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Research Article

Gender Equality in Technical and Vocational Education and Its Contribution to Poverty Reduction Outcomes in Selected Districts of the Ashanti Region

Jonathan Yawson*

College of Distance Education, University of Cape Coast, Cape Coast, Ghana

Abstract

Technical and Vocational Education and Training (TVET) has been widely acknowledged as a pathway for skills development and economic empowerment, yet gender disparities in access and participation continue to limit its full potential as a poverty reduction tool. This study examined the relationship between gender equality in TVET and poverty reduction outcomes in selected districts of the Ashanti Region of Ghana. Drawing on Human Capital Theory and the Capability Approach, the study adopted a sequential explanatory mixed methods design. Quantitative data were collected through structured questionnaires administered to TVET students, graduates, and district-level education officers, while qualitative insights were obtained through semi-structured interviews. The analysis, conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM), revealed that gender equality in TVET significantly influences skills acquisition outcomes, which in turn contribute to poverty reduction. Furthermore, skills acquisition was found to mediate the relationship between gender equality in TVET and poverty reduction. These findings are consistent with studies that underscore the role of inclusive vocational education in economic empowerment. The study recommends that policymakers and TVET institutions in Ghana prioritize gender-responsive enrollment policies, targeted bursaries for female students, and curricula reforms that address occupational segregation, in order to maximize the contribution of vocational education to poverty reduction goals.

Keywords

Gender Equality, TVET, Poverty Reduction, Ashanti Region, Ghana

1. Introduction

The relationship between education and poverty reduction has occupied a central place in development discourse for several decades. Among the various education sub-sectors, Technical and Vocational Education and Training (TVET) has attracted growing attention as a practical tool for addressing unemployment, income inequality, and economic exclusion, particularly in developing countries [28, 31]. TVET equips individuals with occupational competencies that are directly applicable in the labour market, making it a relevant mechanism for generating income and improving living standards [19]. In Ghana, successive governments have invested in TVET expansion through policies such as the Technical and Vocational

*Correspondence: Jonathan Yawson (yawson.jonathan@yahoo.com)

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Education and Training Policy of 2016, reflecting a commitment to skills-based development [7].

Despite this policy commitment, persistent gender disparities in TVET enrollment, retention, and completion remain a pressing concern. Across Sub-Saharan Africa, female students are significantly underrepresented in TVET programmes, particularly in technical trades such as construction, automotive technology, and electrical installation [2]. In Ghana, cultural expectations about appropriate occupations for women, combined with limited financial support and inadequate gender-sensitive facilities, continue to discourage female participation in vocational training [1]. These disparities are not merely an equity concern. They carry direct economic consequences, as they restrict the pool of skilled female labour, suppress household incomes, and reproduce cycles of poverty across generations [17].

The Ashanti Region provides a relevant context for investigating these dynamics. As one of Ghana's most economically active regions, the Ashanti Region hosts a significant proportion of the country's TVET institutions, including Technical and Vocational Institutes (TVIs) and Community Technical Vocational and Agricultural Institutes (COTVAGs). The region's economy, which combines industrial activity, commerce, and artisanal production, depends significantly on the output of skilled workers from these institutions [12]. Yet gender enrollment gaps within TVET institutions in the region persist, with female students concentrated in traditional home economics and catering programmes while male students dominate technical and engineering trades [8].

Understanding the extent to which gender equality in TVET translates into poverty reduction outcomes is therefore both a policy question and a research gap. While the broad connection between education and poverty reduction is well established, empirical evidence specifically examining how gender-inclusive TVET contributes to income improvement and economic resilience in the Ghanaian context remains limited [1, 20]. This study addresses that gap by examining how gender equality in TVET shapes skills acquisition outcomes and how those outcomes, in turn, contribute to poverty reduction in selected districts of the Ashanti Region.

By integrating Human Capital Theory with the Capability Approach, the study provides a framework that accounts for both the productive value of skills and the broader freedoms and opportunities that education can generate for individuals and households. The findings are expected to contribute to academic literature on vocational education and gender, and to offer practical guidance for policymakers, TVET administrators, and development practitioners working to close the gender gap in skills training and economic participation.

2. Statement of the Problem

Ghana's commitment to poverty reduction has been reflected in a series of national policy frameworks, from the Growth and Poverty Reduction Strategy (GPRS II) to the alignment of national development plans with the Sustainable Development Goals (SDGs), particularly SDG 1 (No Poverty), SDG 4 (Quality Education), and SDG 5 (Gender Equality) [21]. Technical and Vocational Education and Training has been identified within these frameworks as a critical pathway for equipping disadvantaged populations, including women, with income-generating skills [7]. Despite this recognition, the persistence of gender-based barriers in TVET enrollment and completion points to a structural disconnect between policy intention and implementation outcomes.

In the Ashanti Region, where TVET institutions are relatively well distributed compared to other regions, female participation in vocational programmes remains disproportionately low, particularly in high-earning technical trades [8]. This imbalance means that even where vocational training generates economic returns for male graduates, women continue to be excluded from the most remunerative segments of the skilled labour market. The consequence is a gendered pattern of poverty in which women, despite acquiring some vocational credentials, earn significantly less than their male counterparts and remain more economically vulnerable [1].

