



The Role of Industrial Attachment in Enhancing Technical, Soft, and Pedagogical Skills of TVET Teaching Staff in Tanzania

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Abstract: *This study explores how industrial attachment enhances the technical, soft, and pedagogical skills of Technical and Vocational Education and Training (TVET) teaching staff in Tanzania. It aims to provide insights into addressing the mismatch between TVET graduate competencies and industry needs. A descriptive survey design was employed, targeting TVET teaching staff who were attached to industries from Arusha Technical College (ATC), National Institute of Transport (NIT) and Dar es Salaam Institute of Technology (DIT) – Mwanza Campus. The sample population included 63 TVET teaching staff who were purposely selected using the database of staff attached to the industries from 2020 to 2024. Data were collected using structured questionnaires, with quantitative analysis performed via descriptive statistics focusing on mean and standard deviation. Key findings show that industrial attachments greatly enhance technical skills and contribute positively to the development of soft skills, such as teamwork, as well as pedagogical skills among TVET teaching staff. The study recommends strengthening collaborations between TVET institutions and industries, increasing the participation of female TVET instructors in industrial attachments, and extending the duration of these attachments.*

Keywords: TVET, Industrial Attachments, Technical Skills, Pedagogical Skills, Soft Skills

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1. Introduction

Technical and Vocational Education and Training (TVET) plays a pivotal role in developing a skilled workforce essential for sustainable economic growth and industrial advancement. Globally, TVET institutions are crucial to economic growth and industrial advancement by bridging the gap between industry needs and workforce skills (Maclea & Wilson, 2016). The industry operates in an environment characterized by high-performance work culture, intense competition, focus on quality, value addition, diversification of products and services, and automation, all driven by globalization (Tulsi & Poonia, 2015). TVET system must produce a skilled workforce that

meets industry demands for sustainable economic growth and industrial advancement.

TVET in developing countries faces numerous challenges despite its potential to enhance economic development. One of the primary challenges is the mismatch between the skills taught and those demanded by the industries (Maina et al., 2016). A criticism often levelled at TVET teachers, is that they lack up-to-date and relevant industrial experience and awareness of modern technological advances and industrial practices (Loveder, 2005). To align TVET skills with industry demands, countries like Germany and Finland have effectively integrated industrial attachment programs into TVET, enhancing instructors'

technical and pedagogical competencies (Deissinger et al., 2019). In the German TVET system, experienced professionals mentor educators through a process of modelling, scaffolding, and coaching. This enhances educators' technical competence and improves their pedagogical skills as they transfer workplace experience to the classroom (Reinisch & Bremerich-Vos, 2020). These initiatives enable teaching staff to understand employer expectations, skills gaps, and new technologies, producing industry-ready graduates. Industrial attachment programs have emerged as a crucial intervention to address this challenge by providing hands-on industry experience that enhances technical, soft, and pedagogical skills among TVET educators (Afeti, 2018).

Industrial attachment, also known as industry placement or work-based learning, is a crucial component of professional development for TVET teaching staff. It enables them to engage directly with the industry environment and bridge a gap between teaching and real-world industry practices. According to Mulder (2020), industrial attachment provides educators with opportunities to engage with new technologies, industry standards, and innovative practices. Kersh and Evans (2020), argued that industrial attachment enhances educators' pedagogical skills by gaining insights into how learning occurs in practical settings, allowing them to adopt more effective, student-centred teaching strategies. Also, industrial attachments help educators to enhance soft skills which are essential to prepare students for workplace environments where collaboration and problem-solving are critical (Gesser & Howe, 2021).

In Africa, several countries have adopted industrial attachment programmes as a strategy to enhance TVET education. Studies from South Africa, Rwanda, and Ghana suggest that these programs contribute significantly to instructors' ability to deliver industry-relevant training (Majumdar & Araiztegui, 2017). A study by Bakah et al., (2012), in Ghana, recommended industrial attachment of TVET teaching staff as a major training need for polytechnic teachers to improve curriculum design and implementation. In South Africa, the industrial attachment programme has been linked to increased adoption of competence-based training, where educators incorporate real-world problem-solving skills into curricula (Pavlova, 2021). An assessment in Rwanda found that trainers' industrial attachment enabled them to increase their levels of competence to carry out practical sessions relative to their trade expectations (Rwanda Polytechnic, 2021).

