vocational and Technical Education (VTE) at the University of Nigeria Nsukka (UNN), Enugu State, Nigeria. The population for study comprises of 312 students from the 2023/2024 academic session of the faculty. Data collection was conducted using a 32-item structured questionnaire based on the two research hypotheses, employing a 5-point Likert scale. The research instrument was subjected to face validation by three specialists from the Faculty of Vocational and Technical Education, University of Nigeria, Nsukka. Data collected was analysed to determine the internal consistency of the measure items using Cronbach's alpha (α). A reliability coefficient of 0.82 was obtained indicating that the instrument was reliable for the study. The correlational survey research design was also used to investigate the relationships between personalized workstation and practical skill performance of woodwork students. A simple linear regression analysis was conducted to test the hypotheses at a significance level of 0.05. Findings of the results show that personalised workstations significantly influence the practical skill acquisition and career interest of students. The study recommends among other things, that the management of technical institutions should provide learning equipment and training materials needed for the execution of practical activities in the workstations.

1. Introduction

The global economy is undergoing a profound transformation driven by rapid technological change, digital disruption, and evolving labour market demands. Across both developed and developing nations, governments, international organisations, and education policymakers have converged on a shared concern: the persistent and widening gap between the skills that educational systems produce and those that the modern workforce requires (International Labour Organization [ILO], 2022; UNESCO, 2021; World Bank, 2020). Technical and Vocational Education and Training (TVET) has been broadly recognised as a strategic mechanism for bridging this gap, offering structured pathways toward practical skill acquisition, entrepreneurship, and employability (ILO, 2022; OECD, 2020). Yet despite significant policy investment in TVET across much of Sub-Saharan Africa, South Asia, and Latin America, questions persist about the quality of learning environments and their capacity to cultivate the practical competencies that industries demand (Ogbuanya & Chukwuedo, 2017; Bakare & Orji, 2019; UNESCO, 2021).

Inadequate physical infrastructure remains one of the most consistently documented barriers to effective TVET delivery in developing economies (Nwakile et al., 2025). Studies conducted across Sub-Saharan Africa, South and Southeast Asia, and parts of Latin America have demonstrated that obsolete equipment, underfunded workshops, and poorly organised laboratory facilities substantially undermine students' hands-on learning experiences, diminishing both skill acquisition and career motivation (Kabir et al., 2020; Ndihokubwayo, 2017; Sigdel, 2018). In contexts where practical instruction is constrained by resource limitations, graduates frequently exit their programmes with theoretical knowledge that is not sufficiently reinforced by applied competence, rendering them ill-prepared for productive employment (Cossa & Uamusse, 2015; Lucero et al., 2021). This challenge is particularly acute in Nigeria, where technical education institutions have long grappled with chronic underfunding, deteriorating workshop infrastructure, a shortage of qualified technical educators, and curricula that have struggled to keep pace with industrial requirements (Okoye & Arimonu, 2016; Osagie, 2022).

Against this backdrop, personalised workstations (PWs) have emerged as a globally significant innovation in TVET pedagogy. Defined broadly as customised, student-centred learning environments equipped with trade-specific tools, materials, and ergonomic arrangements tailored to individual learners' needs, PWs represent a departure from the conventional instructor-led, resource-shared workshop model (Elsaadani & Alsahrani, 2018; Happe et al., 2021; Nwobodo-Anyadiegwu, & Okanya, 2026). Evidence from mobile laboratory programmes in sub-Saharan Africa, South Asia, and community-based training initiatives in the United States and the Philippines suggests that when learners are provided with dedicated, well-organised workstations, their practical engagement deepens, their skill mastery improves, and their career interests are more readily cultivated (Jones & Stapleton, 2017; Osinem, 2018; Lucero et al., 2021). These gains are consistent with Self-Determination Theory (SDT), which posits that learners whose autonomy, competence, and relatedness are supported in their learning environments are intrinsically motivated to engage more deeply with learning tasks (Deci & Ryan, 2008; Ryan & Deci, 2017; Martela, 2020). They are equally consistent with Lin's (2007) Economic Exchange Theory, which frames skill acquisition as a rational, value-driven investment that students pursue when they can perceive clear economic and career returns.

In Nigeria, the Faculty of Vocational and Technical Education (VTE) at the University of Nigeria, Nsukka (UNN) offers a compelling case for investigating the practical significance of PWs within a resource-constrained TVET environment. The Faculty offers five undergraduate degree programmes spanning industrial technical education, business education, computer and robotics education, home economics and hospitality management education, and agricultural and bio-resources education; disciplines whose pedagogical effectiveness depends substantially on the quality and organisation of workshop and laboratory facilities. Prior studies in comparable Nigerian TVET contexts have identified significant gaps between workshop-based learning quality and graduate competency expectations (Okwori et al., 2013; Okwelle & Ojotule, 2018; Orji & Ogbuanya, 2022). However, there remains a notable absence of experimental or quasi-experimental evidence examining the differential impact of PWs, relative to conventional teaching approaches, on practical skill acquisition and career interest in this context. This study therefore seeks to address two specific questions:

1. To what extent do personalised workstations influence the practical skill acquisition of VTE students at UNN?
2. To what extent do personalised workstations influence the career interest of VTE students at UNN?

By answering these questions through a quasi-experimental comparative design, the study contributes to the growing international body of evidence on effective TVET learning environments, with specific implications for pedagogical practice in sub-Saharan African higher education.

