



Impact of Teacher's Qualifications on Instructional Delivery in Fabrication and Assembly Operations in Technical Colleges in Rivers State

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Abstract

The study examines the impact of teachers' qualifications on instructional delivery in fabrication and assembly operations in Technical Colleges in Rivers State. A descriptive research design was used for the study. Four research questions guided the study. The population for the study comprised 187 respondents, made up of 14 teachers who teach fabrication and assembly operations and 173 students offering fabrication and assembly operations in all four government-owned Technical Colleges in Rivers State. Due to the small population size, census sampling was used to draw the entire population. Data were collected using a structured questionnaire design on a 4-point rating scale: Strongly Agree (4), Agree (3), Disagree (2) and Strongly Disagree (1). The instrument was subjected to face and content validity by two experts from Rivers State University, Port Harcourt. Cronbach's alpha was used to determine the reliability of the instrument and a reliability coefficient of 0.81 was established. The instrument was administered and retrieved on the spot after completion with the help of Research Assistants. Data collected were analyzed using mean statistics and standard deviation. The study found that teachers' qualifications have a positive impact on lesson delivery in welding, riveting, bolting, and cutting operations in Technical Colleges in Rivers State. Based on the findings, it was recommended, among others, that the Rivers State government should prioritize the recruitment of teachers with relevant academic qualifications and that teachers' development should be enhanced.

Keywords: Assembly operation, Fabrication operation, Instructional Delivery, Teachers' Qualification

Introduction

Teachers' qualifications have been widely recognized as a crucial determinant of effective lesson delivery and learning outcomes, which has impacted many modern societies. Engida and Iyasu (2024) opined that teachers' qualifications are not limited to academic credentials but also include pedagogical training acquired and technical competence exhibited by the teacher. Darling-Hammond (2017) described teachers' qualifications as the academic, professional, and pedagogical credentials possessed by teachers, which are obtained from instructional engagement processes to enhance their instructional delivery capabilities. According to (Zhang, Tian & Zhao, 2022), effective lesson delivery by the teacher in practical subjects most

times depends on mastery of both content and instructional methods suitable for delivering such lessons. In Technical Colleges were acquisition of scientific knowledge and practical skills for self-reliance are emphasized, (National Policy on Education of the Federal Republic of Nigeria, FRN, 2013), effective instructional delivery could impact significantly on students' interest and achievement in the trade areas.

Achieving technical competency is vital in any society. Iloma and Igwebuike (2025) opined that the development of many modern societies is traceable to availability of skilled technical manpower. The establishment of a technical college is therefore an important asset for technical skill development. A technical college is an educational institution designed to provide students with specialized training in practical and applied skills necessary for specific trades, professions, or technical occupations (United Nations Educational, Scientific and Cultural Organization, UNESCO, 2023). Thus, technical college curriculum consists of a wide range of trades which are offered by students for a period of three years for the Craft Level and additional one year for the Advanced Craft Level (FRN, 2013). Fabrication and assembly operations constitute one of the contents in Mechanical and Metalwork Trades as taught in technical colleges.

Fabrication involves various processes such as cutting, joining, fitting, and fastening aimed at transforming raw materials such as metals into finished products. Groover (2020) defined fabrication as the processes of shaping, cutting, and forming materials into shape. It is the process of changing raw materials into products of different shapes for different purposes (Alzubaidi, Gattman & Orhan, 2022). Maurrya, Ghosal and Manna (2022) asserted that fabrication involves the creation of metal structures and composite materials through value-added processes that involve cutting, forming, joining and assembling of raw materials into finished components. Fabrication therefore involves operations such as cutting, forging, extrusion and drawing to achieve the desired shape. Groover (2020) described assembling as the process that involves joining fabricated components into a final product. It is a functional unit formed by joining more than one metal part, mostly from different origins, into a single structure using methods such as welding, riveting, brazing or fasteners such as screw or bolts (Fictiv, 2022). It is the last stage of manufacturing involving the connection of many parts to form a functional product.

Fabrication and assembly operations as taught in Technical Colleges encompass several specific skill areas, including welding, riveting, bolting, cutting, and fitting operations. Welding operations involve the permanent joining of metals by applying heat, pressure, or both, with or

without filler materials. Welding is a fundamental fabrication skill widely used in construction, manufacturing, and maintenance industries (Cary & Helzer, 2018). Achievement of skilled manpower in this area suggests effective instructional delivery. According to Skripnik, Hoedt, Aghezzaf, and Cottyn (2023), acquiring skills in fabrication and assembly operations promotes the development of a technical workforce of individuals with competence, building and maintaining workers' motivation. Verna et al. (2023) opined that skills in assembly and disassembly directly impact quality performance, which reduces defects in production processes.