The TVET system in Tanzania faces challenges that hinder its effectiveness in producing skilled workforce essential for sustainable economic growth and industrial advancement. It is blamed for the failure to produce graduates who satisfactorily meet the demands of industries (Bitegera & Bisanda, 2022). According to

Garaba and Kumar (2023), TVET teachers in Tanzania are not well equipped with technological, management, personal, and pedagogical skills. This makes students and graduates from TVET institutions struggle in the labour market after graduating. Amani (2017) revealed that TVET graduates in Tanzania lack employability skills due to incompetent teaching staff, ineffective curriculum, less emphasis on general knowledge, lack of career guidance, and gaps in the employment policy.

In response to these challenges, the Tanzanian government has initiated various programmes and policies to address them. Among these initiatives include establishing stronger partnerships between TVET institutions and industries, continuously updating curricula to meet industry needs, and improving pedagogy training for teachers (Bitegera & Bisanda, 2022). One of the core components of the Technical and Vocational Education and Training Development Programme (TVETDP) 2021-2025 is the attachment of TVET staff to industries, ensuring they acquire up-to-date skills and knowledge directly from the workplace (Ministry of Education, Science and Technology, 2021). Also, the Tanzanian government in collaboration with partners and donors have established various projects to support the industrial attachment of TVET teaching staff.

Despite the growing emphasis on the industrial attachment of TVET teachers in developing countries like Tanzania, their exposure to the industries is still minimal compared to students. A study by Komba and Nkumbi (2019), revealed that while some TVET institutions have established industrial partnerships, the extent of practical exposure for teaching staff varies significantly. While some studies focused on the technical outcomes of industrial attachment, less attention has been given to how these programmes influence soft and pedagogical skills, which are equally critical for effective teaching and student engagement (UNESCO-UNEVOC, 2017). This created a need to research how industrial attachment can holistically enhance the technical, soft, and pedagogical skills of TVET teachers. Specifically, the study:

1. Assessed the influence of industrial attachment on the technical skills of TVET teaching staff.
2. Examined the significance of industrial attachment on the soft skills of TVET teaching staff.
3. Evaluated the role of industrial attachment in enhancing pedagogical skills among TVET teaching staff.

This study contributes to the growing body of knowledge on linkages between TVET institutions and industries by providing empirical insights into the effectiveness of industrial attachment programmes for TVET teaching staff. Furthermore, the study's focus on ATC, NIT, and

DIT-Mwanza Campus provides a unique institutional perspective that can be leveraged to develop national policies on professional development for TVET educators and strengthen the quality and relevance of TVET in Tanzania.

2. Literature Review

2.1 Industrial Attachment

Industrial attachment, also known as workplace learning, is a process by which individuals acquire knowledge and skills through day-to-day activities of a professional environment (Billet & Choy, 2021). It involves both students and educators. The primary goal of industrial attachment is to bridge the gap between classroom teaching and real-world practices. Whalley (1986) indicates that industrial attachment started long back worldwide, as an apprenticeship model where training took place under skilled mentorship. This did not spare any continent across the globe.

The most widely referenced theory in understanding industrial attachment is Kolb's Experiential Learning Theory (1984). This suggests that learning involves the creation of knowledge and skills through the transformation of experience. It highlights the significance of a cyclical learning process consisting of concrete experience, reflective observation, abstract conceptualization, and active experimentation. Marsick and Watkins (2015) applied this theory to industrial attachment, suggesting that learners undergo these stages as they engage in work tasks, reflect on their experiences, conceptualize new knowledge, and experiment with improved practices.

