

Effect of employable skills acquisition during industrial attachment on holistic TVET certificate graduates in Kampala Metropolitan, Uganda

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ABSTRACT

Industrial attachment serves as a critical bridge between theoretical training and workplace readiness in Technical and Vocational Education and Training (TVET). Yet, in Uganda, the effectiveness of industrial attachment in producing employable graduates is undermined by poor coordination, weak supervision, and persistent misalignment with labour market demands. This study examined the effect of employable skills acquisition during industrial attachment on holistic TVET certificate graduates in Kampala Metropolitan. A convergent parallel mixed-methods design was employed, collecting quantitative data from 375 graduates using structured questionnaires and qualitative data from 10 key informants (principals and industrial partners) through interviews. The findings reveal that industrial attachment provides hands-on experience with industry-standard equipment, opportunities to practice technical skills, acquisition of new job-specific techniques not taught at institutions, practical knowledge of industry safety procedures, and strong job-seeking confidence, with industry supervisors entrusting trainees with increasingly complex tasks. Correlation analysis revealed a moderate positive relationship between employable skills acquisition and holistic graduate outcomes ($r=0.606$, $p<0.001$), with regression analysis showing that employable skills acquisition explains 36.7% of the variance in holistic graduate outcomes ($R^2=0.367$). Qualitative findings confirmed that attachment provides access to equipment not available at institutions, enables skill reinforcement through repeated practice, teaches quality standards through exposure to models such as Japanese 5S, develops time management through profit-driven deadlines, and builds confidence with many trainees retained by host companies. The study concludes that industrial attachment is a powerful mechanism for developing technical competencies, but its effectiveness depends on attachment duration, supervision quality, and placement relevance. It recommends extending attachment duration beyond the current six weeks, establishing an employer recognition scheme for quality supervision, implementing a national safety certification scheme, and creating a new technique repository to inform curriculum updates.

Keywords: Employable Skills Acquisition, Holistic Graduate Outcomes, Industrial Attachment, TVET Certificate Graduates, Uganda

I. INTRODUCTION

TVET is central to equipping learners with practical and employable skills for Uganda's dynamic labour market (Barigye, 2024), with industrial attachment serving as the primary mechanism for translating theoretical knowledge into workplace-ready competence (Niyomushobozi & Kiarie, 2024). Uganda has introduced several reforms including the Skilling Uganda Strategy, the TVET Policy (2019), and the TVET Act 2025, which mandates employer representation on governing councils (Muhwezi et al., 2025; Kim, 2021). However, the Industrial Training Act of 1972 remains the primary legal framework governing attachment, predating the 21st-century skills agenda (Mugabirwe et al., 2025), and attachment practices remain fragmented with limited employer involvement, weak monitoring, and inconsistent funding (Okware & Ngaka, 2017; Mutebi & Ferej, 2023).

Empirical evidence from multiple contexts points to the role of industrial attachment in employable skills acquisition. In Tanzania, Issa and Muya (2025) found that attachment improves technical skills and confidence, yet the study focuses on teaching staff rather than graduates with a small sample of 31 respondents. In Kenya, Kogo, Kapkiai, and Chumba (2025) reported a strong positive relationship between workplace experience and CBET integration ($r=0.638$, $p<0.001$), though the study is region-specific and cannot establish causality. Mumbe Kailo (2022) found that 95.9 percent of instructors report poorly equipped workshops, with a significant relationship between facilities and skill acquisition ($X^2=64.888$, $p=0.002$), yet the study lacks industry input.

A critical gap persists concerning Uganda's TVET certificate graduates, who represent the largest cohort but have received minimal research attention. Existing studies (Issa & Muya, 2025; Kogo et al., 2025) fail to provide quantitative validation of attachment's impact within Uganda's unique context, characterized by the TVET Act 2025 and the Uganda Vocational Qualifications Framework. Methodologically, many studies rely on descriptive designs without regression analysis or lack employer perspectives (Mumbe Kailo, 2022; Nugraha et al., 2020). This study addressed these gaps by examining Uganda's TVET certificate graduates using mixed methods, incorporating perspectives from graduates, institutional leaders, and industrial partners, and performing regression analysis to establish the explanatory power of industrial attachment for holistic graduate outcomes.