To gain from these advantages, students in fabrication and assembly need to be engaged in several instructions that will yield the acquisition of skills such as welding, riveting and bolting. Welding skill is essential in fabrication and assembly operations. According to Ikpe, Ekanem, and Ohwoekwwo (2025), welding operation is the application of arc-based techniques to join metals by fusion, where heat generated by an electric arc melts the workpieces and filler material to form a strong joint. It is a metal joining process that integrates planning, execution, and control of variables such as heat input, electrode selection, and joint design to ensure productivity and quality in manufacturing (Gyasi, 2014). Welding skills are an important factor for achieving structural safety, usability, durability and prevention of catastrophic failures in composite materials used in engineering practices.

Riveting operations involve the use of rivets to join metal components permanently without melting the base materials. Riveting remains relevant in metal fabrication where welding may not be suitable or where vibration resistance is required (Kalpakjian & Schmid, 2019). Tushar and Soora (2023) opined that mastering specialized skills like riveting enhances workforce competence that aligns with global standards needed by employers. Such skills could also enhance job readiness in advanced manufacturing industries. According to Poláková, Suleimanová, and Madzík (2023), technical skills such as riveting are essential for upholding structural stability in industrial operations, especially where safety and durability are emphasized.

Similarly, students in fabrication and assembly are required to be engaged in instruction in bolting operations. Bolting operations entail the use of bolts and nuts to form detachable joints in fabricated structures. Rousseau and Bouzid (2024) defined bolting operation as the application of a controlled tightening torque to achieve the necessary preload and clamping force in a joint, ensuring structural integrity and preventing failures from fatigue or overload. Bolting operation involves applying torque to achieve a desired preload, with accuracy

depending on thread geometry, lubrication, and surface conditions (Jiang, 2021). Thus, bolting operation is fundamental to joint reliability and proper tightening to prevent fatigue, loosening, or catastrophic failure in mechanical systems. Effective instructional delivery is essential in achieving this.

Effective and result-oriented instructional delivery is essential in achieving the objectives of fabrication and assembly operation skills in technical colleges. According to Okoro (2020), instructional delivery is the systematic use of teaching strategies that align with learning objectives, ensuring that learners acquire the needed instruction effectively. Adeyemi (2019) asserted that instructional delivery involves adopting learner-centered approaches where teachers act as facilitators, guiding students to construct knowledge through active participation. Eze (2023) posits that instructional delivery must be contextually relevant and applicable to improve learner outcomes. Probably, teachers' qualifications may have a positive impact on achieving instructional objectives. Studies such as that of Uddin, Nwachokor, and Uwameiye (2019) have shown that teachers with higher academic and professional qualifications demonstrate better instructional organization, clearer explanations, and more effective practical demonstrations in technical subjects

Despite the importance of fabrication and assembly skills to industrial development, workers' engagement and national growth, poor performance of the students in this area suggests that several factors, such as poor instructional delivery is implicated. Studies such as that of Hinda and Olele (2025) have indicated a shortage of qualified and specialized teachers, with some instructors lacking both the industry-specific knowledge and the pedagogical preparation necessary for effective teaching. James (2025) also showed that teachers in Technical Colleges are often inadequate both in number and in qualifications, which negatively affect instructional delivery and outputs in the college. Qualification and limited teachers' professional development opportunities could dilute the quality of instruction that aligns with industry requirements.

Statement of the Problem

Despite the importance of fabrication and assembly operations in industrial and economic revolution of the nation and the energy attached to developing such skilled technical manpower in technical colleges as enshrined in National Policy on Education (FRN, 2013), there are indications that mechanical Trades students engaged in fabrication and assembly operations in technical colleges are yet to achieve the goals of acquiring scientific knowledge and practical skills required in these areas. Qualifications of technical college teachers, which could have

bearing on the instructional delivery strategies used by the teacher, may be implicated in poor students' performance. Lack of skilled manpower in fabrication and assembly operations could negatively affect industrial operations. It could as well increase loss of jobs and unemployment among graduates of mechanical trades. It has the potential of reducing the chances of being self-reliant and employer of labour among such graduates. Consequently, this could negatively affect the socio-political economy of the nation and the society could be adversely impacted. It therefore becomes pertinent to determine the impact of teachers' qualifications on instructional delivery in fabrication and assembly operations in technical colleges in Rivers State.