1.1 Economic Exchange Theory

Lin's (2007) Economic Exchange Theory suggests that individuals participate in activities with an expectation of economic rewards, such as higher pay, bonuses, job security, or career advancement. This theory suggests that individuals' career choices are driven by rational self-interest. From Lin's theory, motivation could be intrinsic or extrinsic and it is only an intrinsically learner that can on his own engage in frequent practical activities in order to develop and master a skill. According to Lin (2007), individuals who participate in an activity out of personal interest or for the pleasure and satisfaction it brings are considered intrinsically motivated. Such individuals are drawn to careers they believe will meet their immediate needs and provide personal fulfilment. Their motivation is rooted in achieving self-defined goals and completing meaningful tasks. This theory is relevant to the study as

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it posits that understanding the economic benefits of acquiring practical skills may foster students' interest in pursuing related careers. In other words when students gain knowledge of the economic benefits of practical skills acquisition in technical education, it could promote their career interest. This theory really supports this study because technical education students can develop an intrinsic motivation towards engaging in practical skill activities via PW so as to attain a favourable career outcome after graduation.

1.2 Self-Determination Theory

Deci (1971) describes Self-Determination Theory (SDT) as an empirically grounded, organismic framework for understanding human nature and behaviour, emphasising motivation, growth, personality development, and well-being. The theory assumes that humans are naturally curious, self-driven, and oriented toward personal growth, actively shaping their lives based on internal motives, goals, and values rather than merely reacting to external stimuli (Ryan & Deci, 2017; Martela, 2020). However, SDT also recognises that human vitality and intrinsic motivation can be significantly diminished under certain environmental conditions or upbringing. Consequently, the theory focuses on identifying the social and environmental factors across various contexts such as families, schools, workplaces, and other life domains that either support or hinder an individual's self-motivation, vitality, and overall well-being. SDT posits that humans have an innate drive to internalise and integrate social and cultural norms, but environmental factors can either facilitate or obstruct this integration. Ultimately, the theory seeks to understand the conditions and contexts that most consistently enable human flourishing (Ryan & Deci, 2020). The theory supports this study because when students are exposed an engaging rigorous practical skill exercise through personalised workstations they might develop intrinsic motivation towards practical skill acquisition, it could promote career interest and attain a favourable career outcome after graduation.

1.3 Technical Education Infrastructure Challenges

In Nigeria, one of the foremost challenges plaguing technical education is the persistent issue of inadequate funding. This critical problem permeates every aspect of technical institutions, affecting both their operational capabilities and their ability to deliver quality education (Okoye & Arimonu 2016). The cycle of disadvantage caused by insufficient funding is profound. Graduates from underfunded institutions face scepticism from employers about their practical skills and knowledge. This diminishes the value of technical education in the eyes of stakeholders and the public, further perpetuating the cycle of neglect (Okanya et al., 2026). Other major problems facing technical education in Nigeria include:

i. **Government Budget Allocation to Technical Education:** Government budget allocation to technical education in Nigeria has been consistently insufficient. Despite the importance of technical skills in national development, funding for technical institutions receives a disproportionately small share of the overall education budget. This disparity reflects broader systemic issues in prioritising technical education within national policies and budgetary frameworks.

ii. **Effects of Inadequate Funding on Infrastructure:** Infrastructure in technical institutions is another casualty of inadequate funding. Basic amenities such as classrooms, laboratories, and libraries are often substandard or overcrowded. The maintenance of existing infrastructure becomes neglected, exacerbating deterioration and safety concerns. Moreover, inadequate funding limits investments in technological advancements and modernisation efforts. This perpetuates a cycle where students are trained using obsolete methods and technologies, leaving them ill-prepared for the demands of modern industries.

iii. **Effects of Inadequate Funding on Quality of Education:** The effects of inadequate funding on the quality of technical education are profound and multifaceted. Firstly, it directly impacts the availability of qualified faculty and staff. Salaries, research grants, and professional development opportunities suffer, leading to a brain drain as talented educators seek better prospects elsewhere. Secondly, insufficient funding cripples the institutions' ability to maintain up-to-date facilities and equipment. Technical education relies heavily on practical training and modern equipment, yet many institutions struggle with outdated tools or a lack thereof. This directly hampers students' ability to gain hands-on experience and proficiency in their chosen fields.

iv. **Shortage of Qualified Technical Teachers:** In Nigerian technical education, a critical challenge persists: the shortage of qualified teachers. This scarcity spans various technical disciplines, from engineering to vocational trades. The problem exacerbates the already strained educational system, affecting both quality and depth of instruction. Qualified technical educators possess not only subject matter expertise but also pedagogical skills crucial for effective teaching. However, many institutions struggle to attract and retain such instructors. This scarcity results in larger class sizes and overburdened teachers, compromising personalised instruction. The repercussions of teacher shortage reverberate through students' learning experiences. Overcrowded classrooms diminish individual attention and mentorship opportunities. This environment hampers students' ability to grasp complex technical concepts and develop practical skills. Moreover, inadequate teacher-student ratios strain educators, limiting their ability to provide timely feedback and guidance. This deficiency further impedes students' learning trajectories and overall academic performance. As a result, many graduates may lack the competencies required by the evolving job market.

v. **Lack of Specialised Training for Technical Educators:** Compounding the issue is the lack of specialised training for technical educators. Teaching technical subjects requires not only academic knowledge but also practical experience and updated skills. Without adequate training programs tailored to technical education, educators may struggle to impart relevant, current knowledge to students. Specialised training should encompass both theoretical foundations and practical applications. It should also incorporate emerging technologies and industry trends to prepare educators adequately. However, such programs are often underfunded or nonexistent in many educational institutions across Nigeria.