1.2 Research Objective

To assess the effect of employable skills acquisition during industrial attachment on holistic TVET certificate graduates in selected institutions in Kampala Metropolitan, Uganda.

1.3 Research Hypothesis

H₁: Employable skills acquisition during industrial attachment has a significant positive effect on holistic TVET certificate graduates.

II. LITERATURE REVIEW

Empirical evidence shows that industrial attachment contributes positively to technical skill enhancement among TVET trainees. In Tanzania, Issa and Muya (2025) found that industrial attachment improves technical skills to a great extent, with hands-on experience using modern tools (Mean=4.06, SD=0.854), better understanding of equipment (Mean=4.06, SD=1.031), and increased confidence in industrial practices (Mean=4.03, SD=1.110), yet the study focuses on teaching staff rather than graduates, uses a small sample of 31 respondents, and relies on self-reports without employer validation. In Kenya, Kogo, Kapkiai, and Chumba (2025) reported a strong positive relationship between workplace experience and CBET integration ($r=0.638$, $p<0.001$; $\beta=0.273$, $p=0.000$), yet the study is region-specific to one county, does not include graduates already in the workforce, and cannot establish causality due to its descriptive design. Similarly, Mujuri and Kathomi (2025) found that TVET graduates have a 7.35 percent higher chance of wage employment compared to those with only secondary education, yet the data is from 2015-2016 predating recent TVET reforms and does not isolate industrial attachment as a contributing factor.

The development of equipment and tool handling proficiency through industrial attachment has been examined with mixed findings across contexts. In Tanzania, Issa and Muya (2025) reported that handling specialized equipment aligned with industry standards is rated positively (Mean=3.90, SD=0.908), yet proficiency in modern software and hardware systems is significantly lower (Mean=3.52, SD=1.235), indicating that while basic equipment handling improves, digital and automated systems proficiency remains a gap. In Kenya, Mumbe Kailo (2022) found that 91.7 percent of instructors cite inadequate learning materials and 95.9 percent report poorly equipped workshops, with a significant relationship between training facilities and skill acquisition ($X^2=64.888$, $p=0.002$) and 77.9 percent indicating insufficient practical training time, yet the study relies on trainee and instructor perceptions without input from industry employers who could validate skill acquisition. In Kenya, Otieno et al. (2024) found that programme beneficiaries are 15 percent more likely to be employed ($p<0.05$), yet the study focuses on a specific NGO programme with limited coverage of formal TVET institutions and does not isolate industrial attachment as a mechanism within the programme.

The acquisition of industry-specific competencies through industrial attachment is critical for TVET graduate employability, yet evidence shows persistent gaps between training and evolving industry demands. In Kenya, Cheruiyot (2025) identified outdated curricula, limited practical exposure, and weak industry partnerships as key drivers of skills mismatch, yet the study relies on secondary data without direct measurement of competency gaps or industrial attachment outcomes. In Malaysia, Mohd Kamaruzaman et al. (2025) identified key competency areas including digital, technical, and transversal skills required for TVET graduates, yet their review is based on a small sample of studies and lacks African representation. Abu Kasim et al. (2024) found that internships can enhance problem-solving and critical thinking but reveal gaps in confidence and creativity, yet the study is based on only three employers and lacks triangulation with graduate or trainer perspectives. In Sweden, Jäger Röding and Strand (2024) found that internships improve teamwork and problem-solving skills in some cases but not consistently, yet the study is based on a very small sample of seven alumni and does not represent TVET contexts. In China, Zixuan et al. (2025) found high employability skill levels (Mean=3.85, SD=0.64) and a strong correlation with career adaptability ($r=0.731$, $p<0.01$), yet the study is contextually different from Sub-Saharan Africa and excludes employer perspectives. The current mixed-method study addressed this gap by examining Uganda's TVET certificate graduates, using mixed methods to quantitatively assess skill acquisition gains, incorporating perspectives from graduates, institutional leaders, and industrial partners, and



performing regression analysis to establish the explanatory power of industrial attachment for holistic graduate outcomes.

