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Leadership mediation of green skills curriculum implementation in Tshwane TVET colleges

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Research Article

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Abstract

Technical and vocational education and training (TVET) colleges face growing expectations to prepare students for environmentally sustainable work while delivering nationally prescribed curricula. Less is understood about how institutional actors translate these expectations into teaching when curriculum authority, facilities and lecturer development are uneven. This qualitative study examines understandings, leadership practices and institutional conditions shaping green skills curriculum operationalisation in selected campuses of Tshwane North and Tshwane South TVET Colleges. A constructivist approach combines social constructivism with Fraser's dimensions of redistribution, recognition and representation. Seven purposively selected institutional leaders and curriculum practitioners participated in semi-structured interviews, which were complemented by analysis of institutional and policy documents. Thematic analysis identifies five patterns: future-oriented understandings of the curriculum, uneven integration of green skills, leadership mediation of policy, interdependent implementation strategies, and structural constraints. Participants describe contextualising teaching, supporting lecturers, developing partnerships and mobilising resources within limited formal curriculum autonomy. Accounts of renewable energy learning coexist with reports of limited integration and insufficient practical infrastructure. The analysis proposes institutionally enabled curriculum mediation as a context-specific explanation of how leadership interpretation depends on material and professional support. It distinguishes policy commitment, reported pedagogical enactment and demonstrated learner competence, the last of which this study does not measure. The contribution is an interpretive account of relationships between leadership agency, implementation conditions and equitable opportunities to learn green skills. Coordinated professional development, practical facilities and accountable partnerships are proposed as priorities, with further research needed to examine learner experiences and outcomes.

Keywords: TVET; green skills; curriculum operationalisation; leadership mediation; social justice

Introduction

The transition towards environmentally sustainable production changes the purposes and practices of vocational education. Preparing students for greener work involves technical knowledge, occupational judgement and opportunities to practise resource-conscious decisions. However, the existence of a sustainability policy does not establish that students encounter such opportunities. McGrath and Powell (2016) situate vocational education within sustainable human development, while McGrath and Ramsarup (2024) call for broader thinking about vocational education and sustainable futures. Their work provides a basis for examining institutional implementation rather than treating the addition of environmental topics as sufficient evidence of transformation.

Green skills refer here to the knowledge, practical capabilities and judgements used to undertake work in environmentally responsible ways. Curriculum operationalisation denotes how institutional actors interpret prescribed requirements and organise teaching, practical activities, staff support and partnerships. It differs from formal curriculum redesign, which may fall outside campus authority. Quality education for sustainable development (QESD) is used as a normative orientation connecting educational quality, inclusion and sustainability, rather than as a measured outcome of the present study.

International scholarship identifies substantial variation in how greening vocational education is conceptualised. Albertz and Pilz (2025) distinguish between discourse on occupational green skills and the greening of vocational providers. Pavlova (2019) links emerging environmental industries to changing skill requirements and TVET responses. These perspectives make it necessary to investigate how institutional actors connect changing work with learning provision. They also caution against using green skills, curriculum transformation and campus greening interchangeably.

Within South African TVET, Mkhatshwa et al. (2026) examine leaders' perceptions of QESD and identify constraints involving resources, curriculum and institutional capacity. The present study focuses specifically on the mediation between national curriculum requirements and reported local implementation. Its contribution is therefore not the discovery that resources matter, nor a claim that leadership mediation is entirely new. It provides a situated explanation of how interpretation, professional support and material conditions interact in participants' accounts of green skills provision.

Research problem and questions

The practical problem is that sustainability expectations can exceed campuses' capacity to provide consistent, practical learning. Leaders and practitioners may support greener work while lacking sufficient facilities, professional learning opportunities or authority to alter formal curricula. This produces an implementation problem and a potential equity problem: access to green learning

opportunities can depend on programme and institutional conditions rather than educational intention alone.

The empirical gap concerns how institutional actors exercise agency within these constraints. International and South African studies establish the importance of greening vocational education, but the relationship between local interpretation, coordinated support and uneven implementation requires context-specific investigation. This study asks three questions.