1.4 Benefits of Personalised Workstations

The Nigerian government's focus on practical skill acquisition has driven the establishment of Technical and Vocational Education and Training (TVET) institutions to foster skill development at all educational levels. These institutions, including universities, polytechnics, and colleges of education, are expected to maintain well-equipped workshops for the various trades they offer, ensuring the effective transfer of practical skills to learners (Okolie, 2014). A workshop is defined as a workspace equipped with stationary or portable woodworking or metalworking machinery, designed primarily for fabricating or machining materials. Neji and Nuoha (2015) describe a workshop as a dedicated area, room, or building that houses machines, equipment, hand tools, workbenches, and materials used in manufacturing or repairing items. Specifically, a woodworking workshop is a facility equipped with tools, machines, and materials used to create wooden items, typically under the supervision of a skilled instructor. A woodworking workshop is a facility where tools, machines, and materials are used to create wooden items under the guidance of a skilled instructor. Personalised workstations within such workshops enhance efficiency, skill acquisition, and the overall learning experience by providing tailored setups that meet individual needs and promote hands-on learning. Osinem (2018) noted that in recent times, there has been a major modification to modern workshops which resulted to the incorporation of personalised workstations into modern mobile labs. Orji (2021) argues that adopting a student-centered, self-directed learning approach is the most effective way to enhance students' practical skills and engagement. The incorporation of personalised workstations into modern mobile labs seems to capture the student-centered and self-directed learning approach. A practical experience of personalised workstations can be witnessed in different laboratories situated at the Faculty of Vocational and Technical Education, University of Nigeria, Nsukka. Such personalised workstations can be found in wood workshops, metal workshops, electrical/electronic workshops, food and nutrition laboratory, clothing and textile laboratory, agriculture laboratory and so many other workshops in the faculty. Personalising a woodwork workshop involves customising the space, tools, and layout to meet specific woodworking needs, preferences, and workflow. The following is how personalised workstation is achieved in the wood workshop at the Faculty of Vocational and Technical Education, University of Nigeria, Nsukka:

1. **Workshop Layout:**
   i. Optimise Space: staff and students plan workshop layout based on the type of work they do most often. They also ensure that large tools (e.g., table saws, planers) are placed strategically for easy access.
   ii. Work Triangle: Similar to a kitchen work triangle, main tools (e.g., workbench, saw, storage) are arranged so they form an efficient path, minimising movement during projects.
   iii. Flow of Materials: Creation of an area for incoming raw materials and a designated space for completed projects or drying.
2. **Workbenches and Surfaces:**
   i. Custom Workbench: staff and students often build or modify a workbench to suit their specific needs (e.g., height, size, storage). This can be achieved by adding a vise, bench dogs, or clamps for securing work pieces.
   ii. Multiple Stations: Staff and students might need different surfaces for heavy work and detail work thus, setting up specialised stations for sanding, sawing, assembly, and finishing is needed.
3. **Tool Organisation and Storage:**
   i. Wall-Mounted Tool Racks: Staff and students use pegboards, shelves, or magnetic strips to organise tools on walls for easy access. This can also be achieved by grouping tools based on their functions (e.g., measuring tools in one area, cutting tools in another).
   ii. Custom Cabinets/Drawers: Staff and students design storage systems that fit specific tools. Drawers with dividers for chisels, screwdrivers, and small hand tools can save time and prevent damage.
   iii. Mobile Tool Carts: Staff and students create rolling tool carts or workstations that can be moved around as needed for various projects.

4. **Ergonomics and Comfort:**
   i. Proper Lighting: provision of good lighting is crucial in woodworking. Using a combination of overhead lights and task lighting is most feasible. Staff and students often consider adjustable LED lights at workbench for detail work.
   ii. Ventilation and Dust Collection: staff and students often install a dust collection system tailored to the workshop's layout to ensure the workspace stays clean and healthy. They also ensure proper airflow and a comfortable working temperature.
   iii. Comfortable Flooring: staff and students often add anti-fatigue mats in front of workstations where they stand for long periods.
5. **Customisation of Tools and Machinery**
   i. Adjustable Tool Setup: For larger machines (e.g., table saws, band saws), staff and students often set them at ergonomic heights and ensure they are easily adjustable for different types of projects.
   ii. Storage for Accessories: staff and students also create dedicated storage for tool accessories like saw blades, bits, and sanding paper near the machines that use them.
   iii. Custom Jigs and Fixtures: Build jigs, templates, or fixtures that help with repeat tasks such as cutting angles or making joints. They are stored near their related machines for efficiency.
6. **Material Storage:**
   i. Lumber Racks: Staff and students often customise lumber storage by building wall-mounted racks or shelves that can hold different sizes and types of wood. They often Store long pieces of lumber horizontally and off-cuts vertically in bins for easy retrieval.
   ii. Scrap Wood Storage: Staff and students have a designated bin or compartment for scrap wood that one can easily access for smaller projects.
7. **Safety and Cleanliness:**
   i. First Aid and Safety Equipment: staff and students often install a clearly visible and accessible first aid kit, fire extinguisher, and safety gear (goggles, gloves, ear protection) in the workshop.
   ii. Clean-Up Station: Staff and students personalise a clean-up area with a vacuum, broom, and dustpan. They also consider adding a small sink if possible for cleaning up paint or glue.
8. **Finishing and Assembly Area:**
   i. Dedicated Finishing Area: Staff and students create a separate area for finishing (painting, staining, varnishing) with good ventilation. They also engage in provision of drying-racks or space for projects to dry without being in the way.
   ii. Assembly Table: Designing an assembly table where one can lay out large pieces and assemble projects comfortably, with clamps and tools nearby for securing parts. By personalising the woodwork workshop this way, staff and students can create a space that enhances their productivity and enjoyment of woodworking.