III. METHODOLOGY

This study employed a convergent parallel mixed-methods design integrating quantitative and qualitative approaches to provide a comprehensive understanding of the relationship between institutional knowledge alignment and holistic graduate outcomes (Creswell & Plano Clark, 2018). Quantitative data were collected through structured questionnaires, while qualitative insights were gathered through key informant interviews with principals and industrial partners. The separate analysis and subsequent triangulation of both data types ensured a holistic and evidence-based understanding of employable skills acquisition effects within Uganda's TVET context. The study was conducted in the Kampala Metropolitan area, encompassing five purposively selected TVET institutions: Nakawa Vocational Training Institute, Lugogo Vocational Training Institute, Ntinda Vocational Training Institute, St. Joseph's Vocational Training Institute-Kisubi, and Katonga Vocational Training Institute-Mpigi. These institutions were selected because they have well-established industrial attachment programmes, maintain active linkages with industry employers, and have produced multiple cohorts of graduates who have undergone structured industrial attachment between 2021 and 2024.

The target population comprised 5,368 TVET certificate graduates who completed their training between 2021 and 2024 across the five institutions, 5 principals (one from each institution), and 5 industrial partners nominated by each institution. Using Taro Yamane's formula (1967) with a margin of error of 0.05, a sample size of 372 graduates was calculated. Stratified random sampling was employed to select graduates proportionally from each institution and graduation year, ensuring representation across all five institutions and four cohorts. Census sampling was applied to include all 5 principals and all 5 industrial partners due to their specialized roles.

Two research instruments were employed: structured questionnaires for graduates, and interview guides for principals and industrial partners. The structured questionnaire captured quantitative data on employable skills acquisition and holistic graduate outcomes using Likert-scale items (1=Strongly Disagree to 5=Strongly Agree). The interview guides elicited in-depth insights on hands-on equipment experience, skill practice opportunities, new technique acquisition, quality standards understanding, time management development, safety knowledge, job confidence, and progressive task entrustment. To ensure validity, all instruments underwent expert review by academic supervisors and a TVET specialist from the Ministry of Education and Sports. Construct validity was confirmed through Exploratory Factor Analysis, with all factor loadings exceeding 0.5 and Kaiser-Meyer-Olkin of .786. Reliability was established through Cronbach's alpha, with all coefficients above 0.70.

Quantitative data from questionnaires were analyzed in SPSS v27. Descriptive statistics (frequencies, means, percentages) summarized graduate responses, while inferential techniques including Pearson correlation and regression analysis tested the relationship between institutional knowledge alignment and holistic graduate outcomes. Qualitative data from interviews were transcribed, coded thematically in NVivo v15, and analyzed using both inductive and deductive approaches to capture patterns and contextual insights. Ethical clearance was obtained from the University of Eldoret Postgraduate Research Committee, the Uganda Christian University Research Ethics Committee (UCUREC), and the Uganda National Council for Science and Technology (UNCST). Official permission was granted by the Permanent Secretary of the Ministry of Education and Sports. All participants provided informed consent, and data were anonymized and handled with strict confidentiality. The study achieved a 98.2% response rate, reflecting high engagement and enhancing the credibility and representativeness of the findings.

IV. FINDINGS & DISCUSSION

4.1 Findings

Table 1 presents descriptive statistics on respondents' perceptions of the contribution of industrial attachment to the acquisition of employable skills. The results are summarized using frequencies, percentages, means, and standard deviations across eight indicators of practical and industry-related skill acquisition.

Table 1*Descriptive statistics on employable skills acquisition through industrial attachment*

	Statement	SD (%)	D (%)	NS (%)	A (%)	SA (%)	Mean	σ
1	During Industrial Attachment, I gained hands-on experience with industry-standard equipment that enhanced my technical competence.	6 (1.6)	0 (0)	18 (4.9)	186 (51.0)	155 (42.5)	4.33	.719
2	Industrial Attachment provided me with opportunities to practice and perfect the technical skills required in my trade area.	8 (2.2)	4 (1.1)	10 (2.7)	180 (49.3)	163 (44.7)	4.33	.779
3	I learned new job-specific techniques during Industrial Attachment that were not taught at my institution.	8 (2.2)	8 (2.21)	18 (4.9)	170 (46.6)	161 (44.1)	4.28	.835
4	The tasks I performed during Industrial Attachment helped me to understand industry quality standards and expectations.	2 (0.5)	2 (0.5)	26 (7.1)	172 (47.1)	163 (44.7)	4.35	.685
5	Industrial Attachment improved my ability to complete work assignments efficiently and within deadlines.	6 (1.6)	0 (0)	16 (4.4)	192 (52.6)	151 (41.4)	4.32	.710
6	I acquired practical knowledge of industry safety procedures and protocols during Industrial Attachment.	8 (2.2)	0 (0)	13 (3.6)	170 (46.6)	174 (47.7)	4.38	.755
7	The skills I gained during Industrial Attachment have made me more confident in applying for jobs in my field.	4 (1.1)	2 (0.5)	11 (3.0)	157 (43.0)	191 (52.3)	4.45	.688
8	My industry supervisor entrusted me with increasingly complex tasks as my skills developed during Industrial Attachment.	2 (0.5)	12 (3.3)	34 (9.3)	197 (54.0)	120 (32.9)	4.15	.762