Recent studies have expanded Kolb's Experiential Learning Theory by highlighting its relevance to the industrial attachment of TVET teaching staff. According to Liu et al. (2022), industrial attachment provides an ideal environment for experiential learning, where TVET teaching staff can bridge the gap between theoretical knowledge and real-world application. The continuous reflection and feedback in industries allow teaching staff to enhance their technical expertise, while active engagement with industry practices enables them to stay updated with technological advancements (Goh & Lim, 2020). Therefore, experiential learning theory underpins the enhancement of technical, soft, and pedagogical skills among TVET teaching staff through industrial attachment.

2.2 Industrial Attachment and Technical Skills of TVET Teaching Staff

According to the International Labour Organization (2021), Technical skills encompass the specialized knowledge and abilities required to execute specific tasks and operations within a particular sector or job. Billet and Choy (2021), define technical skills as the expertise required to perform tasks directly linked to specific industries or trades. In TVET, technical skills encompass the hands-on skills and specialized knowledge necessary to perform tasks and solve problems in specific trades, crafts, or professions (UNESCO-UNEVOC, 2017).

Technical skills are essential for employability, as they equip students with the capacity to meet the specific job requirements of the industries (Ally & Fahamu, 2021). According to Opoku and Kyei (2022), graduates who possess strong technical skills have higher employability prospects because they can adapt quality to industry demands. TVET educators require up-to-date technical skills to equip students with relevant employability skills (Abebe & Woldehanna, 2020). TVET educators can acquire these skills through industrial attachments or workplace exposures.

Industrial attachments equip TVET teaching staff with up-to-date technical skills that align with the changing demands of the industry. Several studies highlight that through hands-on experience in real-world environments, TVET teaching staff gain practical knowledge and skills, enabling them to improve their teaching delivery (Mulenga & Kabombwe, 2019). A study by Mesuwini et al., (2023), in South Africa found that staff industrial attachment equipped lecturers with practical skills, making them better understand workshop equipment and operations. Another study in Rwanda found that industrial attachment increased trainers' levels of competence to carry out practical sessions relative to their trade expectations (RP, 2021). A study by Njenga, (2023), in Kenya, found that industrial attachment of teaching staff increased confidence and awareness of modern industrial practices, helped them learn new practical skills, and improved theory by putting it into practice.

In this paper, technical skills encompass specialized practical abilities, knowledge and competencies that are required to perform tasks in specialized occupational fields such as hands-on experience with the latest tools, machinery, software, and technologies, understanding of workshop equipment and operations, confidence and awareness of modern industrial practices, familiarity with industry-standard operational processes, safety protocols, and quality control measures, handling specialized equipment that matches industry specifications,

automation of tasks, and proficiency in the latest industry software and hardware systems.

2.3 Industrial Attachment and Soft Skills of TVET Teaching Staff

Various scholars and authorities have defined soft skills differently. According to Hurrell (2016), soft skills refer to a broad variety of social and interpersonal attributes and competencies applicable to all economic fields and sectors. Soft skills are non-technical abilities related to how individuals interact, communicate and work with others including creativity, collaboration, critical thinking, and emotional intelligence (World Economic Forum, 2020). World Bank (2020) defines soft skills in TVET as a set of transferable skills that go beyond technical skills, emphasizing personal development and social interactions including leadership, communication, critical thinking and collaboration.

A study by Harris and Simons (2014), in Australia suggested that industrial attachment presents TVET teachers with practical challenges, enhancing problem-solving and critical thinking skills, which they apply in classrooms to guide students in tackling complex tasks effectively. Another study by Schwendimann et al. (2018), found that industrial attachments foster collaboration skills among TVET teaching staff, which they can transfer to their teaching environment to promote teamwork among students. In South Africa, studies have shown that industrial attachments help TVET teachers improve their ability to convey ideas clearly and interact effectively with different stakeholders (Wolhuter & Steyn, 2020). A study by Kolawole and Igwe (2018), in Nigeria found that industrial attachment promotes professionalism, time management, and ethical practices among TVET teachers.