Purpose of the Study

The purpose of the study is to determine the impact of teachers' qualifications on instructional delivery in fabrication and assembly operations in Technical Colleges in Rivers State. Specifically, the study determined the impact of teachers' qualifications on:

1. instructional delivery in welding operations in Technical Colleges in Rivers State
2. instructional delivery in riveting operations in Technical Colleges in Rivers State
3. instructional delivery in bolting operations in Technical Colleges in Rivers State

Research Questions

To guide the study, the following questions were answered:

1. What is the impact of teachers' qualifications on instructional delivery in welding operations in Technical Colleges in Rivers State?
2. What is the impact of teachers' qualifications on instructional delivery in riveting operations in Technical Colleges in Rivers State?
3. What is the impact of teachers' qualifications on instructional delivery in bolting operations in Technical Colleges in Rivers State?

Methodology

The study adopted a descriptive survey research design. The study was conducted in the four government-owned Technical Colleges (GTC) in Rivers State. The population of the study comprised 187 respondents, made up of 14 teachers who teach fabrication and assembly operations and 173 mechanical Trades students in all four Technical Colleges in Rivers State. The distribution of the population is GTC Ahoada (5 teachers and 54 students), GTC Eleogu (3 teachers, 15 students), GTC Port Harcourt (6 teachers, 98 students) and GTC Tombia (3 teachers, 15 students). Census sampling was used to draw the entire population and was used for the study since the size of the population is manageable. Data were collected using a structured questionnaire titled "Teachers' Qualifications and Instructional Delivery in

Fabrication and Assembly Operation Questionnaire (TQLDFAOQ)". The instrument contains 15 items structured In a 4-point rating scale of Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). the instrument was validated by two experts in the department of Industrial Technology Education, Rivers State University, Port Harcourt. The observations and pieces of advice rendered were adequately utilized. The reliability of the instrument was determined using the Cronbach Alpha method and a reliability coefficient of 0.81 was established which was considered adequate for the study. Instrument was administered on respondents and retrieved at the spot after completion by the researchers and four Research Assistants. Data collected were analyzed using mean and standard deviation. Item with a mean score of 2.50 and above was regarded as agreed, while a mean score below 2.50 was regarded as disagreed.

Results

The results of the study were presented in Table below

Research Question 1

What is the impact of teachers' qualifications on instructional delivery in welding operations in Technical Colleges in Rivers State?

Table 1: Mean Response of Teachers and Students on Teachers' Qualifications on Instructional Delivery in Welding Operations in Technical Colleges in Rivers State

SN	Item	Teachers N = 14		Students N =173		X _T	Decision
		X ₁	SD ₂	X ₂	SD ₂		
1.	Improved instructions in joint preparation and fit-up	3.23	0.83	3.41	0.78	3.32	A
2.	Effective instructional delivery in welding technique and arc control	3.31	0.86	3.44	0.76	3.38	A
3.	Improved students' welding skill knowledge of materials and processes	3.38	0.65	3.46	0.77	3.42	A
4.	Enhanced instructional delivery in safety and quality control	3.15	0.82	3.40	0.79	3.27	A
5	Enhanced instructional delivery in T-Joint fillet welds	3.23	0.83	3.43	0.76	3.33	A
	Grand Mean	3.26	0.80	3.83	0.77	3.36	A

The results presented in Table 1 showed that records of mean values were above the benchmark of 2.50. The grand mean of 3.26 and 3.36, respectively for teachers and students, showed that respondents agreed that teachers' qualifications enhance effective instructional delivery and skill acquisition in welding operations.

Research Question 2

What is the impact of teachers' qualifications on instructional delivery in riveting operations in Technical Colleges in Rivers State?

Table 2: Mean Response of Teachers and Students on Teachers' Qualifications on Instructional Delivery in Riveting Operations in Technical Colleges in Rivers State

SN	Item	Teachers N = 14		Students N =173		X _T	Decision
		X ₁	SD ₂	X ₂	SD ₂		
1.	Improved students' engagement in rivet selection and specification	3.23	0.83	3.40	0.79	3.32	A
2.	Enhanced participatory instruction in hole preparation and layout	3.31	0.86	3.44	0.76	3.38	A
3.	Better teaching outcomes in joint Fit-up and alignment	3.31	0.86	3.43	0.77	3.37	A
4.	Enhanced practical engagement in rivet setting technique	3.38	0.65	3.45	0.78	3.41	A
5	Improved instructional delivery in quality inspection and testing	3.15	0.82	3.39	0.80	3.27	A
	Grand Mean	3.28	0.80	3.42	0.78	3.35	A

Data analyzed in Table 2 showed that respondents consistently agreed that teachers' qualifications influence effective instructional delivery in riveting operations, as the mean obtained for each item is above the decision mean of 2.50. The grand mean of 3.28 for teachers and 3.35 for students indicated that both strata agreed that teachers' qualifications enhanced instructional delivery in riveting operations in Technical Colleges.