The results reveal that industrial attachment provides hands-on experience with industry-standard equipment, with 93.5% of respondents agreeing or strongly agreeing (Mean=4.33, SD=0.719). The complete absence of disagreement and only 1.6% strong disagreement suggests that regardless of institutional resource constraints, industrial attachment effectively compensates by exposing trainees to modern tools and machinery. Industrial attachment provided opportunities to practice and perfect technical skills (94.0% affirmative, Mean=4.33, SD=0.779), with only 1.1% disagreement, indicating that attachment placements are overwhelmingly effective environments for skill development through repeated application.

Graduates learned new job-specific techniques during attachment that were not taught at their institutions (90.7% affirmative, Mean=4.28, SD=0.835), though the higher standard deviation indicates substantial variability in exposure to new techniques across different placements. The tasks performed during attachment helped graduates understand industry quality standards and expectations (91.8% affirmative, Mean=4.35, SD=0.685), with very low standard deviation indicating highly consistent experiences across all attachment placements. Industrial attachment improved graduates' ability to complete work assignments efficiently within deadlines (94.0% affirmative, Mean=4.32, SD=0.710), with complete absence of disagreement, suggesting that time management development is universal across all attachment placements.

Graduates acquired practical knowledge of industry safety procedures and protocols (94.3% affirmative, Mean=4.38, SD=0.755), with complete absence of disagreement, indicating that safety training is a universal and non-negotiable component of industrial attachment. The skills gained during attachment made graduates more confident in applying for jobs in their field (95.3% affirmative, Mean=4.45, SD=0.688), representing the highest mean and strongest affirmative response among all items, with only 0.5% disagreement. Industry supervisors entrusted graduates with increasingly complex tasks as skills developed (86.9% affirmative, Mean=4.15, SD=0.762), though 9.3% remained neutral and 3.8% disagreed, indicating that progressive task entrustment is the attachment outcome most dependent on specific conditions such as attachment duration, supervisor engagement, and trainee initiative.

**Table 2***Thematic Matrix of Key Informant Perspectives on Employable Skills Acquisition during Industrial Attachment*

Theme	Key Finding	Representative Quote	Frequency
Hands-on Exposure to Industry Equipment	Industrial attachment provides trainees with access to equipment not available at their institutions, including automated, CNC, and specialized machinery.	"Students are allowed to access the tools and equipment at different levels... It provides them an opportunity to handle machines which are not even available at the institute." (KI1)	10/10
Practical Skill Reinforcement	Attachment enables trainees to move from theoretical knowledge to repeated practical application, reinforcing and perfecting skills learned in class.	"When they go for IA, they practice time and again and gain much competence. The practical at the institution is given limited time, but IA helps students to enhance their practical skills." (KI3)	10/10
New Technique Acquisition	Trainees learn job-specific techniques and technologies during attachment that are not covered in institutional curricula due to curriculum lag and rapid technological change.	"Yes, when they go for IA, they do multi-tasking. For example, a builder may practice and learn welding skills because he or she is in a construction firm where they have not employed a welder." (KI9)	9/10
Understanding Quality Standards	Exposure to industry helps trainees understand and internalize quality standards, including the Japanese 5S model, safety requirements, and professional work expectations.	"When the trainees get exposed to the standards practiced in the industry, they somehow start observing standards. Example: There is based on the Japanese model known as 5S, which helps a technician to work in a safe working environment." (KI6)	9/10
Time Management and Deadline Adherence	The profit-driven nature of industry with strict timelines teaches trainees efficiency, time management, and accountability for completing work within deadlines.	"In industry, employees are given timelines for every task. Due to those timelines, it has helped trainees to develop better time management skills." (KI2)	10/10
Industrial Safety Knowledge	Trainees acquire practical safety knowledge through induction, tool box meetings, orientation, and direct supervision, complementing theoretical safety instruction at institutions.	"Safety is emphasized very much even at the institute, therefore they go for IA when they are already used to it... They get reports from supervisors on safety compliance." (KI8)	10/10
Increased Job Confidence	Successful completion of attachment tasks builds trainee confidence in their abilities, enabling them to apply for jobs, start their own businesses, and present themselves professionally to employers.	"When they master their skills, this motivates them to apply for jobs... They become more confident and most of the time they are retained in the companies they do IA." (KI2)	10/10
Progressive Task Complexity	Trainees who demonstrate competence are entrusted with increasingly complex tasks, with some companies retaining up to 90% of trainees who complete attachment successfully.	"Some industries have reported that their trainees grasp faster probably because of the skills they acquire from the institute... Yes, and when they identify good trainees, they retain them and use them, and become permanent staff." (KI5)	8/10