RQ1 How do institutional leaders and curriculum practitioners understand green skills development and its relationship to QESD in selected Tshwane TVET campuses?

RQ2 How do these actors lead and enact curriculum operationalisation for green skills development within nationally prescribed curricula?

RQ3 What institutional strategies, enabling conditions and challenges shape this implementation?

Literature and theoretical framework

Sustainability and the purposes of vocational education

A narrow approach associates green skills primarily with labour-market adjustment. A broader approach asks how vocational education supports sustainable livelihoods, environmental responsibility and participation in social change. McGrath and Powell (2016) provide the latter orientation, and McGrath and Ramsarup (2024) extend the debate about sustainable vocational futures. This study draws on that orientation without assuming that the reported practices meet all its expectations. Industry responsiveness is examined alongside the educational opportunities available to students.

Albertz and Pilz (2025) show that the discourse spans actors, content and regional contexts. Their review helps clarify why an institution's environmental commitments cannot substitute for evidence about teaching. Pavlova (2019) locates skill requirements in changing environmental industries. Together, these contributions support an analytical distinction between the demand for green capabilities and the arrangements through which students can acquire them. The present investigation concentrates on the latter, while recognising its dependence on the former.

Keyhan and Kazemnia (2026) address the movement from broad sustainability prescriptions to a coherent curriculum architecture. Their mixed-methods model links curriculum purposes, activities, resources and assessment. Its relevance here is to clarify what integrated curriculum planning entails; the present study examines reported implementation conditions rather than validating that model in South Africa.

Leadership and implementation conditions

Leadership can influence learning indirectly through staff development and organisational conditions. Leithwood et al. (2020) offer a useful account of such relationships in school leadership, although their findings cannot simply be transferred to TVET. In vocational settings, specialised equipment, workplace links and qualification requirements make institutional coordination particularly significant. The relevant question is how leaders support delivery within their actual responsibilities and authority.

Mkhatshwa et al. (2026) establish the relevance of resource and capacity constraints to South African TVET sustainability leadership. This study builds on that work by examining reported actions: interpreting requirements, contextualising content, supporting lecturers and organising partnerships. These actions are treated as forms of curriculum mediation. The concept focuses on what institutional actors can influence, while avoiding the assumption that campuses independently determine national curricula.

Yang and Omar (2026) investigate instructors' experiences of green skills pedagogy and the implementation gap across four institutions. This practitioner focus complements research on leadership perceptions. Read together, the studies suggest a need to connect institutional coordination with lecturers' practical capacity rather than treating leadership and pedagogy as separate explanations.

Social construction and social justice

Social constructivism provides an interpretive orientation for examining how participants make sense of sustainability and curriculum practice. Vygotsky (1978) foregrounds the social mediation of learning, while Berger and Luckmann (1966) offer a broader account of socially constructed meanings. These traditions are related but not identical. Here, their contribution is to sensitise analysis to interpretation and interaction; the study does not test a developmental theory of student learning.

Fraser's (2008) framework introduces a complementary concern with redistribution, recognition and representation. Redistribution concerns access to facilities, lecturer expertise, time and learning resources. Recognition concerns whether curriculum delivery values learners' circumstances and relevant contextual knowledge. Representation concerns whose voices influence implementation decisions. These dimensions guide interpretation rather than function as a scoring instrument.

The lenses perform different tasks. Social construction helps explain how curriculum expectations acquire local meaning. Social justice helps interrogate the conditions under which those meanings become accessible learning opportunities. In this dataset, evidence concerning resources is stronger than direct evidence about student voice or recognition. Consequently, the analysis does not claim equal empirical support for every theoretical dimension.

Methodology

Approach and study setting

The study adopted a qualitative approach within a constructivist paradigm. A multiple-case design involved selected campuses of Tshwane North and Tshwane South TVET Colleges. The analysis presented here synthesises institutional and practitioner accounts across these settings; it does not rank colleges or establish college-level differences. The unit of analytical interest is the reported practice of curriculum operationalisation within institutional conditions.