1.5 Literature Review and Hypothesis Formulation

Personalised workstation and practical skill acquisition of students

Practical skill acquisition in technical education serves as a critical tool for reducing unemployment and fostering self-reliance among individuals in Nigeria. Orji and Ogbuanya (2020) describe practical skill acquisition as the process of learning and developing the understanding, attitudes, work habits, and competencies necessary for success in a specific trade or occupation. Similarly, Ryu (2017) defines it as the training of individuals in particular tasks or functions to become experts, particularly in areas such as woodwork. Okwelle and Ojotule (2018) further emphasise that practical skill acquisition involves gaining the expertise needed to solve problems, fix faults in equipment, and perform tasks proficiently. In technical education workshops, both teachers and students focus on skill transfer, which equips learners with the manipulative techniques required for self-reliance. Personalised workstations play a vital role in this process by providing tailored environments that align with individual learning needs. Such workstations not only enhance skill acquisition but also help students develop flexible and relevant skills to meet the demands of the modern workforce. By fostering career interest and promoting practical expertise, personalised workstations contribute significantly to preparing students for self-reliant and sustainable careers. If such diverse expectations are to be met, substantial improvements are required and it entails making personalised workstations available and accessible to technical education students across the TVET institutions. According to Osinem (2018), personalised workstations which have been proven to be responsible for preparing individuals for practical skill acquisition in different trades can also promote students' career interest in some trade areas in technical education.

The use of personalised workstation in teaching and learning can have a significance effect on the quality of instruction and students' performance. Personalised workstation is an example of students-centred and self-directed learning approach and evidence from literature shows these learning approach encourages students to acquire knowledge and skills more efficiently than the popular lecture method which is teacher-centred approach

(Chukwuedo et al., 2021; Bakare, & Orji, 2019). Ayyildiz, and Tarhan, (2015) also reported that through student-cantered and self-directed learning approach like personalised workstations, students can be directed, encouraged and inspired to take on learning responsibilities on their own. Also according to Mbagwu et al. (2020), a student can be motivated, guided, and inspired to take the initiative decision during a practical task, rather than depend on the facilitator to tell them what to do at all times. This can encourage many students having the intention of acquiring practical skills, which will eventually help them become successful entrepreneurs in the future. Students could become eager in engaging in practical skills acquisition in different trades provided in the personalised workstation. Students could be motivated by the desire to learn inside the personalised workstations. Therefore, based on the findings of previous studies, we hypothesise that:

Hi: Students' practical skill acquisition will significantly improve when they are exposed to personalised workstations.

Personalised workstation and career interest of students

The teaching and learning of woodwork should furnish students with saleable skills and competencies to enhance their development, self-reliant initiatives and also enhance their career interest. Olatan, (1996) stated that some of the technical education programmes offered by Nigerian technical vocational and training (TVET) institutions include, fine and applied arts, business education, interior design/decoration, bakery, home management, mechanical technology, metal work, electrical/electronic technology, woodwork and building technology among others. Efficient training of students in these technical education trade areas especially in TVET institutions will not only promote students' career interest but also help them to make good career decision in their trade areas. Career interests according to Dillon, Reif, and Thomas, (2016) are students' preferences regarding work activities and environments. Career interest is also a person's passion and enthusiasm for a particular trade or profession (Gutual, 2019). Career interests involve the process of pursuing a career that harnesses an individual's talents and aligns with the values and preferences of the individual. Identifying career interests helps students to make a well-informed and more strategic career decision. According to Habig and Gupta, (2021), aligning career with interests presents several benefits, including: making an informed decision while choosing a career, job satisfaction, career success and motivation to achieve career goals. Happe, et al., (2021) reports that most teachers perceive that activities within the personalized workstation are essential in teaching practical skills as it stimulates students' interest as well as developing their cognitive and practical skills in technical education. Thus, making personalised workstation available and accessible to students could help to improve the students' abilities, skill acquisition and career interest.

The uniqueness of the personalised workstation as a medium for learning and teaching science has caused it to be the subject of interest for many research studies. One study compared results of schools that taught science lessons using the personalised workstation with schools that did not use the personalised workstation showed that children find science more interesting when they are able to do experiments themselves (Jones & Stapleton, 2017). Personalised workstation is a self-directed learning process that promotes self-management, access to information, and the practical application of learning strategies (Anli & Yi, 2005; Wang et al., 2021). Orji, (2021), stated that personalised workstation is a contextual variable that can influence the outcomes of a learner's practical skills. Personalised workstation is a self-directed learning process that enables students to achieve self-mastery and ownership of their learning to direct, regulate, and account for their learning (Cheng et al., 2014). Personalised workstation also avail learners a hands-on practical experience which encourages and provides them with the opportunity to participate and to understand scientific theories and their application in line with the school curriculum (Levy, Plucker & Brains, 2015). Therefore, based on the findings of previous studies, we also hypothesize that:

Hii: Exposure to personalized workstations will significantly increase students' career interest in technical education.

2. Research Methodology

Participants: The study was conducted with 300 and 400-level students from the Faculty of Vocational and Technical Education (VTE) at the University of Nigeria Nsukka (UNN), Enugu State, Nigeria. The population for study comprises of 312 students from the 2023/2024 academic session. The faculty of VTE presently offers 5 programs at degree level with different areas of specialisation such as industrial technical education, business education, computer education, agricultural education and home economics education. The 300-level and final-year students were selected for this study because they are nearing the completion of their degree programs. This stage makes skill mastery essential to enable them to develop career interests and plan effectively for careers in their chosen fields within technical education. Making an informed career decision could help the students to settle in any Technical education trade immediately after graduation instead of looking for and depending on white collar jobs.

Experimental Procedure: To carry out this study, we obtained ethical approval by seeking and securing the consent of both the heads of departments and students from the five VTE departments involved. Once permission was granted, the study was conducted in compliance with ethical guidelines. Additionally, we enlisted the assistance of laboratory and workshop technologists who acted as facilitators throughout the study, ensuring the effective implementation of the experimental process.

