Article

Exploring the role of voluntary local and national reviews in advancing knowledge of education-related SDGs in TVET: A comparative case study of Pittsburgh and Nairobi

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Abstract

This study investigates how global Sustainable Development Goals (SDGs) are adapted within Technical and Vocational Education and Training (TVET) systems by examining two institutions with distinct governance frameworks: the Community College of Allegheny County (CCAC) in the U.S. and Kabete National Polytechnic in Kenya. While previous research examines SDG integration broadly, this study addresses a critical gap by analyzing how governance structures, whether participatory or centralized, shape SDGs implementation within TVET institutions. Using qualitative methods and applying Critical Discourse Analysis to 19 interviews and a survey of 75 students, this study reveals that CCAC's decentralized and stakeholder-driven governance fosters institutional and organizational learning by allowing flexible adaptation and responsive SDG alignment. In contrast, Kabete's top-down and policy-driven governance ensures national consistency but limits institutional autonomy, hindering localized innovation. These findings highlight that governance structures play a pivotal role in determining the effectiveness of SDG integration in TVET,

influencing how institutions adapt policies, engage stakeholders, and implement sustainability education. The study emphasizes the need for governance frameworks that are both adaptable and contextually relevant, balancing national oversight with institutional flexibility. By providing comparative insights, this research offers practical recommendations for policymakers and educators, advocating for governance reforms that enhance SDG implementation in TVET systems worldwide.

Keywords: Sustainable Development Goals, Technical and Vocational Education and Training, Multi-level Governance Frameworks, Critical Discourse Analysis, Educational Policy

Introduction

The Sustainable Development Goals (SDGs), adopted by all United Nations Member States in 2015, represent a global commitment to address critical challenges such as poverty, inequality, climate change, and ensuring quality education for all by 2030. Within this framework, Technical and Vocational Education and Training (TVET) institutions are essential in fostering workforce development while promoting inclusive access to learning opportunities (SDG 4) and sustainable education systems that support long-term economic and social progress (SDG 8) (UN, 2015; UNESCO, 2022a; 2022b). As the demand for skilled labor grows in response to shifting economic and technological landscapes, TVET is increasingly recognized not only as a means of workforce preparation but also as a vehicle for social and economic mobility. However, the effectiveness of SDG implementation within TVET is influenced by governance models that shape policy execution, institutional responsiveness, and stakeholder engagement.

Although extensive research explores SDG integration in education, little attention has been given to how governance structures enable or limit TVET institutions in aligning with SDG objectives across different contexts. Most studies focus on single-country analyses, leaving a gap in understanding how decentralized and centralized governance models compare in shaping SDG implementation. This study addresses this gap by examining how different governance frameworks influence the adaptation of SDGs in vocational education, emphasizing institutional learning and organizational adaptation.

Governance in TVET operates across different levels, from national policies to institutional decision-making. This study examines how governance models – participatory and centralized – influence the implementation of SDGs in TVET systems in two distinct national contexts: the Community College of Allegheny County (CCAC) in the United States and Kabete in Kenya. By comparing how governance models shape institutional decision-making, stakeholder engagement, and policy alignment, this research highlights their role in SDG implementation within vocational education. CCAC adopts a participatory governance model that fosters localized decision-making and stakeholder-driven curriculum development (Every Student Succeed Act, 2015; USDOE, 2025), while Kabete follows a state-led, structured model that emphasizes competency-based education and training (CBET) (Government of the Republic of Kenya, 2007;

TVET Act, 2013). This study situates these governance models within the broader discourse of multi-level governance, exploring how global SDG policies are interpreted and adapted within national and institutional settings.

By analyzing two contrasting governance structures, this study offers insights into how institutional learning (policy alignment and national oversight) interacts with organizational learning (institutional flexibility and local adaptation). This approach underscores the importance of governance models that strike a balance between national consistency and institutional responsiveness.

This research is guided by the following research questions:

1. How do multi-level governance frameworks differ in their approach to facilitating institutional learning, organizational learning and knowledge acquisition required to substantiate (define, construct, and frame) the education-related SDG 'text' to local 'text'?
2. How do multi-level governance frameworks affect institutional learning, organizational learning outcomes, knowledge acquisition, and competency development in the context of education-related SDG implementation?
3. How do TVETs identify what local education-related SDG 'text' needs to be captured and prioritized, and how does institutional learning influence this process?
4. How do TVETs translate and institutionalize prioritized education-related SDGs, and what role does institutional learning play in this process?

By exploring these questions, this study contributes to discussions on how governance frameworks influence educational inclusion, policy alignment, and institutional sustainability in TVETs, offering evidence-based insights for policymakers, educators, and institutional leaders. Through this comparative lens, it underscores the importance of governance models that balance national oversight with institutional adaptability, ensuring that TVETs can effectively contribute to the SDGs.

Background

The role of TVET in achieving sustainable development has been widely recognized, particularly in the context of the SDGs. Across different regions, the integration of these goals into TVET systems varies significantly, driven by diverse governance models and local needs.