Sampling and participants

Seven participants were purposively selected for experience relevant to curriculum leadership, teaching, implementation or oversight. Their perspectives included institutional leadership and curriculum practice. Pseudonyms P1 to P7 identify accounts. Exact campus and post combinations are withheld because specialised roles in a small sample create a risk of indirect identification. A public participant-to-post table is therefore omitted.

The sample provides focused experiential accounts rather than statistical representation of TVET employees. Malterud et al. (2016) explain that qualitative sample adequacy depends on information power rather than a numerical threshold alone. In this study, the focused questions and participants' relevant responsibilities support an exploratory interpretation, but role diversity and limited cases constrain the depth of subgroup comparison. No unsupported claim of saturation is made.

Data generation and documentary evidence

Semi-structured interviews explored understandings of QESD, green skills, leadership practices, curriculum requirements, professional support, partnerships and implementation challenges. A common guide supported consistency while allowing participants to explain their responsibilities and experiences. Interview extracts illustrate participants' meanings and the tensions between their accounts.

Document analysis complemented the interviews. The reported documentary categories comprise an institutional strategic plan, DHET policy and curriculum frameworks, NC(V) documents, Report 191/NATED documentation and QCTO occupational qualification documents. Following Bowen (2009), documents are treated as situated sources with particular purposes, rather than transparent descriptions of everyday practice. Strategic intentions can contextualise accounts, but they do not verify that intended activities occurred.

Documentary priorities included lecturer reskilling, occupational programmes, workplace learning, partnerships and digital development. Documentary convergence is interpreted cautiously and does

not establish causation or implementation fidelity. The absence of a detailed documentary inventory limits independent appraisal of this component.

Analysis and trustworthiness

Thematic analysis involved familiarisation, initial coding, comparison of codes, category development and refinement of themes. Braun and Clarke (2006) provide the methodological foundation for this sequence. Coding attended to the research questions while remaining open to participants' accounts of curriculum centralisation, green technologies, lecturer development, partnerships, funding and infrastructure. Theoretical interpretation followed attention to these accounts rather than replacing them with predefined justice categories.

Five themes were retained: future-oriented curriculum understandings, uneven green skills integration, leadership mediation, interdependent implementation strategies and structural constraints. Accounts were compared for convergence and tension. For example, reports of renewable energy teaching were considered alongside statements that implementation remained limited. Such differences were retained as evidence of uneven experience, rather than resolved into a single institutional narrative.

Credibility rests on the relationship between interpretations and reported interview evidence, considered alongside documentary context. A common interview guide and an audit trail connecting statements, codes and themes supported analytical transparency. Nowell et al. (2017) support transparent documentation of analytical decisions. This does not establish intercoder agreement, member checking or independent observation, none of which is claimed here. The researcher's interpretive role is acknowledged; fuller reporting of positionality and interview conditions remains important under the COREQ guidance of Tong et al. (2007).

Ethical safeguards

The University of South Africa College of Education Ethics Review Committee granted approval under reference 13481 for the parent study on curriculum transformation towards QESD in Tshwane TVET colleges. Approval runs from 18 April 2026 to 17 April 2029. The supplied gatekeeper letter grants access at Tshwane North TVET College and requires local arrangements with the relevant site. Participation was voluntary and informed, and interview records were handled confidentially.

The approval requires adherence to the approved methods, reporting of changes affecting risk, protection of confidentiality and storage in accordance with university requirements for up to 15 years. Third-party disclosure requires explicit participant and Unisa consent. Future secondary research is limited to de-identified data and similar objectives; identifiable secondary use requires additional ethics clearance. These conditions govern the restricted data availability statement and accompanying data management plan.