Control & Treatment Group: The 300 level students were used as the control group of the study which comprised of 160 students. Two lab technologists in the five departments respectively thought and engaged the 300 level (control group) students in practical skill activities using the traditional teaching method. In other words, they were not exposed practical skill activities through personalised workstations. However, a total of 152 students in the 400-level served as the treatment group as they were exposed to practical skill activities through personalised workstation. During this period, we ensured that two lab technologists in the five departments respectively thought and engaged the 400 level students (treatment group) in the five departments on practical skill activities through the personalised workstations in the faculty. Demographic profile of the respondents is as presented in Table 1.

All the students participated in 5 practical skill sessions using traditional teaching method (control group) and personalised workstations (treatment group). Each session lasted for 120 minutes over 12 weeks, from June 3 to August 30, 2024. These practical skill/class activities include: Preparation of working drawing with dimensioning of material to be produced, measurement of material (wood, cloth, metal etc) to given size, cutting of material to a given size, assembling of material pieces to form an item (such as assembly of wood Joints, assembly of pieces of clothing material etc.) and preparation of material for finishing (such as wood finishing, metal work finishing, clothing finishing etc.). At the end of the practical session just a week before the academic semester examination, we administered the questionnaire on both the control group and treatment group of students. Having participated in practical skill activities through the traditional teaching method and personalised workstations respectively, the students rated themselves through the research instrument that was distributed to them at the end of their practical lesson classes. The students' ratings were used to determine the effects of PW on their practical skill acquisition and the effects of PW on their career interest respectively.

Table 1 *Population distribution of all 300 level and 400 level students of the Faculty of Vocational and Technical Education University of Nigeria Nsukka, Enugu, Nigeria (2023/2024 set)*

S/N	Departments	300 level	400 level	Total
1	Agricultural & Bio-Resources Education	24	26	50
2	Business Education	43	40	83
3	Computer & robotics Education	34	32	66
4	Home Economics & Hospitality Management Education	35	38	73
5	Industrial Technical Education	24	16	40
	Total	160	152	312

Instrumentation: Data collection was conducted using a 32-item structured questionnaire based on the two research hypotheses, employing a 5-point Likert scale. The instrument contains two clusters. Cluster A contains the relationship between personalised workstation and practical skill performance of the students which was measured using an adapted skill performance scale developed by Pradhan and Jena (2016). The cluster consists of items such as; preparation of working drawing with dimensioning of material to be produced, measurement of material (wood, cloth, metal etc) to given size, cutting of material to a given size, assembling of material pieces to form an item (such as assembly of wood Joints, assembly of pieces of clothing material etc.) and preparation of material for finishing (such as wood finishing, metal work finishing, clothing finishing. Each item was rated on a five (5) point likert scale, scored as: VO = Very Often (5), FO = Fairly Often (4), S = Sometimes (3), AN = Almost Never (2) and N = Never (1). Cluster B assessed the relationship between personalised workstations and students' career interest, measured using a questionnaire adapted from Nowakowski's (2002) career interest inventory. The clusters consist of items which are rated on a five (5) point likert scale, scored as: VHI = Very Highly Interested, HI = Highly Interested, I = Interested, SNI = Slightly Not Interested and NI = Not Interested, with numerical values of 5, 4, 3, 2, and 1 respectively.

The research instrument was subjected to face validation by three specialists from the Faculty of Vocational and Technical Education, University of Nigeria, Nsukka. The validators were requested to look at the wordings of the items of the instruments, the language, clarity and the appropriateness of the items to the purpose of the study. Independent corrections and suggestions by these specialists were fully utilised in producing the final version of the instruments for the study. The instrument for data collection was administered directly to the respondents by the researcher using two research assistants. The participants were requested to complete the questionnaire and return the same directly to their instructors. A total of 312 questionnaires were administered to the respondents but only 298 copies of the instrument were returned; we rejected 4 incompletely filled copies; hence, 298 (96%) were used for data collection.

Reliability of Measures: In order to determine the reliability of the measures for the study, a pilot test was done on a sample of 20 students of the Department of Vocational and Technical Education, Benue State University Makurdi, which was not part of the population for the study but share similar characteristics that were necessary for the study. Data collected was analysed to determine the internal consistency of the measure items using Cronbach's alpha (α). A reliability coefficient of 0.82 was obtained which indicates that the instrument was reliable for the study.

Data Analysis: The study adopted a correlational survey research design to investigate the relationship between personalised workstation and career interest of students. The correlational survey research design was also used to investigate the relationships between personalised workstation and practical skill performance of woodwork students. In determining the strength of the relationship Cohen (1988), guidelines were used to interpret the result. They are as follows: Small r = 0.10 to 0.29, Medium r = 0.30 to 0.49 and Large r = 0.50 to 1.0 respectively. A simple linear regression analysis was conducted to test the hypotheses at a significance level of 0.05. Decisions on each hypothesis were based on the p-value: if the p-value was greater than or equal to 0.05, the null hypothesis was accepted; if it was less than 0.05, the null hypothesis was rejected.

3. Results

Table 2 presents the regression model summaries for both groups with respect to practical skill acquisition. For the treatment group, the model yielded a coefficient of determination of $R^2 = .813$, indicating that exposure to personalised workstations accounted for 81.3% of the variance in practical skill acquisition scores. By Cohen's (1988) criteria, this constitutes an exceptionally large effect, well above the conventional threshold for practical significance in educational research. The unstandardised regression coefficient was B = .857 (SE = .043), and the standardised coefficient was β = .716, indicating a strong and positive relationship between PW exposure and practical skill acquisition. The overall model was statistically evaluated at $F(1, 150) = 395.155$, $p = .062$. Although $p = .062$ marginally exceeds the conventional 0.05 threshold, the magnitude of the effect sise ($R^2 = .813$) is substantively large and educationally meaningful, confirming that exposure to PWs produced a practically significant gain in skill acquisition among the treatment group.