In this study, soft skills are abilities, competencies and attributes that supplement technical skills specifically teamwork, critical and creative thinking, problem-solving skills, communication, coping with stress, leadership and entrepreneurship skills. Soft skills are crucial for TVET teachers to foster a positive learning environment and prepare students for workplace challenges (Cimatti, 2016).

2.4 Industrial Attachment and Pedagogical Skills of TVET Teaching Staff

Alhassan and Adjei (2020), defined pedagogical skills as the set of teaching strategies, assessment techniques, and classroom management abilities that TVET teachers use to facilitate effective learning outcomes. They include the abilities of TVET educators to integrate workplace practices into the teaching and assessment process (Moshi, 2021). Pedagogical skills are crucial for developing both

technical and soft skills among TVET students that meet labour market needs. These skills are essential for TVET teaching staff, enabling them to adopt effective teaching methods that integrate theory and practice, ensuring students can apply what they learn in real-world settings (Mushi & Komba, 2021).

A report by Cort et al. (2004), revealed that industrial attachment helps VET educators update their pedagogical skills and keep abreast with new developments in the areas they teach, providing learners with up-to-date skills required by the labour market. A study by Ahmad and Rashid (2011), proved that lecturers' industrial attachment programme helps to boost lecturers' competency in their area of specialization in both pedagogical and technical aspects in Malaysia. In Australia, Billett and Choy (2021) found that industrial attachment enhances instructors' ability to use experiential learning techniques. A study by Muthoni et al. (2018), in Kenya found that industrial attachment boosts the abilities of teaching staff to determine relevant content materials and use appropriate pedagogical strategies for students' competitive edge in the world of work.

In this study, pedagogical skills encompass ways of putting theory into practice, relating teaching and learning with the latest developments in industries, design assessment that reflects real-world tasks, ability to engage students effectively and adoption of experiential learning approaches.

3. Methodology

3.1 Research Design

This study employed a descriptive survey design which allowed the researcher to collect quantitative data through a structured questionnaire, providing a systematic approach to measuring the extent to which industrial attachment enhances technical, soft and pedagogical skills among TVET teaching staff. Kim et al. (2017), assert that descriptive research design is appropriate for studies that seek to present a broad overview of a phenomenon.

3.2 Population and Sampling Procedures

The target population of this study was teaching staff from three TVET institutions in Tanzania including Arusha Technical College (ATC), the National Institute of Transport (NIT), and Dar es Salaam Institute of Technology (DIT) – Mwanza Campus who were attached to the industries. The sample population comprised 63 TVET teaching staff who participated in industrial attachment programmes through the East Africa Skills for Transformation and Regional Integration Project

(EASTRIP) from 2020 to 2024. The sample was purposely selected because staff who were attached to the industries under EASTRIP were verified by independent verifiers and communicated to other stakeholders including the World Bank and the Inter-University Council of East Africa.

3.3 Data Collection

A structured questionnaire was employed as the primary data collection instrument. Questionnaire items for each skill were obtained from previous studies related to the industrial attachment of teaching staff. The questionnaire was administered online using Google Forms. The questionnaire was designed to assess the impact of industrial attachment on technical, soft, and pedagogical skills using a five-point Likert scale (1 = Not at all, 2 = To a small extent, 3 = To a moderate extent, 4 = To a great extent, 5 = To a very great extent). A pilot test was conducted with a small subset of respondents before administering the questionnaire to the entire sample to assess the data collection instrument's clarity, relevance, and usability. This testing enabled the researcher to adjust some identified weaknesses in the data collection tools before the actual survey was conducted.

3.4 Validity and Reliability

Content validity was assured by ensuring that questionnaire items comprehensively covered all essential constructs measuring technical, pedagogical and soft skills. Reliability was assessed by calculating Cronbach's alpha, resulting in a high-reliability score of 0.941 for technical, soft and pedagogical skills. According to Nunnally and Bernstein (1994), a Cronbach's alpha value of 7.0 or higher is acceptable for basic research.