Findings

Future oriented and industry responsive curriculum understandings

The first finding shows that participants conceptualised curriculum transformation as more than revising curriculum content; they understood it as repositioning TVET to respond to changing labour markets, sustainability, practical skills and the green economy. P1 argued that green skills should be embedded within curriculum delivery and stressed that TVET should "teach for the industry needs/economy not mass production." Similarly, P2 conceptualised transformation as moving from "static, historical learning models toward dynamic, responsive programs" and described campus actors as implementers who translate national policy into classroom reality. P7 also associated transformation with aligning TVET curricula with twenty-first-century labour demands and integrating green-skills programmes and processes. These perspectives converge with the documentary analysis, which positions curriculum transformation as responsive to labour-market needs, sustainability priorities, inclusive education and emerging skills requirements.

Uneven integration of green skills

The second finding reveals a significant gap between the recognition of green skills and their systematic integration into the curriculum. Interview evidence shows that some programmes already contain sustainability-related learning, particularly renewable energy and energy efficiency. P2 reported that engineering and NC(V) programmes expose students to practical concepts involving "solar and wind energy systems" and connect these technologies to the transition towards a low-carbon economy. However, P7 provided a contrasting perspective, stating that although green-skills programmes are encouraged, "little initiatives are taken for their implementation," with energy-saving content occurring only in some NC(V) modules. P7 further reported that lecturers and students had limited knowledge of greening because such content was not sufficiently incorporated into the formal curriculum. The reported documentary priorities provide a policy context for these accounts but do not independently establish the extent of implementation.

Leadership mediation within prescribed curricula

The third theme reveals that curriculum transformation is shaped by the relationship between centralised curriculum structures and institutional leadership agency. Participants acknowledged that much of the formal curriculum is determined externally, limiting the ability of individual campuses to independently redesign programmes. P1 described TVET colleges as "bureaucratic institutions by nature" and reported limited independence in determining curriculum focus areas. P2, however, demonstrated that limited formal autonomy does not eliminate leadership agency, explaining: "We are the implementers. Transformation means translating national policy into classroom reality." At classroom level, P2 described leadership as acting as a bridge between policy intention and students

by contextualising curriculum material, mentoring students and developing environmental consciousness. The inclusion of leadership perspectives across institutional levels, including a participant with curriculum oversight responsibilities, further indicates that transformation operates across interconnected policy, institutional and implementation levels rather than at campus level alone.

Interdependent institutional implementation strategies

The fourth finding identifies several interconnected strategies through which TVET institutions are attempting to translate QESD into practice, particularly curriculum integration, occupational programmes, industry partnerships, lecturer CPD and digital innovation. Interview evidence indicates that occupational programmes are creating opportunities for stronger localisation and industry engagement. P2 explained that emerging occupational programmes provide colleges with greater opportunities to respond to local curriculum needs and that industry partnerships are increasingly connected with workplace-based learning and infrastructure development. Digital technologies also emerged as an enabling strategy. Participants reported that LMSs and online systems improved resource sharing and institutional efficiency, while P2 argued that digital technologies can reduce paper use, optimise resources and expose students to workplaces where digital and green skills increasingly intersect. P7 similarly reported workshops relating to solar-energy and energy-saving programmes, although implementation remained limited at campus level.

Structural constraints on implementation

The fifth cross-cutting finding concerns the gap between curriculum and policy aspirations and institutional capacity to implement them. Participants consistently identified insufficient funding, infrastructure limitations, inadequate lecturer development, curriculum rigidity and bureaucratic processes as barriers. P7 reported a "lack of resources, and capacity development of lecturers on green skills development programs" and argued that clearer policy and competency frameworks were required. P2 similarly identified capital funding as the major institutional barrier, particularly where specialised green laboratories and renewable-energy equipment were required. Most significantly, P2 stated that "policy without matching financial enablement acts as a constraint," arguing that progressive policies stall when resources do not accompany implementation. P1 likewise identified structural and resource limitations as reasons why campus-level greening remains difficult despite institutional interest in developing relevant skills for a sustainable economy. These accounts describe participants' experiences of the gap between institutional expectations and implementation conditions.