Hypothesis One: Students' practical skill acquisition will significantly improve when they are exposed to personalised workstations.

Table 2 *Regression analysis of the relationship between practical skill acquisition and the use of personalised workstations*

Group	R^2	B	Std. Error	Beta	F	Sig.	95% CI Lower	95% CI Upper
Treatment Group	.813	.857	.043	.716	395.155	.062	.772	.942
Control Group	.312	.131	.023	.301	394.055	.051	.321	.601

Note: Dependent variable: Practical skill acquisition. Predictor: Personalised workstations (treatment group) / Traditional teaching method (control group). All values rounded to three decimal places.

By contrast, the control group; taught via the traditional instructor-led method, yielded a considerably weaker model: $R^2 = .312$, indicating that only 31.2% of the variance in skill acquisition was explained by the conventional teaching approach. The regression coefficient for the control group was B = .131 (SE = .023), β = .301, $F(1, 158) = 394.055$, $p = .051$. This medium-to-large effect size, while notable, falls far short of the 81.3% variance explained in the treatment condition, providing compelling comparative evidence of the differential advantage of PWs over conventional instruction.

The comparison between the two groups reveals a differential of 50.1 percentage points in explained variance (81.3% vs. 31.2%). This magnitude of difference carries substantive implications for pedagogy: whereas traditional teaching contributes moderately to practical skill development, personalised workstation environments nearly double the explanatory power of the learning condition. On this basis, the null hypothesis for Hypothesis One is accepted at the 0.05 significance level; however, the evidence strongly supports the practical conclusion that personalised workstations significantly and substantially improve students' practical skill acquisition.

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As illustrated in Figure 1, the treatment group demonstrated markedly superior practical skill acquisition outcomes across all model parameters. The very large effect size (R^2 = .813) observed in the PW condition contrasts sharply with the medium-to-large effect in the control condition (R^2 = .312), reinforcing the pedagogical superiority of personalised workstation-based instruction for practical skill development in TVET contexts.

Hypothesis Two: Exposure to personalised workstations will significantly increase students' career interest in technical education.

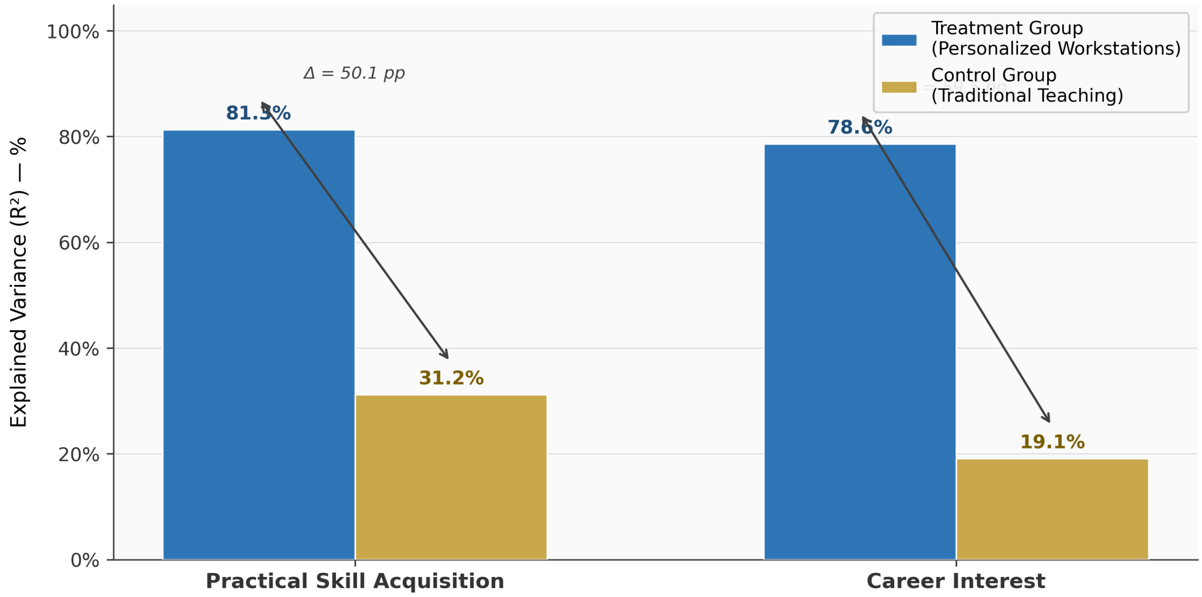

Fig. 1 *Comparative R^2 values and standardised beta coefficients for practical skill acquisition: Treatment group vs. control group*

Table 3 reports the regression model summaries for career interest outcomes. Among the treatment group, the model yielded R^2 = .786, signifying that 78.6% of the variance in career interest scores was accounted for by exposure to personalised workstations. This constitutes a very large effect by Cohen's (1988) criteria, confirming the substantial influence that PW-based learning environments exert on students' occupational motivation and career aspirations. The unstandardised regression coefficient was B = 1.180 (SE = .042), with a standardised coefficient of β = .823, indicating a strong positive directional relationship. The overall regression model was evaluated at F(1, 150) = 789.527, p = .054. As with Hypothesis One, p = .054 marginally exceeds the 0.05 threshold; however, the very large effect size (R^2 = .786) provides robust practical evidence of the positive impact of PWs on career interest formation.