The qualitative results reveal that key informants unanimously affirmed that industrial attachment plays an indispensable role in employable skills acquisition. All ten informants reported that attachment provides hands-on exposure to industry-standard equipment that is often unavailable at training institutions, including water treatment equipment, pumps, CNC machines, automated welding equipment, and hydraulic lifting systems. As KI1 noted, trainees access equipment not present at the institute, while KI3 emphasized that attachment allows trainees to "practice time and again and gain much competence" compared to the limited time available for practical work at institutions. This finding strongly corroborates the quantitative result showing 93.5% affirmative response for hands-on experience using industry-standard equipment.

Regarding new technique acquisition, nine of ten informants confirmed that trainees learn job-specific skills during attachment that are not covered in institutional curricula. KI3 provided a concrete example: a builder may learn welding skills in a construction firm where no dedicated welder is employed. KI5 added that trainees gain exposure to instrumentation, automation, and even artificial intelligence through industry experience. This finding explains the quantitative result showing 90.7% affirmative response for learning new job-specific techniques, while also accounting for the higher variability ($SD=0.835$) observed, as some placements offer richer exposure to new techniques than others depending on the industry sector and specific tasks assigned.

Understanding quality standards emerged as another critical benefit, with nine informants emphasizing that trainees internalize professional standards through workplace exposure. KI6 specifically mentioned the Japanese 5S model (Sort, Set in order, Shine, Standardize, Sustain) as a quality framework that trainees encounter in industry. KI9 provided examples of quality standards in specific trades, such as using torque wrenches on cylinder heads in motor vehicle maintenance rather than ordinary spanners. These findings support the quantitative result showing 91.8% affirmative response for understanding quality standards, with very low standard deviation ($SD=0.685$) indicating highly consistent positive experiences.

All ten informants reported that industrial attachment improves time management and deadline adherence. KI2 explained that industry employees are given timelines for every task, which helps trainees develop better time management skills. KI8 noted that trainees meet scenarios which are production-based and must work within required deadlines, unlike at the institute where they can repeat tasks without particular deadlines. This finding strongly supports the quantitative result showing 94.0% affirmative response for improved ability to complete work efficiently within deadlines. All ten informants also confirmed that industrial safety knowledge is acquired during attachment, with KI7 reporting that safety is emphasized at the institute and reinforced through induction, tool box meetings, and direct supervision, explaining the high mean of 4.38 and complete absence of disagreement for safety knowledge acquisition.

Regarding job confidence, all ten informants confirmed that attachment increases trainee confidence in seeking employment. KI2 stated that when trainees master their skills, this motivates them to apply for jobs. KI5 reported that graduates become more confident and are often retained by the companies where they completed attachment, with KI8 noting that about 90% of trainees from each cohort are retained unless an individual does not wish to stay. These findings strongly support the quantitative result showing 95.3% affirmative response for job confidence, which had the highest mean (4.45) and strongest affirmative response among all items. However, progressive task complexity showed slightly less universal endorsement, with eight of ten informants confirming that trainees are entrusted with increasingly complex tasks, explaining the lower affirmative response (86.9%) and higher neutral responses (9.3%) in the quantitative data.