What is known is that countries like the United States and Kenya have developed distinct approaches to TVET governance. In the U.S., institutions like the CCAC adopt a bottom-up, participatory model that encourages local involvement in shaping TVET programs (Ortiz-Moya & Reggiani, 2023; Pendrak & Viljaste, 2020; Pittsburgh.gov, 2020). In contrast, Kabete in Kenya operates within a top-down, state-driven framework, where the government takes a leading role in aligning education with national development objectives, particularly through CBET (Government of the Republic of Kenya, 2007; TVET Act, 2013).

Despite the widespread integration of SDGs into educational frameworks, gaps remain in understanding how different governance models affect the outcomes of TVET programs. While much is known about the broad approaches to governance, there is limited comparative research examining the specific impacts of bottom-up versus top-down models on the effectiveness of TVET in promoting SDGs, particularly in diverse political and social contexts. These gaps hinder our understanding of how adaptable these models are to local realities, and whether certain frameworks are more effective in advancing the SDGs (Matu & Perez-Johnston, 2023).

Addressing these gaps is significant because it helps to inform policymakers and educators about the most effective ways to structure TVET systems to achieve global education and employment goals. By comparing two distinct governance models, this study provides insights into how governance influences the success of TVET in promoting sustainable, inclusive education and economic growth in different contexts.

The rationale behind this study is grounded in the exploration of how governance frameworks influence the ability of TVET institutions to contribute to achieving the SDGs. Specifically, the study seeks to investigate whether flexibility in governance models, particularly those that respect cultural and social contexts, may enhance the effectiveness of TVET in addressing both global and local challenges. By exploring the approaches of CCAC and Kabete, this study aims to provide insights into how educational governance might be optimized to advance SDGs in diverse settings (Matu et al., 2023).

Literature Review

The integration of SDGs into TVET has been a growing area of research, reflecting a global effort to align educational outcomes with broader sustainable development objectives. Studies have increasingly focused on the role of governance frameworks in facilitating or hindering this alignment. This literature review synthesizes key themes from existing research to establish the foundation for understanding how different governance models impact TVET's ability to promote SDGs in diverse political and cultural contexts. However, while many studies analyze governance structures within specific national contexts, fewer examine the comparative effectiveness of different governance models in supporting SDG implementation in TVETs.

Governance Models and TVET in the Context of SDGs

Governance plays a crucial role in determining how educational institutions, particularly in TVET, adapt to global initiatives such as the SDGs. A common theme across the literature is the contrast between centralized and decentralized governance models. For instance, centralized models, like those in Kenya, where the government directs TVET policy through frameworks like CBETA, have been praised for their

ability to ensure uniformity and alignment with national development goals (TVETA, 2023). However, scholars have also pointed out the rigidity of such models, arguing that they often fail to account for local contexts, thereby limiting their effectiveness in achieving education-related SDGs (Hooghe & Marks, 2020; Leavesley et al., 2022; Ortiz-Moya et al., 2021; Perry et al., 2021; Pipa & Bouchet, 2020).

On the other hand, decentralized models, such as those employed by institutions in the U.S., emphasize local stakeholder involvement, allowing for greater flexibility and adaptability in TVET programming. Studies have shown that participatory governance in TVET fosters institutional autonomy and responsiveness to labor market needs, particularly in community college settings. This localized approach is evident in studies of the CCAC, where a participatory governance model encourages local educators and administrators to shape TVET programs in response to both local and global demands. These models are praised for their responsiveness to community needs but are sometimes critiqued for a lack of alignment with broader national or international educational objectives (Ortiz-Moya & Reggiani, 2023).

SDG Integration in TVET: Global Perspectives

In line with the broader research on education and sustainable development, TVET institutions are seen as crucial in meeting SDG 4 (quality education) and SDG 8 (decent work and economic growth). Several studies underscore the importance of integrating SDGs into TVET systems to promote not only employability but also sustainability and inclusivity in education (Matu et al., 2023). While CBET frameworks in Kenya align with national employment goals and the global drive for sustainable economic growth (Government of the Republic of Kenya, 2007; KNA, 2021; TVET Act, 2013; TVETA, 2023), they have been criticized for their lack of flexibility in addressing the unique needs of local labor markets and students (Matu et al., 2023).

In contrast, the participatory approaches seen in the U.S. offer a bottom-up perspective that fosters local adaptation but may lack the uniformity needed for large-scale SDG implementation (Ortiz-Moya & Reggiani, 2023). A key challenge in SDG integration within TVET institutions is balancing adaptability with alignment to national policies. Studies suggest that highly decentralized models may allow for greater contextual relevance but risk fragmentation in policy implementation, whereas highly centralized models ensure consistency but can stifle innovation (Perry et al., 2021; UNESCO, 2022a). This highlights the need for governance structures that strike a balance between national oversight and institutional flexibility.

Gaps in the Literature

Although significant progress has been made in understanding the role of governance in TVET and SDG integration, there remains limited comparative research on how different governance models influence SDG implementation across sociopolitical contexts. Prior studies primarily focus on national case studies,

lacking direct cross-national comparisons of centralized versus decentralized governance approaches in TVET. While existing research highlights governance structures' role in SDG localization (Ortiz-Moya & Reggiani, 2023), few studies explore how TVETs actively shape governance practices through localized policy adaptation and implementation. Research on SDG implementation often focuses on high-level policy frameworks rather than institutional agency in shaping governance practices.