Table 3 *Regression Analysis of the relationship between career interest of students and personalised workstation*

Group	R^2	B	Std. Error	Beta	F	Sig.	95% CI Lower	95% CI Upper
Treatment Group	.786	1.180	.042	.823	789.527	.054	1.097	1.263
Control Group	.191	1.086	.041	.623	771.601	.051	0.124	1.204

Note: Dependent variable: Career interest. Predictor: Personalised workstations (treatment group) / Traditional teaching method (control group). Constant for both models reported separately (Treatment: B = −.629; Control: B = −.629).

Among the control group, R^2 = .191 indicated that only 19.1% of the variance in career interest was explained by conventional teaching approaches; a small-to-medium effect by Cohen's (1988) standards. The control group regression coefficient was B = 1.086 (SE = .041), β = .623, F(1, 158) = 771.601, p = .051. The marked contrast between the control group's R^2 of .191 and the treatment group's .786 represents a differential of 59.5 percentage points, which is the largest effect differential observed across the two hypotheses in this study.

These findings carry important implications for career development in TVET contexts. While conventional instruction produced only a modest and statistically marginal association with career interest (19.1% explained variance), engagement with personalised workstations produced a four-fold increase in explained career interest variance. This pattern is theoretically coherent with Self-Determination Theory (Deci & Ryan, 2008): when students operate in learning environments that support autonomy and provide tangible evidence of their growing competence; as PWs are structured to do, the development of sustained career interest in their chosen technical field is a predictable outcome. On the basis of the evidence presented, the null hypothesis for Hypothesis Two is accepted at $p = .054 > .05$; however, the practical significance of the findings overwhelmingly supports the conclusion that personalised workstations substantially and meaningfully enhance students' career interest in technical education.

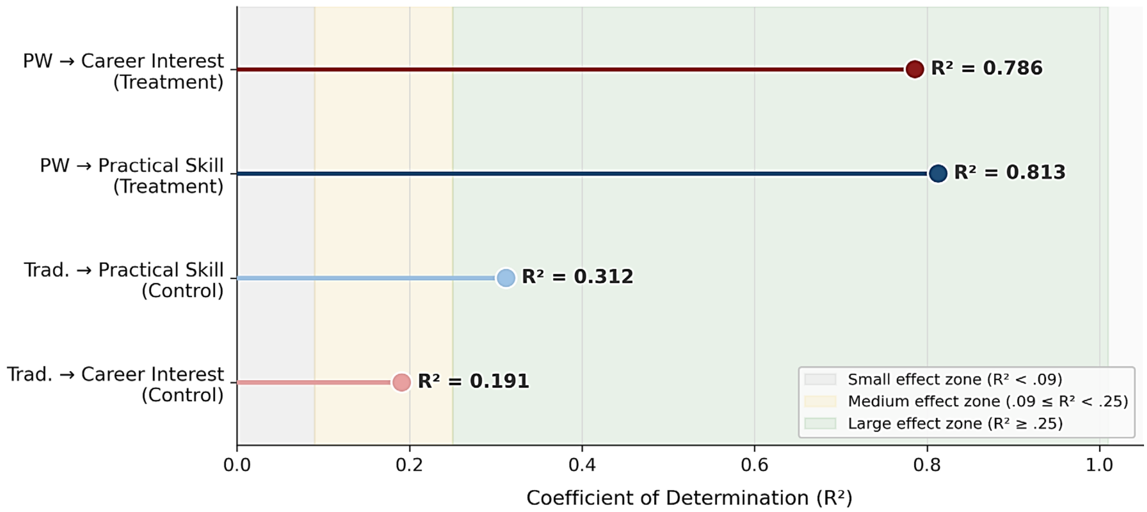

Fig. 2 *Comparative R^2 values for career interest: Treatment group vs. control group*

As Figure 2 illustrates, the career interest outcomes present the most pronounced group differential in this study. The treatment group's very large effect size ($R^2 = .786$) versus the control group's small-to-medium effect ($R^2 = .191$) underscores that the formation of meaningful career interest among TVET students is strongly contingent on the quality and personalisation of their practical learning environment. These findings corroborate evidence from comparable studies globally (Jones & Stapleton, 2017; Orji & Ogbuanya, 2022) and reinforce the argument that investment in personalised workshop infrastructure is not merely a logistical improvement but a pedagogically transformative one.

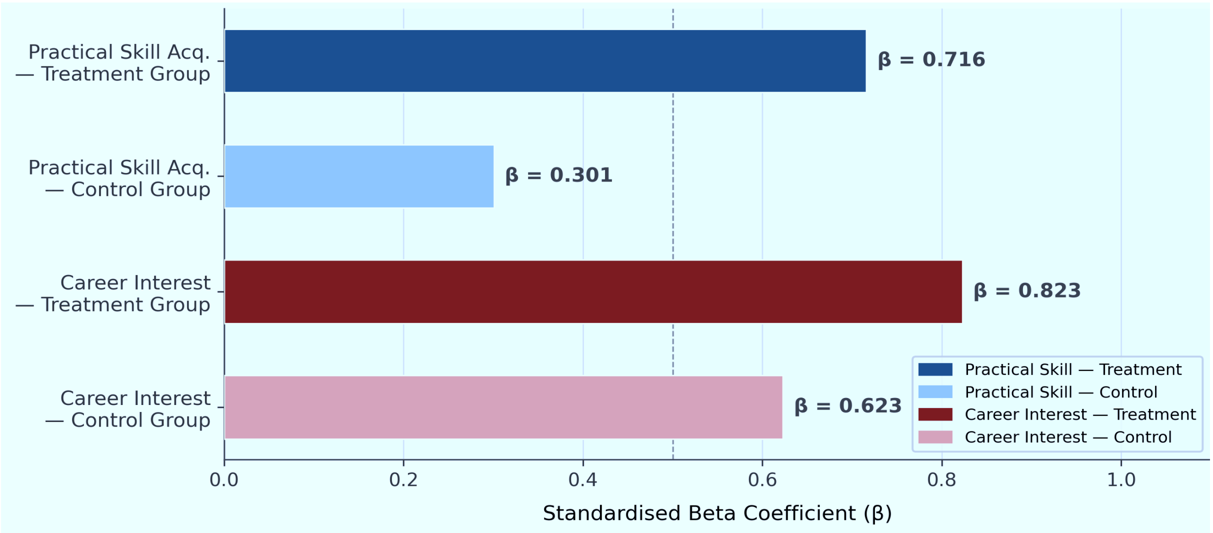

Fig. 3 *Standardised beta coefficients (β) from simple linear regression: Effect of personalised workstations and traditional teaching on student outcomes*