Research Question 3

What is the impact of teachers' qualifications on instructional delivery in bolting operations in Technical Colleges in Rivers State?

Table 3: Mean Response of Teachers and Students on Teachers' Qualifications on Instructional Delivery in Bolting Operations in Technical Colleges in Rivers State

SN	Item	Teachers N = 14		Students N =173		X _T	Decision
		X ₁	SD ₂	X ₂	SD ₂		
1.	Effective instructional delivery in fastener identification and selection	3.44	0.76	3.38	0.65	3.41	A
2.	Outstanding teaching abilities in hole alignment preparation	3.15	0.82	3.40	0.79	3.28	A
3.	Facilitating instructional delivery in the proper tightening method	3.38	0.65	3.46	0.77	3.42	A
4.	Facilitates instructional delivery in a tightening sequence	3.23	0.83	3.41	0.78	3.32	A
5	Effective delivery in inspection and quality check	3.23	0.83	3.43	0.76	3.33	A
	Grand Mean	3.28	0.78	3.41	0.75	3.35	A

Results from Table 3 reveal that teachers' qualifications have a significant positive impact on instructional delivery in bolting operations. All items recorded mean scores above the decision benchmark of 2.50. The grand mean of 3.28 and 3.41 were obtained for teachers and students, respectively. This consistently implies that respondents agree that teachers' qualifications positively impact instructional delivery in bolting operations in technical colleges.

Discussion of Findings

Findings from Table 1 revealed that teachers' qualifications have a significant positive impact on instructional delivery in welding operations in Technical Colleges in Rivers State. Both teachers and students agreed that qualified teachers demonstrate welding procedures more effectively, ensure adherence to safety practices, manage workshops efficiently, and enhance students' skill acquisition. These findings agree with the work of Uddin, Nwachokor, and Uwameiye (2019), who reported that teachers' academic and professional qualifications significantly improve instructional delivery and students' performance in technical college subjects. Similarly, Zhang et al. (2022) found that vocational teachers with strong technical and pedagogical competencies deliver practical lessons more effectively, especially in skill-based trades such as welding. The present findings also align with Okorie and Ezeji (2021), who emphasized that welding instruction requires teachers with both industrial experience and formal pedagogical training for effective skills transfer.

The results from Table 2 showed that teachers' qualifications positively influence instructional delivery in riveting operations, particularly in explanation of concepts, demonstration of techniques, workshop safety, and assessment of practical work. This finding is consistent with Ayonmike, Okwelle, and Okeke (2020), who reported that qualified technical teachers significantly enhance students' understanding of mechanical fabrication processes through effective instructional strategies. The agreement of students and teachers in this study also supports the findings of James (2025), who observed that variations in TVET teachers' technical competence in Rivers State directly affected the quality of practical instruction and student engagement. The present study reinforces the view that riveting operations, which require precision and correct sequencing, demand instructors with adequate professional preparation. Nevertheless, Ogunlade and Aina (2021) reported that years of teaching experience sometimes outweighed formal qualifications in influencing lesson delivery in mechanical trades. This partial disagreement suggests that experience and qualifications should be viewed as complementary rather than mutually exclusive factors.

Findings from Table 3 on bolting operations section revealed strong agreement that teachers' qualifications enhance clarity of instruction, correct tool selection, safety compliance, and effective assessment. These results are in line with UNESCO (2021), which emphasized that teacher quality is a central determinant of effective skills training in TVET institutions globally. The findings also support Okwelle and Wordu (2020), who found that professionally trained teachers were more effective in teaching mechanical assembly tasks due to their ability to integrate theory with practice. Similarly, Engida and Iyasu (2024) reported that teaching quality closely linked to teacher qualifications has a direct influence on students' achievement and skill mastery. However, the findings differ slightly from Ekpenyong and Edet (2019), who argued that students' motivation and interest played a stronger role than teacher qualifications in mastering assembly operations. This difference suggests that while teacher qualification is crucial, learner-related factors also contribute to instructional effectiveness.

Conclusion

From the findings, the researchers concluded that teachers' qualifications positively impact instructional delivery in fabrication and assembly operations, especially in enhancing skills in welding operations, riveting operations and bolting operations.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Government should prioritize the recruitment of teachers with relevant academic qualifications, professional certifications, and industrial experience to teach fabrication and assembly operations.
2. Teachers in service should be supported through scholarships and grants to upgrade their qualifications in welding, riveting, bolting, and cutting and fitting operations.
3. Teachers should be encouraged to integrate theoretical knowledge with practical demonstrations in all fabrication and assembly operations. This will improve students' understanding, skill acquisition, and readiness for industrial work.

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