This study builds on Matu (2022), which conducted a systematic literature review on multi-level governance frameworks and their role in supporting SDG integration in community colleges. That review identified a lack of empirical research on how different governance models, particularly VLRs, facilitate SDG adoption in technical education settings. It also highlighted the absence of comparative studies analyzing governance adaptability, stakeholder engagement, and institutional responsiveness across diverse TVET contexts. This study extends these findings by providing an empirical comparison between CCAC and Kabete, examining how governance models influence SDG integration and educational outcomes.

Locating the Present Study in the Existing Literature

The present study builds on the existing research by directly comparing governance models and their impacts on TVET outcomes in relation to SDG 4 and SDG 8. Unlike previous studies that examine governance models in singular contexts, this research takes a comparative approach to analyze how governance models influence SDG integration across different institutional and national frameworks. While prior research has highlighted the importance of participatory and centralized governance in education, few studies have systematically examined their implications for TVET institutions navigating global sustainability goals.

By exploring the governance frameworks of CCAC and Kabete, this study locates itself at the intersection of education, governance, and sustainable development, contributing to the broader understanding of how TVET can be optimized to meet both local and global challenges.

Theoretical Framework and Methodology

Theoretical Underpinnings

This research employs a multifaceted theoretical framework that examines how governance structures shape institutional learning, organizational learning, policy adaptation, and SDGs integration within TVET systems at the CCAC in the U.S. and Kabete in Kenya. The framework is grounded in the premise that governance functions as both a structural and discursive influence, shaping educational policy, organizational behavior, and social equity within TVETs.

This study differentiates between institutional learning and organizational learning to analyze how governance models influence SDG adoption in TVET settings. Institutional learning refers to the process through which broader governance structures, such as national governments or municipal bodies, develop and adapt policies for SDG implementation (Sullivan et al., 2022). Organizational learning, on the other hand, captures how individual education institutions, such as CCAC and Kabete, acquire, internalize, and operationalize these policies in their specific contexts (Senge, 2006). The governance model, whether decentralized in Pittsburgh or centralized in Nairobi, shapes the interaction between these two forms of learning, influencing how SDG-related knowledge is created, adapted, and institutionalized.

At its core, Critical Discourse Analysis (CDA), as proposed by Rogers (2011), provides a foundational lens to examine how governance structures shape educational discourse and influence policy implementation. This approach helps identify how institutional power dynamics, regulatory language, and governance mechanisms contribute to or hinder SDG adoption in TVETs. To analyze how governance structures translate policy into organizational practice, this study integrates theories of learning and adaptation. Social Learning Theory (Bandura, 1969) emphasizes the role of observational learning, modeling, and organizational adaptation in policy implementation, while Communities of Practice (Wenger, 2011) provides a lens to examine how TVETs function as learning organizations. These theories highlight the dynamic interplay between governance and organizational learning, particularly in how educators and administrators engage with SDG frameworks in practice.

The study also incorporates theoretical perspectives on equity and inclusion to explore how governance models shape educational access and social justice outcomes. Critical Race Theory interrogates how governance structures perpetuate or mitigate disparities in TVET education, particularly regarding marginalized communities. Given the study's cross-national focus, African philosophies like Ubuntu, which emphasizes community solidarity, Harambee (collective pulling together), and Ujamaa (familyhood), provide a culturally relevant framework for understanding participatory governance approaches in Kenya. These perspectives offer comparative insights into how governance models either reinforce hierarchical structures or foster inclusive, community-driven education practices.

By integrating these theoretical strands, this study develops a cohesive analytical framework that examines the intersection of governance, institutional learning, organizational learning, and social equity in SDG implementation within TVETs. This approach allows for a comparative examination of how centralized and participatory governance models influence institutional capacity, policy adaptation, and sustainability education in workforce development.