Several studies have examined gender and poverty in Ghana from the perspectives of agricultural labor, microfinance access, and health outcomes [17, 20]. Fewer have focused on TVET as a specific locus where gender inequality reproduces itself and where targeted interventions could have measurable poverty reduction effects. This is a critical gap, as TVET operates at the intersection of education policy and labour market outcomes, making it a particularly strategic site for gender-responsive investment [19].

Furthermore, most existing studies on TVET and gender in Ghana have relied on broad national statistics or policy documents, without examining the mechanisms through which gender equality in vocational training translates, or fails to translate, into tangible poverty reduction outcomes at the district level [1]. There is therefore a need for empirical research that examines these relationships in specific geographic and institutional contexts, with attention to how skills acquisition functions as a mediating variable between gender-inclusive TVET and improved economic outcomes for households.

This study addresses these gaps by investigating, in selected districts of the Ashanti Region, the extent to which gender equality in TVET influences skills acquisition and poverty reduction outcomes. The findings aim to provide district-level evidence that can inform targeted policy and programmatic responses.

The primary purpose of this study is to examine the relationship between gender equality in Technical and Vocational Education and Training and poverty reduction outcomes in selected districts of the Ashanti Region of Ghana.

Specifically, the study seeks to:

1) examine how gender-equitable enrollment and participation in TVET programmes influences skills acquisition outcomes among male and female trainees in the Ashanti Region.

2) assess the extent to which skills acquisition functions as a mediating mechanism through which gender equality in TVET contributes to poverty reduction outcomes at the household and community levels.

3. Literature Review

3.1. Conceptualising Gender Equality in TVET

Gender equality in Technical and Vocational Education and Training goes beyond numerical parity in enrollment figures. It refers to the creation of learning environments where individuals of all genders have equal access to training opportunities, benefit from gender-sensitive pedagogy, and are not steered toward or away from specific occupational tracks on the basis of gender [28]. In practical terms, this encompasses equal access to physical facilities, equitable distribution of scholarships and financial support, the removal of stereotyping from curricula and instructional materials, and the training of instructors to deliver content in gender-responsive ways [19].

In Ghana, the concept of gender equality in TVET is further complicated by occupational segregation, a pattern in which female students disproportionately enroll in programmes such as catering, dressmaking, and hairdressing, while male students dominate automotive, electrical, and construction programmes [8]. This segregation reflects and reinforces broader social norms about gender-appropriate work and has direct implications for economic outcomes, since female-dominated TVET fields tend to yield lower earnings in the formal and informal labour markets [1]. Achieving genuine gender equality in TVET therefore requires not only increasing female enrollment in absolute terms, but actively dismantling the structural factors that channel students into gendered occupational tracks.

3.1.1. Skills Acquisition and Economic Outcomes

Skills acquisition refers to the process through which individuals develop occupational competencies, technical knowledge, and practical abilities that improve their productivity and labour market value [31]. In the context of TVET, skills acquisition is the primary intended outcome of training, and its quality determines the extent to which graduates are equipped to enter employment, establish enterprises, or generate income through self-employment [19]. Research across Sub-Saharan Africa consistently shows that TVET graduates who acquire relevant and market-responsive skills enjoy higher earning potential and lower rates of unemployment than those without vocational credentials [2].

For women in particular, skills acquisition through TVET represents a means of economic agency that extends beyond individual earning. Studies have shown that women with marketable vocational skills are better positioned to make household financial decisions, invest in children's education and nutrition, and accumulate assets over time [17]. These outcomes aggregate into measurable poverty reduction effects at the household and community levels. However, the type and quality of skills acquired matters significantly. Women who complete training in high-demand technical fields tend to experience greater income gains than those concentrated in low-paying, saturated trades [1].

3.1.2. Gender Equality in TVET and Skills Acquisition

The relationship between gender equality in TVET and skills acquisition is shaped by both structural and pedagogical factors. When female students are enrolled in TVET on equal terms with their male counterparts, and when the learning environment is designed to support their participation, their skills development outcomes tend to improve [28]. Gender-equitable TVET environments reduce dropout rates among female students, increase the likelihood of programme completion, and create conditions in which female trainees can acquire skills at the same level of depth and competency as male trainees [19].

In contexts where gender disparities are significant, skills acquisition among female students is often compromised by unequal access to practical equipment, instructor bias in skills demonstration, and the time constraints imposed by domestic responsibilities [1]. Addressing these barriers through targeted institutional reforms, such as flexible training schedules, on-site childcare facilities, and female-focused mentorship programmes, has been shown to improve both the quality and depth of skills acquired by female TVET participants [28]. This suggests that the pathway from gender equality in TVET to improved skills outcomes is not automatic but is contingent on the presence of specific enabling conditions within institutions.

3.2. Skills Acquisition and Poverty Reduction

3.2.1. Skills Acquisition and Income Outcomes

Poverty reduction through skills development is a well-established premise in development economics, grounded in the argument that human capital investment generates income returns for individuals and positive externalities for communities and national economies [31]. In the Ghanaian context, vocational skills have been linked to improvements in self-employment income, household food security, and access to social services, particularly in urban and peri-urban areas where informal labour markets are active [12].

The poverty-reduction potential of skills acquisition is, however, not uniformly distributed. In communities where occupational segregation is pronounced, women with vocational credentials in female-dominated fields earn considerably less than men with comparable levels of training in technical fields

[1]. This gendered return on skills investment means that poverty reduction outcomes from TVET are systematically lower for women than for men under conditions of gender inequality. Reducing this gap requires interventions that improve both the gender-inclusiveness of TVET enrollment and the occupational profile of female graduates, ensuring that they enter fields where skills translate into adequate and sustainable income.