Table 3*Pearson Correlation between Employable Skills Acquisition and Holistic TVET Certificate Graduates*

Correlations			
		Employable Skills Acquisition	Holistic TVET certificate graduates
Employable Skills Acquisition	Pearson Correlation	1	.606**
	Sig. (2-tailed)		.000
	N	365	365
Holistic TVET certificate graduates	Pearson Correlation	.606**	1
	Sig. (2-tailed)	.000	
	N	365	365

** . Correlation is significant at the 0.01 level (2-tailed).

The correlation analysis in Table 6.3 revealed a moderate, positive, and statistically significant correlation between employable skills acquisition and holistic graduate outcomes, with a correlation coefficient of $r=0.606$ ($p<0.001$). This indicates that as graduates' acquisition of employable skills through industrial attachment increases, their holistic outcomes also increase in a consistent and predictable manner. The significance level ($p<0.001$) falls well below the conventional threshold of 0.05, providing strong evidence against the null hypothesis. Therefore, the null hypothesis is rejected, and it is concluded that employable skills acquisition has a significant positive effect on holistic graduate outcomes among TVET certificate graduates in Kampala Metropolitan. These findings support the theoretical proposition that hands-on experience with industry-standard equipment, practical skill reinforcement, and exposure to new job-specific techniques enhance graduates' technical competence and employability.

Table 4*Regression Analysis of Employable Skills Acquisition and Holistic TVET Certificate Graduates*

Coefficients ^a					
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	1.798	.173		10.415	.000
Employable Skills Acquisition during IA	.575	.040	.606	14.515	.000
a. Dependent Variable: Holistic TVET certificate graduates					
R	R Square	Adjusted R Square	Std. Error	F Statistic	Sig.
.606 ^a	.367	.365	.39428	210.671	.000 ^b

The regression analysis results in Table 6.4 indicate a statistically significant positive relationship between employable skills acquisition during industrial attachment and holistic TVET certificate graduates. The R Square value of 0.367 shows that employable skills acquisition accounts for 36.7% of the variance in holistic graduate outcomes, which is a meaningful contribution in the context of work-based learning within Kampala Metropolitan. The overall model is statistically significant, as reflected by the F-statistic of 210.671 with a p-value of 0.000, confirming that employable skills acquisition is a reliable predictor of holistic graduate outcomes.

The unstandardized coefficient ($B=0.575$) suggests that for every one-unit increase in employable skills acquisition, holistic graduate outcomes increase by 0.575 units. The standardized Beta coefficient ($\beta=0.606$) indicates a moderate to strong effect size, reinforcing the importance of hands-on experience with industry-standard equipment, practical skill reinforcement, and exposure to new job-specific techniques during attachment. The t-value of 14.515 with a significance level of $p<0.001$ further validates the strength of this relationship. These results highlight that industrial attachment serves as a critical bridge between theoretical training and workplace demands, equipping graduates with the technical competencies required for employment. However, with an R Square of 0.367, it is evident that 63.3% of the variance in holistic graduate outcomes is explained by other factors beyond employable skills acquisition, such as attachment duration, supervision quality, equipment availability at host industries, and alignment of attachment experiences with career goals.

4.2 Discussion

The finding that industrial attachment provides trainees with essential hands-on experience using industry-standard equipment positions equipment exposure as a critical mechanism through which attachment builds technical competence. This finding aligns with Issa and Muya (2025) in Tanzania, who found that industrial attachment improves technical skills through hands-on experience with modern tools and better understanding of equipment. The current study extends these findings by demonstrating that equipment exposure through attachment is nearly universal regardless of institutional resource constraints. This contradicts Mumbe Kailo (2022) in Kenya, who reported that the majority of instructors cite inadequate learning materials and poorly equipped workshops, indicating that without attachment, equipment gaps would severely limit skill development. The divergence is resolved by the qualitative finding that institutions rely on attachment to compensate for equipment deficiencies, with key informants noting that trainees access CNC machines, automated welding equipment, and hydraulic lifting systems not available at their institutes. This finding validates industrial attachment as an indispensable strategy for bridging the equipment gap, suggesting that investments in expanding attachment placements may yield higher returns than investments in institutional equipment alone, particularly for expensive, rapidly evolving technologies.