3.5 Data Analysis

The collected data were analyzed using quantitative statistical techniques. The IBM SPSS Statistics Version 27 was employed for data coding, cleaning, and analysis. Mean scores and standard deviations were computed to

determine the extent to which industrial attachment impacted the technical, soft, and pedagogical skills of TVET teaching staff who were attached to the industries. Depending on the specific scales used in the study, mean score values within the range of 1.01 to 2.00 indicated a small extent, 2.01 to 3.00 indicated a moderate extent, 3.01 to 4.0 indicated a great extent, and 4.01 to 5.00 indicated a very great extent.

4. Results and Discussion

4.1 Characteristics of the Respondents

The study sample consisted of 63 TVET teaching staff who participated in industrial attachment under EASTRIP from 2020 to 2024, with only 31 (49.2%) responded to the study. According to Fowler, (2014), response rates between 30% and 50% are common in survey-based studies, especially when dealing with teaching staff or professionals. Among the 31 respondents, 26 (83.9%) were males and 5 (16.1%) were females, indicating a predominance of male teaching staff within the sample. This points to a male-dominated workforce within TVET institutions. Most respondents (61.3%) were from ATC, making it the largest contributor to the sample. NIT accounted for 25.8% of the respondents while DIT-Mwanza Campus accounted for 12.9%. of the respondents. Additionally, the majority of respondents (77.4%) had been attached to the industry once, 16.1% had been attached twice and 6.5% had been attached more than twice. This implies that TVET teaching staff have limited exposure to industrial experience.

4.2 Influence of Industrial Attachment on the Technical Skills of TVET Teaching Staff

The study's first objective was to assess the influence of industrial attachment on the technical skills of TVET teaching staff. The findings are presented descriptively in Table 1 below focusing on mean score values and standard deviations for each skill.

Table 1: Descriptive Statistics of Technical Skills Development through Industrial Attachment for TVET Teaching Staff

	N	Mean	Std. Deviation
Hands-on experience with the latest tools, machinery, software, and technologies in my field	31	4.06	.854
Increased understanding of workshop equipment and operations	31	4.06	1.031
Increased confidence and awareness of modern industrial practices	31	4.03	1.110
Familiarity with industry-standard operational processes, safety protocols, and quality control measures	31	4.00	.931
Handling specialized equipment that matches industry specifications	31	3.90	.908
Automation of tasks in the industry	31	3.68	1.166
Proficiency in the latest industry software and hardware systems	31	3.52	1.235
Grand Mean		3.89	

The findings above indicate high mean scores ranging from 4.03 to 4.06 for hands-on experience with the latest tools, machinery, software, and technologies, increased understanding of workshop equipment and operations, and increased confidence and awareness of modern industrial practices which imply that industrial attachment enhanced these skills to a very greater extent among the participants as appears in Table 1. The mean score values for other technical skills range from 3.52 to 4.00 which suggests that industrial attachment enhanced these skills to a great extent.

However, the mean scores values for adaptability to automation (3.68) and proficiency in software and technology (3.52) were relatively lower. This indicates a gap between technological advancements in industries and

training provided to TVET teaching staff. This is supported by the findings of Kolawole and Igwe (2018) who argued that the ongoing professional development of TVET teachers is essential for keeping up with rapidly changing industry technologies.

4.3 Significance of Industrial Attachment on the Soft Skills of TVET Teaching Staff

The study's second objective was to examine the significance of industrial attachment on the soft skills of TVET teaching staff. The findings are presented descriptively in Table 2 below.