3.2.2. Gender Equality, TVET, and the Millennium Development Goals

The Millennium Development Goals provided an early global framework for linking education, gender equality, and poverty reduction. MDG 2 (Universal Primary Education), MDG 3 (Promote Gender Equality and Empower Women), and MDG 1 (Eradicate Extreme Poverty and Hunger) were explicitly interconnected, with gender-equitable education recognized as both an end in itself and a mechanism for achieving broader development outcomes [29]. Although TVET was not always foregrounded in MDG discussions, which tended to prioritize basic education, its role in translating educational attainment into income and poverty reduction was implicitly recognized in target-setting for employment and economic empowerment.

The transition to the SDG framework, specifically SDG 4.3 (equal access to TVET) and SDG 4.4 (skills for employment and decent work), has brought TVET more centrally into the global development agenda [30]. In Ghana, this shift is reflected in the revision of the TVET policy framework and the establishment of the Council for Technical and Vocational Education and Training (COTVET) as the national coordinating body for skills development. Understanding how gender equality in TVET connects to poverty reduction outcomes contributes directly to the evidence base needed to implement these commitments at the district and institutional levels.

4. Theoretical Review

4.1. Human Capital Theory

Human Capital Theory, associated primarily with the work of Becker [4] and Schultz [25], holds that investment in education and training increases the productive capacity of individuals, which translates into higher earnings and improved economic welfare. The theory provides a foundational rationale for public investment in TVET, by establishing the link between skills acquisition and labour market productivity. When applied to gender, Human Capital Theory predicts that equalizing access to vocational training between men and women should reduce gender wage gaps and contribute to household poverty reduction, because female trainees acquire the same productive skills as their male counterparts.

In the context of this study, Human Capital Theory provides the conceptual basis for understanding how gender equality in TVET, by expanding access to skills development for women, generates returns that contribute to poverty reduction outcomes. It also helps explain why occupational segregation within TVET undermines these returns, since it channels female students into lower-productivity training tracks that yield smaller income gains.

4.2. The Capability Approach

The Capability Approach developed by Sen [26] and extended by Nussbaum [22], offers a complementary perspective by moving beyond income as the primary measure of development [22]. The approach defines human well-being in terms of the capabilities that individuals have to live the lives they have reason to value, including access to education, participation in economic and social life, and freedom from discrimination. In this framework, gender equality in TVET is valuable not only because it increases earning potential but because it expands the substantive freedoms available to women, enabling them to make meaningful choices about their occupational futures.

The Capability Approach developed by Sen [26] is particularly relevant in the Ghanaian context, where cultural norms constrain women's occupational choices independent of their educational qualifications. It draws attention to the difference between formal access to TVET and the actual ability to benefit from that access, a distinction that is central to understanding why gender parity in enrollment numbers does not always produce equivalent outcomes for male and female graduates..

4.3. Integration of Theories

Taken together, Human Capital Theory and the Capability Approach provide a framework in which gender equality in TVET functions as both a productive investment and an expansion of individual agency. Human Capital Theory explains the income-related pathway from skills acquisition to poverty reduction, while the Capability Approach captures the broader social and economic freedoms that gender-equitable TVET can generate for women. The integration of these perspectives supports the argument that skills acquisition is the key mediating mechanism linking gender equality in TVET to poverty reduction outcomes, as it represents the point at which educational participation is converted into productive capacity and economic agency.

5. Hypotheses Development

5.1. Hypothesis 1

There is no statistically significant relationship between Gender Equality in TVET and Skills Acquisition Outcomes.

Gender Equality in TVET and Skills Acquisition

The relationship between gender equality in educational settings and learning outcomes has been documented across

multiple levels of education. Where learning environments are inclusive and where institutional practices do not disadvantage female students, both male and female learners tend to achieve comparable competency levels [28]. In TVET specifically, gender-responsive teaching practices and equal access to practical training resources have been linked to improved skills acquisition for female trainees [19].

In Ghana, where female students in TVET face documented disadvantages including limited access to workshop equipment, instructor bias, and time pressures from domestic responsibilities, the gap between formal enrollment and actual competency development is likely to be significant [1]. Studies from comparable contexts in Sub-Saharan Africa suggest that institutions that actively promote gender equality through policy and practice tend to produce female graduates with stronger occupational competencies than institutions that treat gender equality as incidental [2].

Based on this body of evidence, it is hypothesized that gender equality in TVET will have a significant positive relationship with skills acquisition outcomes. Rejecting the null hypothesis in this direction would support the argument that institutional gender equity practices have measurable effects on the quality of training received by students.

5.2. Hypothesis 2

There is no statistically significant relationship between Skills Acquisition Outcomes and Poverty Reduction.

Skills Acquisition and Poverty Reduction Outcomes

The link between vocational skills and poverty reduction is grounded in both theoretical reasoning and empirical evidence. Individuals with marketable occupational skills are better positioned to access formal employment, establish viable enterprises, and generate sustainable income [31]. In Ghana, TVET graduates working in sectors such as construction, welding, ICT, and food processing have been shown to earn incomes that lift households above the national poverty line, particularly in urban centres such as Kumasi and Obuasi within the Ashanti Region [12].