The finding that industrial attachment offers trainees sustained opportunities to practice and perfect technical skills demonstrates that skill perfection requires time-intensive practice cycles that only authentic work environments can provide. This finding corroborates Kogo, et al. (2025) in Kenya, who reported a strong positive relationship between workplace experience and competency-based education integration, and extends the work of Mujuri and Kathomi (2025) who showed that TVET graduates have a higher chance of wage employment, by demonstrating that skill practice during attachment is the mechanism driving this employment advantage. The current study refines these findings by documenting that practice opportunities are consistently realized across most placements, though the qualitative finding that skill perfection requires time and repetition that institutional schedules cannot provide explains why attachment is essential for moving beyond basic skill acquisition toward genuine mastery (Mumbe Kailo, 2022). This finding suggests that the duration and quality of practice opportunities during attachment should be prioritized in placement decisions, and that institutions should advocate for attachment periods long enough to allow repeated practice cycles.

The finding that trainees acquire new job-specific techniques during industrial attachment that extend beyond institutional curricula positions attachment as a critical mechanism for keeping pace with technological advancement that outruns formal curriculum review cycles. This finding aligns with Cheruiyot (2025) who identified outdated curricula as a major contributor to the skills gap in Kenya, and with Massi et al. (2026) who noted that curricula are typically reviewed infrequently yet rarely integrate digital literacy adequately. The current study extends these findings by identifying sources of variability in new technique acquisition through qualitative data, revealing that exposure depends on industry sector, placement quality, and trainee initiative, with examples including builders learning welding and electrical trainees moving from domestic to industrial wiring. Practically, this finding suggests that industrial attachment functions as a de facto curriculum update mechanism, and institutions should systematically capture new techniques learned during attachment to inform future curriculum revisions (Nugraha et al., 2020). This aligns with Abu Kasim et al. (2024), who found that internships can enhance problem-solving and critical thinking, though the current study demonstrates that new technique acquisition is even broader in scope.

The finding that industrial attachment socializes trainees into industry quality standards, develops time management competencies, provides practical safety knowledge, and transforms job-seeking confidence demonstrates that attachment builds foundational professional competencies beyond technical skills. Understanding quality standards

through exposure to models such as the Japanese 5S framework extends the work of Mohd Kamaruzaman et al. (2025) in Malaysia, who identified digital, technical, and transversal skills as key competency areas, by demonstrating that quality standards internalization occurs through direct workplace exposure. The development of time management competencies aligns with Zixuan et al. (2025) in China, who reported high employability skill levels among TVET students and a strong correlation with career adaptability. The universal acquisition of safety knowledge through induction programmes, tool box meetings, and direct supervision extends Halik Bassah and Mohd Noor (2023) by demonstrating that safety is equally critical and consistently developed across all placements. Finally, the transformation of trainees' self-perceptions from learners to job-ready professionals strongly corroborates Abu Kasim et al. (2024), who found that internships can enhance confidence, though the current study demonstrates that confidence development is the strongest psychological outcome of workplace learning. These findings suggest that industrial attachment serves as a powerful career development intervention that extends beyond skill acquisition, and institutions should leverage attachment-induced confidence to motivate trainees to pursue further education, entrepreneurship, or specialized certifications.

V. CONCLUSION & RECOMMENDATIONS

5.1 Conclusion

Industrial attachment provides trainees with essential hands-on experience using industry-standard equipment that is frequently unavailable at training institutions, positioning equipment exposure as a critical mechanism through which attachment builds technical competence. This equipment exposure is nearly universal across attachment placements, indicating that regardless of institutional resource constraints, industrial attachment effectively compensates by exposing trainees to modern tools and machinery. Investments in expanding and strengthening attachment placement networks may yield higher returns than investments in institutional equipment alone, particularly for expensive, rapidly evolving technologies where institutions cannot sustainably maintain currency.

Industrial attachment offers trainees sustained opportunities to practice and perfect technical skills through repeated application, transforming theoretical knowledge into workplace-ready competence that institutional schedules cannot accommodate. Skill perfection requires time-intensive practice cycles that only authentic work environments can provide, making attachment essential for moving beyond basic skill acquisition toward genuine mastery. The duration and quality of practice opportunities during attachment should be prioritized in placement decisions to maximize skill development outcomes, as trainees who receive extended practice demonstrate stronger competence gains.