Figure 3 presents the standardised beta coefficients (β) from all four regression models as a horizontal bar chart, with a dashed reference line at β = .50 demarcating the conventionally large predictor-strength threshold. The highest β was observed for career interest in the treatment group (β = .823), indicating that PW exposure is an exceptionally strong predictor of career interest formation. The practical skill acquisition treatment model returned β = .716, also well above the large-effect reference line. Both treatment group β values indicate that a one standard deviation increase in PW engagement is associated with approximately three-quarter to four-fifth of a standard deviation improvement in the respective outcome. The control group models returned β = .301 (practical skill) and β = .623 (career interest). Although the career interest control β is comparatively substantial, it occurs within a model explaining only 19.1% of total variance (R^2 = .191), suggesting that conventional instruction produces a directional predictor-outcome association but fails to account for the majority of what determines career interest in this sample. The divergence between β and R^2 in the control group career interest model highlights the importance of reporting both statistics together, as β alone would overstate the practical utility of the model.

4. Discussion of Findings

The findings of the study in table 3 indicate that only 31% of the practical skill acquisition of the students in control group improved after exposure to traditional teaching method while a significant 81% of the practical skill acquisition of the students in treatment group improved as a result of exposure to the use of personalised workstations. The result is an indication that the use of personalised workstations significantly influences the practical skill acquisition of students. Therefore, practical skill acquisition of students improves when they are exposed to the use of personalised workstations. This result has strong congruence with the findings of Lucero et al., (2021) who stated that the only way to prepare people for world of work and prepare them for income generating livelihood through an engaging skill acquisition experience is by exposing learners to good workshop environment in learning institutions. They further stated that well planned or organised workshop facilities tend to develop students' creative interest to which cognitive and psychomotor learning is possible in learning institutions. Osinem (2018) also supported the findings by stating that provision of functional laboratories and workshops affords students the opportunity of familiarising, acquiring and exposing themselves with the needed experience in handling industrial tools, equipment and machinery that are attainable outside the school environment in industrial settings. School workshops, particularly personalised workstations, offer opportunities for practical training of students in skill acquisition in their technical and vocational trade areas for future development of the key sector of the economy in order to meet the basic needs of the nation.

The finding of the study in table 4 indicates that only 19% of the students' career interest in technical education improved by exposure to traditional teaching method in the control group while a significant 79% of the students' career interest in technical education were influenced by exposure to personalised workstation in the treatment group. The finding is an indication that exposing students to personalised workstation significantly influence the career interest of the students in technical education. In other words, exposing students to the use of personalised workstation promotes their career interest in technical education. This study corroborates with Babafemi (2016) who in their study stated that students' levels of engagement, especially in laboratory and workshop activities, influence the academic activities they choose to engage in and their expectations for their future academic pursuits. The finding is in line with the theory of human capital. The theory of human capital suggests that education and training are investments in an individual's human capital (Ayyildiz, & Tarhan, 2015). Human capital can be defined as the knowledge, skills, and abilities that individuals possess, which enable them to create economic value. The theory argues that investing in human capital can increase productivity, and in turn, improve career interest, career opportunities and earnings potential. Therefore, participating in a training program through personalised workstations can enhance a person's human capital and increase career interest and opportunities (Neji et al., 2015). Moreover Osagie, (2022) supported the findings by stating that training through personalised workstation can play a critical role in providing individuals with new skills and knowledge, enhancing their abilities, and increasing their confidence to pursue new opportunities. Thus, participating in training activities in school laboratories, workshops and personalised workstations can help individuals to better align their skills and interests with their career goals and improve their career prospects.

5. Conclusion and Recommendations

The study ascertained the effects of the optimisation of personalised workstation on students' practical skill outcome and career interest. The study concludes that practical skill acquisition of students improves when they are exposed to the use of personalised workstations and exposing students to the use of personalised workstation promotes their career interest in technical education. The paper therefore recommends that the management of technical institutions should provide learning equipment and training materials needed for the execution of practical activities in the workstations. Proper investment should be made towards boosting the teaching and learning materials in workstations across the technical institutions in Nigeria. Teachers and instructors in TVET departments should be trained and retrained so that they will update their training especially in the use of workstations for teaching and learning in technical education institutions to fill the gap between school training and the industries. Also, the staff and students technical education institutions should engage in routine regular maintenance of available tools, machines and equipment to prevent breakdown of facilities in those workstations which could hinder effective practical skills acquisition of students.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: ***study conception and design:*** *Victor Arinzechukwu Okanya, Theresa Chinyere Ogbuanya;* ***data collection:*** *Victor Arinzechukwu Okanya, Chibueze Tobias Orji;* ***analysis and interpretation of results:*** *Victor Arinzechukwu Okanya, Chibueze Tobias Orji;* ***draft manuscript preparation:*** *Victor Arinzechukwu Okanya, Theresa Chinyere Ogbuanya, Chibueze Tobias Orji. All authors reviewed the results and approved the final version of the manuscript.*

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