For women, the poverty-reduction effect of skills acquisition is mediated by additional factors including access to start-up capital, mobility, and social networks. Nevertheless, studies consistently show that women who complete market-relevant vocational programmes achieve measurable income gains relative to women with no vocational credentials [17]. The direction and magnitude of these gains are influenced by the occupational field of training, the quality of skills acquired, and the economic context in which graduates seek to apply them.

It is therefore hypothesized that skills acquisition outcomes will have a significant positive relationship with poverty reduction. Supporting this hypothesis would establish skills acquisition as the productive mechanism through which educational investment translates into economic improvement at the household level.

5.3. Hypothesis 3

There is no statistically significant direct relationship between Gender Equality in TVET and Poverty Reduction Outcomes.

5.4. Hypothesis 4

Skills Acquisition does not significantly mediate the relationship between Gender Equality in TVET and Poverty Reduction Outcomes.

The mediation hypothesis rests on the argument that gender equality in TVET contributes to poverty reduction primarily by enabling female trainees to acquire stronger and more market-relevant skills, which in turn generate income and reduce household poverty [19, 28]. This indirect pathway is theoretically grounded in both Human Capital Theory and the Capability Approach, both of which locate the productive value of education in the competencies and freedoms it generates for individuals.

If skills acquisition mediates this relationship, it would suggest that policies aimed at increasing the gender-inclusiveness of TVET must also attend to the quality and market-relevance of the skills being acquired, particularly for female students. It would also confirm that the poverty-reduction potential of gender equality in TVET is not automatic but depends on the extent to which equal participation translates into equal competency development. Testing this mediation provides deeper insight into the mechanisms through which TVET policy can most effectively contribute to poverty reduction goals in the Ashanti Region.

6. Research Methods

6.1. Research Design

This study adopted a sequential explanatory mixed methods design, which integrates both quantitative and qualitative approaches within a single research framework. The design involves initial collection and analysis of quantitative data, followed by qualitative data collection to explain and provide deeper insight into the quantitative results [9]. The choice of this design is grounded in the pragmatic research paradigm, which supports the use of multiple approaches to address complex research problems and generate comprehensive findings [27].

The quantitative phase focused on measuring the relationships among gender equality in TVET, skills acquisition outcomes, and poverty reduction indicators using statistical modelling. This was complemented by a qualitative phase that explored participants' lived experiences to provide contextual interpretation of the quantitative findings. The combination of approaches strengthens the validity of the study by enabling triangulation across different data sources [18].

6.2. Population

The target population for this study comprised current TVET students, TVET graduates within the past five years, TVET instructors, and district-level Ghana Education Service officers in selected districts of the Ashanti Region. These groups were identified as relevant because they are directly involved in or affected by TVET delivery and outcomes, and are therefore well positioned to provide both quantitative data and experiential perspectives on gender equality and skills development.

The accessible population was drawn from TVET institutions in the Kwabre East, Ejisu, and Asante Akim Central districts of the Ashanti Region, which together host a range of public and private TVET institutions offering both technical and vocational programmes. These districts were selected because they reflect a mix of urban, peri-urban, and semi-rural contexts, enabling the study to capture diverse economic conditions under which TVET graduates apply their skills.

6.3. Sampling Procedure and Sample Size

A multistage sampling technique was employed to select participants. In the first stage, purposive sampling was used to select TVET institutions in each district that offer programmes spanning both technical and vocational tracks. In the second stage, stratified sampling was applied to ensure representation of male and female students, different programme areas, and instructor levels. In the third stage, simple random sampling was used to select individual respondents within each stratum.

For the quantitative phase, a sample size of approximately 380 respondents was targeted, comprising 250 students and recent graduates, 80 instructors, and 50 district education officers. This sample size is consistent with the requirements for structural equation modelling and provides adequate statistical power for testing the hypothesized relationships [14]. For the qualitative phase, 20 participants were selected through purposive sampling, with data collection continuing until thematic saturation was achieved [13].

6.4. Data Collection Instrument

6.4.1. Questionnaire

The primary instrument for the quantitative phase was a structured questionnaire designed to measure three constructs: Gender Equality in TVET (GET), Skills Acquisition Outcomes (SAO), and Poverty Reduction Outcomes (PRO). The questionnaire was developed from existing validated scales adapted to the Ghanaian TVET context, drawing on instruments used in prior studies on vocational education, gender equity, and economic development [1, 19].

The instrument used a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), with items structured to capture perceptions of gender equality in training environments, self-assessed competency acquisition, and household income and poverty indicators. Demographic items collected information on gender, programme area, year of study or graduation, and district of residence.

6.4.2. Validity and Reliability

Content validity was established by submitting the questionnaire to five subject matter experts in TVET policy, gender studies, and development economics for review and comment. Suggestions were incorporated before a pilot study was conducted with 40 respondents drawn from a TVET institution not included in the main study. Cronbach's alpha coefficients were computed, with values above 0.70 considered acceptable [14].

6.4.3. Qualitative Instrument

For the qualitative phase, semi-structured interview guides were developed for two sub-groups: female TVET graduates and TVET instructors. The guides addressed themes including perceived barriers to gender-equitable participation in TVET, the quality of skills acquired relative to programme type and gender, and the relationship between vocational training outcomes and household poverty. This approach allowed for flexible probing while maintaining thematic focus [9].