Figure 1. Integrated Framework of Theoretical Approaches Influencing TVET Policy and Practice Through VLR and VNR Mechanisms
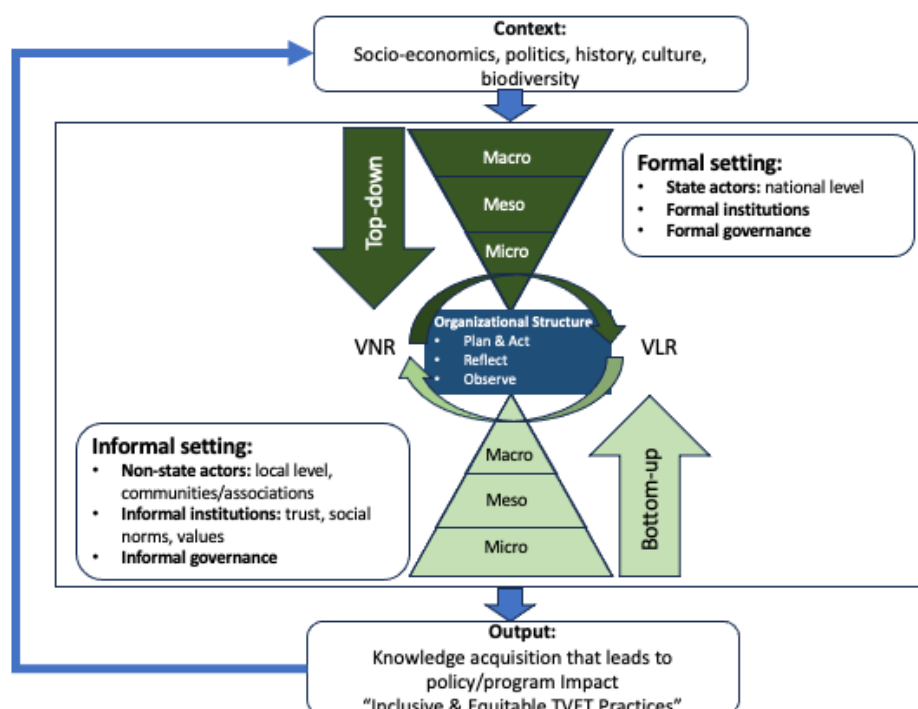
Note. This figure illustrates the interplay between theoretical frameworks and their influence on education-related SDG implementation in TVET contexts. It highlights the roles of VLRs and VNRs in shaping governance, knowledge acquisition, and policy impacts across formal (national) and informal (local) settings. The framework integrates micro (individual) and macro (institutional) perspectives, emphasizing the socio-economic, cultural, and political contexts of TVET institutions.

Methodological Approach

The study employs a comparative case study methodology to analyze governance structures at two TVET institutions with distinct governance models: the CCAC in Pittsburgh, USA, which utilizes a participatory and decentralized governance model, and Kabete in Nairobi, Kenya, which follows a centralized, policy-driven governance approach. This selection allows for an in-depth examination of governance adaptability, organizational responsiveness, and the execution of SDG-related policies with different regulatory environments.

Data were gathered through 19 purposive interviews combined with an online survey completed by 75 students from both institutions. This combination ensures that diverse perspectives are captured, particularly regarding institutional governance, SDG prioritization, and learning outcomes.

This study received Institutional Review Board (IRB) approval, and all participants provided informed consent prior to participation. To ensure confidentiality and anonymity, participants were assigned unique identifiers, and all data were securely stored. Participants were also informed of their right to withdraw at any stage without any consequences.

The data were analyzed using NVivo software, following a thematic coding process that combined deductive and inductive approaches. Deductive coding categorized responses based on governance models, institutional learning, and SDG integration, while inductive coding identified emerging themes related to organizational adaptation, stakeholder engagement, and policy translation. This iterative process ensured that the analysis remained grounded in the empirical data while being informed by the overarching theoretical framework, thus enabling a nuanced understanding of the discursive practices affecting educational outcomes at CCAC and Kabete (Baxter & Jack, 2008; Yin, 2018).

The findings from the interviews and surveys are systematically organized in a table format, which categorizes the themes that emerged during the analysis. This presentation method not only helps illustrate how various discursive practices influence educational practices at both institutions but also ensures clarity and accessibility of the data. This structured presentation aligns with academic standards, aiding in the scholarly narration of how SDG-related policies and practices are operationalized within different TVET governance models (Creswell & Poth, 2018; Denzin & Lincoln, 2018).

Comparative Study Findings: A Multi-level Examination of TVET Systems

This study, informed by a multi-theoretical framework, critically examines how SDGs are institutionalized within TVET systems by analyzing governance structures, stakeholder engagement, and policy translation at the CCAC and Kabete. The findings are around the research questions, ensuring that the analysis remains focused on governance models and their impact on SDG integration. By organizing findings through these lenses, the study demonstrates how governance systems either enable or constrain SDG alignment within TVET education. Each section summarizes the key discoveries and illustrates these with pertinent quotes from participants to deepen understanding.

Research Question 1: Difference in Governance Frameworks

At CCAC, the decentralized governance structure facilitates a participatory decision-making, allowing faculty and staff to actively contribute to SDG-related curriculum development. This model enables localized adaptation of SDGs to institutional needs, fostering innovation. In contrast, Kabete operates under a top-down framework, ensuring alignment with national policies but limiting organizational autonomy in policy adaptation.

Supporting Quotes

CCAC Administrator: "Our governance model encourages faculty-driven initiatives, which means SDGs aren't just top-down mandates but are actively shaped by those delivering education. For example, our 'Diversity

Dictionary' project was initiated by faculty to ensure inclusive terminology is integrated into our teaching material, directly linking governance and SDG implementation."

Kabete Faculty Member: "Our governance is highly structured, which ensures national consistency in policy execution. However, it leaves little space for bottom-up innovation. For instance, while the Ministry of Education mandates gender inclusion, we have limited control over how to contextualize it beyond government-defined targets."

Research Question 2: Impact on Knowledge Acquisition and Implementation

CCAC's decentralized model supports institutional learning and continuous adaptation, ensuring that SDG-related knowledge is updated and applied in real-time. Faculty members at CCAC report greater flexibility in modifying teaching strategies to align with evolving SDG priorities. At Kabete, the structured governance model ensures strict policy adherence but lacks mechanisms for rapid curriculum innovation or responsive adjustments to local economic and social demands.