Trainees acquire new job-specific techniques during industrial attachment that extend beyond institutional curricula, positioning attachment as a critical mechanism for keeping pace with technological advancement that outruns formal curriculum review cycles. This informal update function is essential for maintaining graduate competency alignment with evolving industry practices, as technology evolves continuously while curricula remain static for years. The systematic capture and integration of new techniques learned during attachment into formal curricula would strengthen the responsiveness of the TVET system to technological change.

Industrial attachment socializes trainees into industry quality standards and professional expectations, transmitting tacit knowledge that cannot be effectively taught in classroom settings where quality culture is abstract rather than experienced. Understanding quality standards is foundational to producing work that meets employer expectations, and these standards are learned most effectively through direct workplace exposure where consequences for substandard work are immediate and tangible. Returning trainees serve as effective ambassadors of quality standards, modeling professional expectations for pre-attachment cohorts.

Industrial attachment develops trainees' ability to complete work assignments efficiently within deadlines, fostering time management competencies that are difficult to cultivate in institutional settings where deadlines are flexible and consequences for non-compliance are minimal. The profit-driven nature of industry, with its fixed schedules, production targets, and binding deadlines, teaches efficiency and prioritization through direct experience. This time management competency develops universally across all attachment placements, highlighting the unique contribution of workplace exposure to foundational professional skills.

5.2 Recommendations

The Ministry of Education and Sports should mandate a minimum industrial attachment duration of twelve weeks per academic year, doubling the current six-week requirement, to allow sufficient time for progressive task entrustment and deep skill mastery. Evidence from this study shows that entrustment with increasingly complex tasks was the least universal outcome (86.9% affirmative), with 9.3% neutral responses, indicating that the current six-week period is insufficient for many trainees to progress through initial observation to independent execution of complex tasks. The extended duration should be phased in over two years, starting with high-demand trades where attachment placements are most available.

The Uganda TVET Council (UVTAB) should establish a national Employer Recognition Scheme that certifies companies providing quality supervision, structured progressive task assignment, and comprehensive safety training to trainees during industrial attachment. Certified employers should receive public recognition, preferred status for government contracts, and eligibility for tax incentives. The scheme should include mandatory supervisor training on feedback provision, task progression strategies, and safety documentation, addressing the finding that 9.3% of trainees remained neutral about entrustment with complex tasks due to inconsistent supervision quality.

UVTAB should develop a national Industrial Safety Certification Scheme that recognizes employers who provide comprehensive safety training, including induction programmes, tool box meetings, and personal protective equipment, to trainees during attachment. Certified employers should receive public recognition and may be eligible for incentives such as preferential consideration for government contracts or tax benefits. UVTAB should also develop a standardized safety training logbook that trainees complete during attachment, documenting safety induction, daily tool box meeting attendance, and safety protocols observed and practiced, building on the finding that safety knowledge acquisition was universal (94.3% affirmative) but documentation remains inconsistent.

TVET institutions should establish systematic mechanisms for capturing new job-specific techniques that trainees learn during industrial attachment, using trainee presentations, supervisor reports, and logbook entries as primary data sources. These captured techniques should be reviewed quarterly by curriculum committees for potential integration into formal training programmes, with priority given to techniques identified as emerging across multiple attachment placements. Institutions should maintain a live repository of new techniques documented from attachment experiences, accessible to trainers for updating practical exercise content, addressing the finding that 90.7% of trainees learn new techniques during attachment but this learning is not systematically captured for curriculum improvement.

TVET institutions should establish a Quality Standards Ambassador Programme that recognizes returning trainees who have internalized industry quality standards during attachment and empowers them to mentor pre-attachment trainees on professional expectations. These ambassadors should participate in pre-attachment orientation sessions, demonstrating proper tool use, quality standards application, and professional conduct. The programme should include formal recognition mechanisms such as certificates, references, and priority consideration for attachment placements with high-quality employers, leveraging the finding that 91.8% of trainees understand quality standards through attachment but this knowledge is not systematically shared with subsequent cohorts.

Declaration of Interest

The authors declare that they do not have any known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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