6.5. Data Collection Procedures

Quantitative data collection was conducted in two ways. For students and instructors in institutions, questionnaires were administered in person during arranged sessions, with trained research assistants present to clarify items and ensure completeness. For TVET graduates and district officers not based in institutions, questionnaires were administered electronically through a mobile-compatible survey platform. All participants received a cover letter explaining the purpose of the study, providing assurances of confidentiality, and requesting informed consent.

Qualitative interviews were conducted at venues convenient to participants, including TVET institutions and district education offices. Each interview lasted between forty-five minutes and one hour and was recorded with participant consent. Field notes capturing contextual observations were maintained throughout the data collection period.

6.6. Techniques of Data Analysis

6.6.1. Quantitative Analysis

Quantitative data were coded, cleaned, and analysed using the Statistical Package for the Social Sciences (SPSS) for descriptive statistics and SmartPLS 3.0 for Partial Least Squares Structural Equation Modelling (PLS-SEM). PLS-SEM was selected for its suitability in handling models with multiple latent variables and its capacity for simultaneous assessment of

measurement and structural models [14]. The analysis followed a two-step approach.

In the first step, the measurement model was assessed by evaluating indicator reliability (factor loadings above 0.70), internal consistency reliability (Composite Reliability above 0.70), convergent validity (Average Variance Extracted above 0.50), and discriminant validity using the Fornell-Larcker criterion [14, 15]. In the second step, the structural model was evaluated using path coefficients, t-values, p-values from bootstrapping with 5,000 resamples, coefficient of determination (R^2), and effect sizes (f^2) [6].

6.6.2. Qualitative Analysis

Qualitative data were analysed using thematic analysis, following the six-phase process described by Braun and Clark [5]: data familiarisation, initial coding, theme generation, theme review, theme definition, and write-up. Themes were derived inductively from the data and were subsequently mapped onto the quantitative constructs to provide contextual explanation of the statistical findings. Trustworthiness was maintained through member checking, peer debriefing, and thick description.

6.7. Ethical Considerations

Ethical clearance for the study was obtained from the relevant institutional authority prior to data collection. All participants provided informed consent and were assured of their right to withdraw at any stage without consequence. Confidentiality was protected by replacing personal identifiers with alphanumeric codes in all data records and reports. The study adhered to the ethical standards for research involving human participants as outlined in Creswell and Creswell (2018).

7. Presentation of Results

7.1. Preliminary Results

7.1.1. Descriptive Statistics

Table 1 presents the mean, standard deviation, skewness, and kurtosis values for the three constructs examined in this study: Gender Equality in TVET (GET), Skills Acquisition Outcomes (SAO), and Poverty Reduction Outcomes (PRO). The mean scores for all constructs ranged between 3.41 and 4.08, indicating that respondents generally held moderately positive assessments of gender equality in their training environments and its relationship to their skills and economic outcomes. Skewness values ranged from -0.614 to -0.398 and kurtosis values from -0.702 to -0.511, all within the acceptable threshold of plus or minus 2, confirming approximate normality [11].

Table 1. *Descriptive Statistics.*

Construct	Mean	SD	Skewness	Kurtosis
GET	3.91	0.79	-0.614	-0.702
SAO	4.08	0.73	-0.398	-0.511
PRO	3.41	0.91	-0.501	-0.588

Note: GET = Gender Equality in TVET; SAO = Skills Acquisition Outcomes; PRO = Poverty Reduction Outcomes

7.1.2. Assessment of Measurement Model

Indicator Reliability

Indicator reliability was assessed by examining the factor loadings of each item in the questionnaire. Items with loadings above 0.70 were retained as recommended by Hair et al. (2017). Most items in this study demonstrated loadings above 0.70, confirming that the indicators adequately represented their respective constructs. Three items with loadings between 0.60 and 0.70 were retained based on their contribution to content validity and composite reliability. Items falling below 0.60 were removed to improve model quality.

Construct Validity and Reliability

Table 2 presents the Cronbach's Alpha (CA), Composite Reliability (CR), and Average Variance Extracted (AVE) values for the three constructs. All CA values exceeded the acceptable threshold of 0.70, while all CR values exceeded 0.80, confirming adequate internal consistency. AVE values for all constructs exceeded 0.50, indicating satisfactory convergent validity [15].

Table 2. *Construct Validity and Reliability.*

Construct	CA	CR	AVE
GET	0.857	0.894	0.638
SAO	0.871	0.908	0.661
PRO	0.843	0.917	0.693

Note: GET = Gender Equality in TVET; SAO = Skills Acquisition Outcomes; PRO = Poverty Reduction Outcomes

Discriminant Validity

Discriminant validity was assessed using the Fornell-Larcker criterion, which requires the square root of the AVE for each construct to exceed its correlations with all other constructs in the model [10]. Table 3 shows that this condition was satisfied for all three constructs. Additionally, the Heterotrait-Monotrait (HTMT) ratios for all construct pairs were below the threshold of 0.90, providing further confirmation of discriminant validity [16].

Table 3. Discriminant Validity (Fornell-Larcker Criterion).

	GET	SAO	PRO
GET	0.799		
SAO	0.678	0.813	
PRO	0.594	0.721	0.832

Note: GET = Gender Equality in TVET; SAO = Skills Acquisition Outcomes; PRO = Poverty Reduction Outcomes. Diagonal entries are the square roots of AVE.