Supporting Quotes

CCAC Faculty Member: "Our open governance model encourages ongoing dialogue, allowing us to swiftly integrate new SDG-related insights into our educational practices. For example, when discussions on climate resilience became more prominent, our department was able to add sustainability case studies and practical simulations without waiting for lengthy bureaucratic approvals. This agility is key to ensuring our students are prepared for the evolving job market."

Kabete Administrator: "The rigid structure of our governance system makes it difficult to incorporate new ideas or adapt to changes quickly, often delaying the implementation of necessary reforms. Faculty often discuss new approaches to teaching SDGs, but these suggestions must be approved at the national level before implementation. This top-down approach ensures consistency across institutions but slows down responsiveness to emerging trends."

Research Question 3: Local Prioritization of SDGs

At CCAC, stakeholder engagement influences which SDGs are prioritized, ensuring responsiveness to localized institutional needs and student demands. Conversely, at Kabete, SDG priorities are determined at the national level, sometimes leading to misalignment with institutional capacities.

Supporting Quotes

CCAC Committee Member: "We hold open forums with faculty, students, and local industry partners to determine which SDGs are most relevant to our context. For instance, our diversity, equity, and inclusion (DEI) efforts strengthened after faculty-led discussions identified it as a priority area for our organization."

Kabete Faculty Member: "We have SDG integration policies, but they are developed at the national level. For example, while sustainability is a priority, there's a lack of flexibility in how institutions like ours can tailor SDG initiatives to our specific student population, which affects practical implementation."

Research Question 4: Organizational Learning and Adaptation

CCAC's governance model promotes continuous organizational learning, allowing faculty to modify

educational strategies in real time, fostering alignment between industry demands and SDG objectives. Kabete's model, while ensuring structured stability, lacks built-in mechanisms for quick adaptation to emerging sustainability challenges.

Supporting Quotes

> CCAC Staff Member: "Our participatory governance model ensures that we can continuously refine our approach. For example, after an industry partner highlighted gaps in green technology skills, we rapidly incorporated sustainability modules into our courses, making our graduates more competitive in the job market."

> Kabete Educator: "Our system is stable and provides clear direction, but it also restricts flexibility. For example, we identified a growing need for research training, but before we could make changes, we had to navigate multiple approval levels, slowing down the process."

Table 1. Comparative Analysis of SDG Integration at CCAC and Kabete National Polytechnic

Criteria	CCAC (USA)	Kabete (Kenya)	Cross-Cultural Communication Challenges	Outcome on Knowledge Acquisition	Outcome on Implementation	Student Voices	Theoretical Lenses
Discourse-as-text	Title 9, DEI policies	CBET policy, Government directives on gender and people with disability	Language Nuances: 'Inclusion' in DEI may imply marginalized groups (such as race, ethnicity, gender sexuality, disability, and culture), whereas in CBET, it may lean towards gender and disability representation.	Misalignment of key terms can lead to varied focus areas for each institution.	Inconsistent implementation approaches; DEI policy may emphasize marginalized group issues, while CBET may focus on gender parity and disability.	Student surveys and interviews highlight the understanding and impact of DEI; fewer avenues for student input in CBET context	Social Learning Theory: Influence of modeling & reinforcement
Discourse-as-discursive practice	Produced by internal committees; influenced by lived experiences of staff	Produced by governmental bodies	Hierarchical vs. Egalitarian Views: In the U.S., CCAC staff contributions may challenge official narratives. In Kenya, government directives are more authoritative.	In the U.S., open dialogues may foster a wider range of knowledge acquisition. In Kenya, more uniform but potentially narrow perspective.	In the U.S., possibility of adapting to new insights; In Kenya, less adaptability but more alignment with national goals.	Student-led forums and committees at CCAC; limited student representatives in administrative meetings at Kabete	Organizational Development: Adaptive vs. Controlled Change

| Discourse-as-social practice | Read and implemented by faculty and administrative staff | Mandated reading for faculty and administrative staff | Local vs. Global: CCAC faculty may have academic freedom to interpret and critique; in Kenya, divergence from government guidelines may not be tolerated. | U.S.: More democratic, encouraging critique; Kenya: More prescriptive, less room for interpretation. | U.S.: Implementation may vary across departments; Kenya: Uniform but top-down implementation. | Student involvement in action research projects at CCAC; limited student participation in Kabete | Communities of Practice: Shared learning vs. Top-Down Learning Action Research: Influence bottom-up problem-solving |
| Power Dynamics | Bottom-up; driven by staff and institutional ethos | Top-down; government-driven | Hierarchical vs. Egalitarian Views: At CCAC, staff may petition for change; in Kabete, change usually comes from above. | U.S.: Greater awareness and advocacy among staff; Kenya: Less awareness but stronger alignment with national goals. | U.S.: Incremental changes, grassroots initiatives; Kenya: Large-scale, policy-driven changes. | Student activism around DEI at CCAC; Student compliance with national policies at Kabete | Critical Race Theory: Addressing systemic imbalances Ubuntu, Harambee, and Ujamaa: Influence collective and community responsibility, including community empowerment |

Note. This table compares the integration of SDGs in TVET systems at the CCAC and Kabete. It highlights differences in governance models, knowledge acquisition, implementation outcomes, and student engagement, analyzed through the lens of CDA. The criteria include discourse-as-text, discourse-as-practice, and discourse-as-social-practice, reflecting the interplay between global policy directives and local educational practices.