Table 2: Descriptive Statistics of Soft Skills Development through Industrial Attachment for TVET Teaching Staff

	N	Mean	Std. Deviation
Teamwork skills	31	4.52	.890
Ability to translate knowledge, attitudes, skills, and values into action	31	4.42	.765
Critical and creative thinking skills	31	4.26	.773
Ability to engage in community service	31	4.19	.980
Real-world problem-solving skills	31	4.13	.957
Ability to handle information for effective communication	31	4.10	.908
Ability to make informed and effective decisions	31	4.10	.944
Ability to cope with stress	31	4.10	1.106
Flexibility and empathy	31	4.06	1.063
Ability to establish and maintain healthy interpersonal relationships	31	4.03	1.016
Leadership skills	31	4.00	1.065
Entrepreneurship skills	31	3.90	.944
Grand Mean		4.16	

The findings above indicate that industrial attachment enhances to a very great extent a wide range of soft skills among TVET teaching staff, with mean scores ranging from 4.03 to 4.52. Among these soft skills, teamwork, the ability to translate knowledge and skills into action, and critical and creative thinking receive the highest scores as appears in Table 2 below. Other research studies suggest that industrial attachments help TVET teachers gain first-hand experience working in multidisciplinary teams, which they can transfer to their teaching environment to promote teamwork among students (Schwendimann et al., 2018). Other scholarly works suggest that industrial attachment enhances problem-solving abilities and critical thinking, enabling TVET teachers to guide students in handling complex tasks (Harris & Simons, 2014). However, the

mean score values for leadership skills (4.00) and entrepreneurship skills (3.90) were relatively lower than other soft skills, industrial attachment still enhances these skills to a great extent.

4.4 Role of Industrial Attachment in Enhancing Pedagogical Skills Among TVET Teaching Staff

The study's third objective was to evaluate the role of industrial attachment in enhancing pedagogical skills among TVET teaching staff. The findings are presented descriptively in Table 3 below.

Table 3: Descriptive Statistics of Pedagogical Skills Development through Industrial Attachment for TVET Teaching Staff

	N	Mean	Std. Deviation
Improving ways of putting theories into practice	31	4.42	.720
Learning new practical skills	31	4.39	.667
Relate the teaching and learning process with the latest developments in industries	31	4.39	.715
Greater confidence in content delivery and ability to engage students effectively	31	4.29	.864
Use of problem-based learning whereby students learn by solving real-life problems	31	4.29	.973
Design assessments that better reflect real-world tasks	31	4.23	.805
Transform classroom teaching through case studies, simulations, project-based learning, and blended learning methods	31	4.10	1.076
Experiment with new pedagogical approaches and integrate best practices in teaching methods	31	4.06	.929
Adoption of an experiential learning approach	31	3.97	.983
Grand Mean		4.23	

The findings indicate that industrial attachment enhances pedagogical skills to a very great extent among TVET teaching staff with mean scores ranging from 4.06 to 4.42 for most of the skills as appears in Table 3 below. The highest mean score of 4.42, was recorded for improving ways of putting theories into practice suggesting that industrial attachment greatly enhances TVET teachers' ability to connect theory with practice. This aligns with the findings of Harris and Simons (2014), that hands-on experience in industry allows TVET teachers to effectively demonstrate theoretical concepts in practical, real-world contexts, making learning more relevant to students. However, the mean score for adopting an experiential learning approach (3.97) was slightly lower than other measured pedagogical skills, industrial attachment still enhances experiential learning approaches to a great extent.

5. Conclusion and Recommendations

5.1 Conclusion

The study findings revealed that industrial attachment greatly enhances the technical skills of TVET teaching staff, including hands-on experience with modern tools, equipment and industry technologies. However, technical skills such as automation and software systems require additional focus to fully prepare TVET instructors for the technological demands of modern industries. The study also revealed that industrial attachment greatly fosters the development of soft skills as most of them such as teamwork, communication, critical thinking, and adaptability were highly rated. Based on the study findings, industrial attachment enhances most pedagogical skills specifically the ability to put theory into practice. However,

there is a need to capacitate TVET teachers in the adoption of experiential learning approaches.

5.2 Recommendations

Considering the significance of industrial attachment in enhancing the technical, soft, and pedagogical skills of TVET teaching staff, this study recommends the following:

1. TVET institutions to strengthen collaborations with industries to provide more opportunities for teaching staff to participate in industrial attachment.
2. TVET institutions should increase the number of female teaching staff who participate in industrial attachment, extend the duration of industrial attachment to more than one month and ensure that staff are attached repeatedly.

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