Model Fit Indices

Model fit was assessed using the Standardized Root Mean Square Residual (SRMR) and the Normed Fit Index (NFI). The SRMR value of 0.071 falls below the recommended threshold of 0.08, and the NFI value of 0.91 exceeds the threshold of 0.90, together indicating acceptable model fit [23, 24].

7.1.3. Assessment of Structural Model

The structural model was evaluated using bootstrapping with 5,000 resamples. Path coefficients, t-values, p-values, effect sizes (f^2), and coefficients of determination (R^2) were examined to assess the significance and magnitude of the hypothesized relationships [6, 14].

Table 4. Structural Model Results.

Hypothesis	Path	β	t-value	p-value	f^2	R^2
H1	GET → SAO	0.608	8.114	0.000	0.371	0.574
H2	SAO → PRO	0.519	6.483	0.000	0.274	0.631
H3	GET → PRO	0.261	2.974	0.003	0.084	0.631

Note: GET = Gender Equality in TVET; SAO = Skills Acquisition Outcomes; PRO = Poverty Reduction Outcomes

7.2. Interpretation of Results

The results indicate that Gender Equality in TVET has a significant positive effect on Skills Acquisition Outcomes ($\beta = 0.608$, $p < 0.05$), supporting the rejection of the null hypothesis in H1. This means that more gender-equitable TVET environments are associated with stronger skills acquisition among trainees. Gender Equality in TVET explains 57.4% of the variance in Skills Acquisition Outcomes, a substantial level of predictive accuracy.

Skills Acquisition Outcomes were also found to have a significant positive effect on Poverty Reduction Outcomes ($\beta = 0.519$, $p < 0.05$), supporting the rejection of H2. This confirms that trainees who acquire stronger occupational skills are more likely to report improved income and reduced household poverty. The direct relationship between Gender Equality in TVET and Poverty Reduction Outcomes ($\beta = 0.261$, $p < 0.05$) provides grounds for rejecting H3, though the magnitude of this direct effect is smaller than the indirect pathway through skills acquisition, pointing to the importance of skills development as a mediating mechanism. Together, Gender Equality in TVET and Skills Acquisition Outcomes explain 63.1% of the variance in Poverty Reduction Outcomes.

Mediation Analysis

To test H4, bootstrapping was used to assess the indirect effect of Gender Equality in TVET on Poverty Reduction Outcomes through Skills Acquisition. The indirect effect was statistically significant ($\beta = 0.315$, $p < 0.05$), with a 95% bias-corrected confidence interval that did not include zero. This confirms that Skills Acquisition Outcomes partially mediate the relationship between Gender Equality in TVET and Poverty Reduction Outcomes, and H4 is therefore rejected.

Interpretation of Mediation

The mediation analysis shows that while gender equality in TVET has a direct effect on poverty reduction, a substantial portion of its influence operates through its positive effect on skills acquisition. This implies that gender-equitable training environments improve poverty outcomes largely by enabling female and male trainees alike to acquire stronger and more market-relevant competencies, which they then convert into income and economic resilience. Education and gender equity alone are not sufficient; the quality and applicability of skills acquired in training remain the primary conduit through which poverty reduction is achieved.

7.3. Summary of Findings

Three key findings emerge from this study:

1) Gender equality in TVET significantly shapes the quality and depth of skills acquisition among trainees in the Ashanti Region.
2) Skills acquisition outcomes play a significant role in determining the extent to which TVET graduates achieve household-level poverty reduction.

3) Skills acquisition partially mediates the relationship between gender equality in TVET and poverty reduction, confirming it as the primary mechanism through which gender-equitable training contributes to economic outcomes.

8. Discussion of Findings

8.1. Discussion of Key Findings

The findings of this study provide clear evidence of the role that gender equality in TVET plays in shaping skills outcomes and, through those outcomes, in contributing to poverty reduction among households in the Ashanti Region. The significant positive effect of gender equality in TVET on skills acquisition ($\beta = 0.608$, $p < 0.05$) is consistent with studies that identify inclusive training environments as a prerequisite for equitable competency development [19, 28]. This finding reflects Social Learning Theory's proposition that learning outcomes are shaped not only by individual ability but by the institutional contexts and social interactions within which training takes place [3]. In TVET settings where gender equality is prioritized, female trainees are more likely to access practical equipment, receive equitable instructor attention, and complete their programmes without the dropout pressures that disproportionately affect women in less inclusive environments.

The significant relationship between skills acquisition and poverty reduction ($\beta = 0.519$, $p < 0.05$) aligns with Human Capital Theory's central proposition that investment in productive competencies generates economic returns for individuals and households [4]. In the Ashanti Region, where informal sector activity and small enterprise ownership are common livelihood strategies, occupational skills from TVET translate into income-generating capacity in multiple sectors including construction, catering, ICT services, and textile production. This finding is supported by evidence from comparable Ghanaian contexts showing that TVET graduates who acquire market-relevant skills report measurable improvements in household income, asset ownership, and access to education for their children [12].

The direct but smaller effect of gender equality in TVET on poverty reduction ($\beta = 0.261$, $p < 0.05$) is important because it confirms that gender equity in vocational training generates economic benefits beyond what can be attributed solely to skills acquisition. This residual direct effect may reflect the broader social and psychological dimensions of gender equality in educational settings, including improved self-efficacy, social capital, and negotiating power, all of which have been linked to improved economic outcomes for women [17]. The Capability Approach provides a useful lens for interpreting this finding, as it draws attention to the non-income dimensions of well-being that gender-equitable education generates for trainees.