The findings from each research question demonstrate the critical influence of governance models on the integration of SDGs within TVET systems. CCAC's adaptive and inclusive approach results in more effective and comprehensive SDG integration, while Kabete's rigid model restricts dynamic engagement and timely adaptation to SDG mandates. This analysis not only supports the theoretical underpinnings of the study but also offers practical insights for enhancing SDG integration in TVET systems globally.

Discussion

Governance Frameworks in TVET: An Emphasis on VLRs and VNRs

This study's exploration into the influence of governance frameworks on SDG integration in TVETs highlights the distinct roles of VLRs and VNRs in shaping educational policies. As examined in research question 1, governance structures determine how institutions prioritize and implement sustainability

education, affecting institutional learning, organizational learning, knowledge transfer, and policy execution.

The CCAC in Pittsburgh demonstrates the effectiveness of a decentralized governance structure that fosters both institutional and organizational learning. This structure has been pivotal in fostering an environment where DEI initiatives thrive, supporting the notion that local adaptability is key to long-term sustainability (Pipa & Bouchet, 2020). In contrast, the case of Kabete in Nairobi follows a centralized governance structure that emphasizes institutional learning at the national level but constrains organizational learning within institutions. This rigidity can hinder responsiveness to local labor market needs and sustainability challenges, a concern noted by Leavesley et al. (2022).

While centralized governance ensures policy uniformity, it may overlook local nuances critical for SDG implementation. At CCAC, institutional learning occurs through ongoing collaboration between local actors, while policies are iteratively refined on faculty and student inputs. At Kabete, institutional learning is largely government-led, where policy frameworks are designed nationally and enforced at the institutional level with limited room for adaptation (Ortiz-Moya et al., 2021), whereas Kabete's top-down model primarily focuses on national priorities, often missing opportunities for localized innovation (Senge, 2006; 2011).

The comparative analysis between CCAC and Kabete not only delineates the effectiveness and limitations of governance frameworks within TVET institutions but also reinforces the argument for governance structures that are sensitive to the interaction between institutional and organizational learning (Hooghe & Marks, 2003; 2020). Such an approach is imperative for the operationalization of SDGs in educational settings, as it respects the diversity of educational environments and makes strides towards equitable and inclusive education.

These findings emphasize the need for governance structures that balance national development goals with organizational flexibility, enabling TVETs to effectively contribute to SDG targets while remaining responsive to local realities (Hooghe & Marks, 2003; Perry et al., 2021).

Debates and Controversies in Sustainability Education

Our investigation into the effectiveness of governance frameworks within sustainability education (RQ1) brings forth a comparison of the participatory governance model at the CCAC with the centralized approach of Kabete and their impact on institutional and organizational learning. This comparison provides a critical lens for understanding how governance models shape knowledge acquisition, policy implementation, and curriculum innovation within TVETs.

CCAC's initiative to create a 'Diversity Dictionary' aligns with Freire (1970) and Rawls' (1971) emphasis on

education as a tool for empowerment, encouraging learners to critically engage with diverse perspectives. By incorporating lived experiences into the educational framework, this initiative fosters holistic organizational learning, resonating with the pedagogical philosophies discussed by Anyolo et al. (2018), which highlights the enrichment of learning environments through diverse narratives. However, as Kopniona (2011) argues, integrating lived experiences into formal educational settings raises important debates about the balance between localized, experience-based knowledge and standardized global sustainability frameworks. This tension underscores the need to critically examine how governance models mediate these interactions in TVETs.

Conversely, the implementation of CBET at Kabete presents a case where institutional learning dominates, but organizational learning remains constrained. This governance structure, while ensuring national alignment, limits the agency of faculty and administrators in modifying sustainability curricula based on localized needs. A decolonized CBET, as suggested by Mukundi and Njuki (2019) and Pashby et al. (2019), could enhance organizational learning by allowing TVETs greater autonomy to integrate local socio-cultural perspectives into their teaching and learning process.

Through the lens of our findings, the juxtaposition of CCAC and Kabete illustrates the complex dynamics between governance structures and educational methods, reinforcing the discourse presented by Pavlova and Chen (2019) on the need for governance models that facilitate both institutional and organizational learning in sustainability education. This insight not only responds to the research question concerning the efficacy of governance models but also adds to the broader conversation about achieving sustainability goals within TVET. It underscores the importance of aligning pedagogical practices with the SDGs, as discussed by Pashby et al. (2019) and Pavlova et al. (2019), where the consonance between global aspirations and local relevance is vital.