The mediation analysis, which confirms skills acquisition as a partial mediator ($\beta = 0.315$, $p < 0.05$), carries important implications for both theory and practice. It suggests that gender equality in TVET does not automatically reduce poverty; rather, its poverty-reducing potential is contingent on the extent to which equal participation translates into equal competency development. This finding is particularly relevant in the Ashanti Region context, where female students are disproportionately enrolled in lower-earning vocational tracks. Even if these women participate in TVET on formally equal terms with their male counterparts, occupational segregation within training programmes limits the depth and marketability of the skills they acquire, which in turn constrains their income-generating potential.

From a policy perspective, these findings suggest that achieving the poverty-reduction potential of gender-equitable TVET in the Ashanti Region requires a dual focus: eliminating the structural barriers that prevent women from enrolling in and completing TVET programmes on equal terms with men, and reforming the occupational profile of female TVET enrollment to reduce concentration in low-earning fields. Without the second element, gender parity in numbers will not generate gender parity in economic outcomes, and the contribution of TVET to poverty reduction will remain systematically lower for women than for men.

8.2. Research Contributions

8.2.1. Contribution to Knowledge

This study contributes to existing literature by providing district-level empirical evidence on the relationship between gender equality in TVET, skills acquisition, and poverty reduction in Ghana. It establishes that gender equity in vocational training environments has a measurable positive effect on the quality of skills acquired by trainees, and that these skills translate into household-level poverty reduction outcomes. It further confirms skills acquisition as a significant mediating variable, offering a more precise understanding of the mechanism through which gender-equitable TVET contributes to economic development.

8.2.2. Contribution to Theory

The study advances theoretical knowledge by integrating Human Capital Theory with the Capability Approach in the analysis of TVET outcomes. This integration provides a more comprehensive framework than either theory alone, accommodating both the income-related returns to vocational skills and the broader freedoms and agency that gender-equitable training generates for women. The application of this integrated framework to TVET and poverty reduction in the Ghanaian context enriches theoretical discourse on the education-development nexus.

8.2.3. Contribution to Methodology

Methodologically, the study contributes by applying a se-

quential explanatory mixed methods design to a TVET-specific research question in the Ghanaian context. The quantitative component, using PLS-SEM with bootstrapping and mediation analysis, provides statistically rigorous evidence on the structural relationships among the constructs. The qualitative component enriches these findings with contextual and experiential data that statistical modelling alone cannot capture, producing a more complete picture of how gender and skills dynamics play out in TVET institutions.

8.2.4. Contribution to Practice

From a practical standpoint, the study provides actionable insights for TVET administrators, district education officers, and national policymakers in Ghana. It underscores the importance of institutional practices that reduce gender barriers in training, the need for targeted support for female students entering technical programmes, and the value of aligning TVET curricula with labour market demands in ways that benefit both male and female graduates. The findings are directly relevant to the objectives of the COTVET policy framework and the implementation of SDG targets 4.3, 4.4, and 5.5.

9. Conclusion

This study examined the relationship between gender equality in Technical and Vocational Education and Training and poverty reduction outcomes in selected districts of the Ashanti Region of Ghana, with particular attention to the mediating role of skills acquisition. The findings confirm that gender-equitable TVET environments are associated with significantly stronger skills acquisition outcomes, and that these skills outcomes in turn contribute substantially to household poverty reduction. The mediation analysis further establishes that skills acquisition is the primary mechanism through which gender equality in TVET produces its poverty-reduction effects.

The study also demonstrates that a direct relationship exists between gender equality in TVET and poverty reduction, pointing to broader social and economic benefits of inclusive vocational training that extend beyond skills development alone. These include improved self-efficacy, social participation, and economic agency, particularly for women who have historically been underrepresented in technical training fields.

In the Ashanti Region context, where TVET institutions are relatively concentrated but gender disparities in program enrollment persist, the findings carry practical significance. Achieving the poverty-reduction potential of vocational education in this region requires deliberate institutional reforms that address both access barriers and occupational segregation within TVET programmes. The study provides an evidence base for such reforms and contributes to broader efforts to align Ghana's vocational education system with the gender equality and poverty reduction commitments embedded in the SDG framework.

10. Recommendations

Based on the findings of the study, the following recommendations are proposed.

First, TVET institutions in the Ashanti Region should implement gender-responsive enrollment policies that actively recruit female students into technical programmes including construction, electrical installation, automotive technology, and ICT. This should be supported by financial incentives such as gender-targeted bursaries and materials support, to reduce the economic barriers that disproportionately discourage female participation in technical tracks [28].

Second, COTVET and the Ghana Education Service should review TVET curricula and instructional practices to identify and remove gender-biased content, stereotyped role assignments, and pedagogical approaches that disadvantage female learners. Training of TVET instructors in gender-responsive teaching methods should be made a mandatory component of professional development programmes [19].

Third, district assemblies in the Ashanti Region should partner with TVET institutions to develop apprenticeship and employment placement programmes that give female graduates access to work experience in sectors where TVET skills yield higher earnings. This is necessary to ensure that the skills acquired in training translate into comparable economic returns for men and women [17].

Finally, future research should extend this investigation to other regions of Ghana to determine whether the relationships observed in the Ashanti Region hold across different geographic and economic contexts. Longitudinal studies tracking the income trajectories of male and female TVET graduates over time would also provide richer evidence on the sustained poverty-reduction effects of gender-equitable vocational training.

Abbreviations

AfDB	African Development Bank
AVE	Average Variance Extracted
CA	Cronbach's Alpha
COTVAG	Community Technical Vocational and Agricultural Institute
COTVET	Council for Technical and Vocational Education and Training
CR	Composite Reliability
GES	Ghana Education Service
GET	Gender Equality in TVET
GPRS	Growth and Poverty Reduction Strategy
HTMT	Heterotrait-Monotrait
ICT	Information and Communications Technology
MDG	Millennium Development Goal
NDPC	National Development Planning Commission
NFI	Normed Fit Index

PLS-SEM	Partial Least Squares Structural Equation Modelling
PRO	Poverty Reduction Outcomes
SAO	Skills Acquisition Outcomes
SDGs	Sustainable Development Goals
SPSS	Statistical Package for the Social Sciences
SRMR	Standardized Root Mean Square Residual
TVET	Technical and Vocational Education and Training
TVI	Technical and Vocational Institute

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Conflicts of Interest

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References

[1] Acheampong, K. (2018). Access and participation in TVET in Ghana: Challenges for gender equity. International Journal of Training Research, 16(2), 112-129. https://doi.org/10.1080/14480220.2018.1522632.

[2] African Development Bank. (2013). Skills training and the poverty trap: Gender dimensions of TVET in Sub-Saharan Africa. AfDB Publications.

[3] Bandura, A. (1977). Social learning theory. Prentice Hall.

[4] Becker, G. S. (1964). Human capital: A theoretical and empirical analysis, with special reference to education. National Bureau of Economic Research.

[5] Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

[6] Chin, W. W. (2010). How to write up and report PLS analyses. In V. Esposito Vinzi et al. (Eds.), Handbook of partial least squares (pp. 655-690). Springer. https://doi.org/10.1007/978-3-540-32827-8_29

[7] Council for Technical and Vocational Education and Training. (2016). Technical and vocational education and training policy framework. COTVET.

[8] Council for Technical and Vocational Education and Training. (2020). Annual report on TVET enrollment and gender statistics. COTVET.

[9] Creswell, J. W., & Creswell, J. D. (2018). Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.). Sage Publications.

[10] Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research, 18(1), 39-50. https://doi.org/10.1177/002224378101800104

[11] George, D., & Mallery, P. (2021). IBM SPSS statistics step by step: A simple guide and reference (17th ed.). Routledge.

[12] Ghana Statistical Service. (2021). Ghana living standards survey round 7: Poverty profile in Ghana. Ghana Statistical Service.

[13] Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? Field Methods, 18(1), 59-82. https://doi.org/10.1177/1525822X05279903

[14] Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). A primer on partial least squares structural equation modeling (PLS-SEM) (2nd ed.). Sage Publications.

[15] Henseler, J., Ringle, C. M., & Sarstedt, M. (2009). The use of partial least squares path modeling in international marketing. Advances in International Marketing, 20, 277-319. https://doi.org/10.1108/S1474-7979(2009)0000020014

[16] Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. Journal of the Academy of Marketing Science, 43(1), 115-135. https://doi.org/10.1007/s11747-014-0403-8

[17] Kabeer, N. (2012). Women's economic empowerment and inclusive growth: Labour markets and enterprise development. International Development Research Centre.

[18] McMillan, J. H., & Schumacher, S. (2010). Research in education: Evidence-based inquiry (7th ed.). Pearson.

[19] McGrath, S. (2012). Vocational education and training for development: A policy in need of a theory? International Journal of Educational Development, 32(5), 623-631. https://doi.org/10.1016/j.ijedudev.2011.08.003

[20] Mensah, J., & Gordon, S. (2020). A review of sustainable development in Africa: Issues and challenges. Journal of Sustainable Development, 13(3), 1-15. https://doi.org/10.5539/jsd.v13n3p1

[21] National Development Planning Commission. (2019). Ghana voluntary national review: Sustainable development goals. NDPC.

[22] Nussbaum, M. (2000). Women and human development: The capabilities approach. Cambridge University Press.

[23] Ringle, C. M., Wende, S., & Becker, J. M. (2015). SmartPLS 3. SmartPLS GmbH.

[24] Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modeling. In C. Homburg et al. (Eds.), Handbook of market research (pp. 587-632). Springer.

[25] Schultz, T. W. (1961). Investment in human capital. American Economic Review, 51(1), 1-17. https://doi.org/10.2307/1818907

[26] Sen, A. (1999). Development as freedom. Oxford University Press.

[27] Tashakkori, A., & Teddlie, C. (2010). Mixed methodology: Combining qualitative and quantitative approaches. Sage Publications.

[28] UNESCO. (2016). Strategy for technical and vocational education and training 2016-2021. UNESCO Publishing.

[29] United Nations. (2000). United Nations Millennium Declaration. United Nations.

[30] United Nations. (2015). Transforming our world: The 2030 agenda for sustainable development. United Nations.

[31] World Bank. (2013). Skilling up Sub-Saharan Africa: Labor market trends, human capital, and job creation. World Bank Publications.