Pedagogical Approaches to Sustainability in TVET

The identification and prioritization of local education-related SDGs within TVET institutions, as explored in our third research question, highlight the critical role of governance in shaping institutional and organizational learning dynamics.

CCAC's governance structure fosters both institutional and organizational learning by integrating experiential, participatory, and problem-based learning approaches. Faculty-led study abroad programs and community partnerships exemplify a governance system that facilitates organizational learning through continuous stakeholder engagement and iterative curriculum adjustments. These initiatives not only provide direct exposure to global and community issues but also enable the practical integration of sustainability principles, bridging institutional mandates with bottom-up innovation (Anyolo et al., 2018;

Merritt et al., 2018; Pashby et al., 2019).

In contrast, Kabete's centralized governance model emphasizes institutional learning at the national level while constraining organization learning with individual institutions. While this structure has achieved progress in gender equity with STEM (science, technology, engineering, and mathematics) fields, it lacks mechanisms for bottom-up curriculum development that could enable more meaningful organizational learning through faculty-led initiatives (UNESCO, 2017).

The current form of CBET at Kabete, largely shaped by Western-centric educational models, highlights the need for a decolonized approach that is sensitive to the cultural and historical context of African learners (Assié-Lumumba, 2016). This perspective echoes the call within the literature for decolonizing TVET and embracing indigenous knowledge systems, such as Ubuntu, Harambee, and Ujamaa, which emphasize community, collective effort, and familyhood (Asamoah & Yeboah-Assiamah, 2019; Nkomo et al., 2019). Integrating these philosophies into the governance and curriculum could lead to more culturally responsive and relevant pedagogy, fostering a deeper connection between students and their learning environment.

The juxtaposition of CCAC's and Kabete's approaches to pedagogy illustrates the dynamic interplay between governance models and instructional practices, reflecting the literature's emphasis on the need for sustainability education that is both practical and transformative (Kopniona, 2011; MCKeown & Hopkins, 2007). Effective teacher preparedness and adaptive instructional leadership emerge as key factors for successfully integrating sustainability into TVET education, highlighting the importance of institutional structures that support dynamic and responsive educational leadership (Croese et al., 2021).

Comparative Analysis of Governance Models in Pittsburgh and Nairobi: Implications for TVET Programs

Our research presents a comparative analysis of governance models in TVET systems in Pittsburgh and Nairobi, addressing the implications for institutional and organizational learning outcomes (RQ2) and the identification of local education-related SDGs for prioritization (RQ3). The participatory governance model in Pittsburgh, characterized by its encouragement of faculty autonomy and stakeholder engagement, fosters an adaptable and innovative environment within TVET programs. This model aligns with the principles of network governance, which suggest that such decentralization can lead to more responsive and sustainable development practices (Hooghe & Marks, 2003).

Conversely, the centralized governance framework in Nairobi reinforces institutional learning at the national level but limits the organizational learning needed for institutions to independently adapt to evolving SDG priorities. This finding reflects broader critiques within the literature, which argue that centralized models can inhibit grassroots innovation and may not be as effective in fostering a culture of

continuous improvement (Leavesley et al., 2022; Perry et al., 2021).

Our findings draw parallels to the literature that examines the efficacy of governance frameworks in enabling TVET institutions to respond to industry and societal changes. The flexible, decentralized model of Pittsburgh is conducive to the adaptive governance Senge (2006) advocates for, which is crucial in an era marked by rapid technological advancements and shifting economic landscapes. On the other hand, the centralized approach of Nairobi's educational system raises concerns about its ability to meet the local application of global SDGs, as highlighted by Pipa and Bouchet (2020), who emphasize the necessity of local adaptability for long-term sustainability.

This comparative study not only enhances our understanding of the practical implications of governance models on TVET systems but also contributes to a growing body of literature that interrogates the role of multi-level governance in education (Hooghe & Marks, 2020). Our research underscores the need for policy frameworks that provide autonomy and encourage stakeholder engagement to ensure the agility and effectiveness of TVET programs, echoing the sentiments of Leavesley et al. (2022) on the importance of local engagement in the successful implementation of sustainability initiatives.

Organizational Development and Local Translations of Global Commitments

The institutionalization of prioritized education-related SDGs varies between CCAC and Kabete, shaping organizational development (RQ4). At CCAC, the 'plan and act' phase is facilitated by an inclusive governance model that integrates stakeholder input, aligning with Senge's (2011) concept of adaptive learning organization. This approach ensures SDGs are locally contextualized and continuously refined (Annan-Aggrey et al., 2021). In contrast, Kabete's rigid, top-down governance structure, influenced by Western-centric frameworks, overlook indigenous knowledge systems essential for decolonized education (Assié-Lumumba, 2016; Croese et al., 2021).

CCAC's 'reflect' includes ongoing assessments of their SDG-related strategies (RQ 2), aligning with recommendations by Fox and Macleod (2021) for robust internal structures that support iterative policy evaluation. However, Kabete's centralized model restricts local educational leaders from meaningful engagement in policy assessment (Osman et al., 2021). Similarly, the 'observe' phase, which enables institutions to monitor external conditions influencing SDG implementation (RQ3), is actively practiced at CCAC but constrained at Kabete due to its rigid governance, echoing Hickmann's (2021) concerns about limited institutional adaptability.

This comparative analysis underscores the critical role of governance in translating global SDGs into institutional practice. CCAC exemplifies a flexible governance model that fosters deeper engagement with

complex educational and sustainable development goals, while Kabete highlights the need for greater institutional autonomy to ensure responsive and localized SDG implementation.

Policy Implications and Future Research: Unpacking the Governance-Pedagogy-SDG Nexus in TVET Institutions

Drawing upon the outcomes of this study, we discern significant policy implications concerning governance models in TVET institutions, particularly regarding their role in facilitating institutional and organizational learning for SDG implementation. Our comparative analysis of the CCAC and Kabete demonstrates that decentralized governance models, such as the one employed by CCAC, facilitate greater organizational learning and a more comprehensive engagement with SDGs. This model aligns with contemporary calls for educational systems that are responsive, adaptive, and reflective of diverse educational needs (UNESCO, 2017; 2022a; 2022b).

For policymakers, the key takeaway is that TVET governance should enable both institutional learning (ensuring policy alignment) and organizational learning (empowering institutions to adapt and innovate based on their unique contexts). This study highlights that while institutional learning ensures consistency across TVETs, organizational learning drives localized innovation, making SDG implementation more effective.

The implications for future research are equally robust. This study lays the groundwork for subsequent inquiries into how governance models can best integrate institutional and organizational learning frameworks to maximize educational impact. Future studies could explore how faculty autonomy, decentralized decision-making, and localized adaptation processes shape long-term SDG outcomes in TVET.

Moreover, there is an opportunity to explore the intersection of pedagogical innovation and governance. Investigations could examine how pedagogical practices, such as the implementation of CBET, evolve under different governance structures and what this evolution implies for the fulfillment of SDG 4 and related goals.

Finally, our research underscores the importance of governance structures that are not only flexible and inclusive but also deeply intertwined with the pedagogical fabric of TVET institutions. For TVET systems to be truly global in their outlook yet local in their impact, a harmonious blend of governance, pedagogy, and a commitment to sustainable development must be achieved.

Research Limitations

This comparative case study analyzed the roles of VLRs and VNRs in the governance frameworks of CCAC

and Kabete. While these institutions provide valuable insights, the scope of this study is inherently limited. Examining only two institutions restricts the generalizability of our findings across diverse TVET contexts (Baxter & Jack, 2008; Yin, 2018). Future research should incorporate a broader sample of institutions to enhance external validity. Additionally, the reliance on self-reported data introduces potential biases, such as social desirability and recall limitations, common in qualitative research (Palinkas et al., 2015). A mixed-methods approach could mitigate these limitations by integrating quantitative measures to complement the qualitative depth (Creswell & Poth, 2018).

The absence of a longitudinal design limits our ability to assess the sustained impact of governance models on SDG implementation in TVET (Nese et al., 2013). Long-term studies would provide deeper insights into governance adaptability and institutional learning. While Kabete's specific cultural context offers rich detail, transferability to other settings remains uncertain. Comparative studies across varied socio-political environments could further clarify the effectiveness of CBET and VNRs (Creswell & Poth, 2018). Lastly, while our qualitative approach yields in-depth analysis, larger datasets could capture broader governance trends (Saldaña, 2016). Despite these limitations, this study underscores the critical role of governance frameworks in TVET and lays the foundation for future research on governance-driven SDG integration.

Conclusion

This study explored how VLRs and VNRs integrate education-related SDGs into TVET institutions, using CCAC and Kabete as models. The findings demonstrate that governance structures play a decisive role in shaping how TVETs adapt global SDG frameworks to local educational realities.

At CCAC, the localized, bottom-up approach of VLRs demonstrates the potential of participatory governance to enhance engagement with SDGs, supporting theories that advocate for inclusivity and active participation in policy-making. This model fosters both institutional learning and organizational learning, leading to a more adaptive, responsive SDG integration process.

Conversely, Kabete's experience with a centralized VNR approach highlights the challenges of implementing policies that may not fully align with local educational needs. While ensuring national policy alignment and consistency, this model limits institutional autonomy, slowing the pace of curriculum innovation and adaptation to emerging workforce demands. Adopting a decolonized approach to CBET, reflecting indigenous values like Ubuntu, could improve educational outcomes and relevance.

These findings emphasize the importance of culturally tailored educational policies that respect local identities and knowledge systems, advocating for governance that aligns global objectives with local realities. A key implication for policymakers is the need to balance national oversight with institutional

flexibility, allowing TVETs to refine SDG implementation in response to community and labor markets.

Future research should broaden the cultural and institutional scope, incorporating quantitative measures to augment the robustness of findings. Longitudinal studies examining how governance adaptations influence SDG implementation over time could provide further insights into the sustainability of different governance models. Additionally, comparative studies that analyze governance structures across multiple regions would enhance the generalizability of these findings. For stakeholders, this study encourages a reevaluation of governance models to better accommodate the diversity of learner experiences and cultural contexts, aiming for a TVET system that is inclusive and aligned with global educational goals.

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