Discussion

Institutionally enabled curriculum mediation

Across the themes, participants describe agency exercised through interpretation and coordination within prescribed structures. Their accounts support the concept of institutionally enabled curriculum mediation: the translation of sustainability expectations into reported teaching arrangements through local interpretation, lecturer support, resources and partnerships. This is an analytical explanation derived from the accounts, not a validated intervention model or a claim that the study originates the general idea of mediation.

The account extends the leadership-capacity concerns identified by Mkhatshwa et al. (2026) by specifying relationships among implementation activities. Interpretation alone cannot provide equipment or professional expertise. Conversely, equipment alone does not explain how sustainability is connected to occupational tasks. The contribution is the articulation of their interdependence in the selected settings. This addresses RQ2 and RQ3 by identifying both reported leadership practices and conditions that enable or constrain them.

Leithwood et al. (2020) locate leadership influence partly in organisational conditions. The present interpretation is consistent with that general insight while specifying a vocational context in which formal curriculum autonomy is limited. The findings therefore support attention to the conditions of enactment, rather than attributing success or failure solely to individual leadership commitment. They do not establish how much any particular leadership action changes student outcomes.

Distinguishing commitment from educational opportunity

Participants recognise sustainability as relevant to future work, addressing RQ1. Yet recognition coexists with reports of limited integration. P2's account of renewable energy teaching and P7's account of limited implementation should be read together. They suggest that the presence of green content in a programme is insufficient evidence of consistent access across programmes. The study cannot determine how widespread either experience is because no programme audit or observation dataset is available.

The analytical distinction is between policy commitment, reported pedagogical enactment and demonstrated learner competence. Interviews principally illuminate the first two. They cannot establish the third. This distinction gives greater precision to claims about curriculum transformation: a college may recognise green priorities without providing sustained practical opportunities, and reported opportunities may still require assessment of what students learn.

Keyhan and Kazemnia (2026) emphasise connections between curricular elements and assessable learning. The present findings complement that design orientation by highlighting the institutional conditions required to enact learning activities. They also qualify claims of integration: the presence

of relevant curriculum content should be distinguished from evidence that learners can demonstrate the associated competencies.

Albertz and Pilz (2025) clarify that green skills and green providers occupy related but distinguishable areas of discourse. The present findings add a local illustration of why the distinction matters. Digitisation or reduced paper use may support institutional efficiency, but neither by itself demonstrates occupational green competence. Pavlova (2019) connects emerging environmental work to skill requirements; the current analysis suggests that explicit pedagogical links between occupational tasks, technologies and environmental judgement require closer investigation.

Resources and the justice of curriculum implementation

Fraser's (2008) redistribution dimension is particularly useful for interpreting reports of insufficient facilities and lecturer support. Resources shape the opportunities students can encounter. When practical learning depends on specialised equipment or workplace access, uneven provision can produce unequal opportunities even where formal curriculum requirements are shared. The findings identify this risk; they do not quantify inequality or establish its distribution across the two colleges.

Recognition and representation remain important but less directly evidenced. Contextualised teaching may respond to learners' circumstances, but no student interviews establish how learners experience recognition. Partnership arrangements may broaden participation, but the presence of a partnership does not show whose voice determines priorities. These dimensions therefore identify questions for institutional review and further research rather than completed empirical findings about inclusion.

McGrath and Powell (2016) and McGrath and Ramsarup (2024) connect vocational education with broader sustainable futures. The present study gives that concern an institutional expression: curriculum responsiveness should be considered alongside students' access to the conditions needed to learn. In these accounts, financial and professional enablement are not background matters; they shape what sustainability commitments can become in practice.

Coordinating implementation strategies

The reported strategies involve occupational programmes, professional learning, digital resources and industry collaboration. Their proposed value lies in coordination. A partnership may create access to equipment, but educational benefit depends on how lecturers integrate experience into teaching. Professional learning may strengthen pedagogical judgement, but lecturers also need time and usable facilities. Digital resources may supplement learning, but they cannot be assumed to replace hands-on occupational practice.

Yang and Omar's (2026) practitioner accounts reinforce the importance of support for green skills pedagogy. In the Tshwane accounts, professional learning is connected to facilities, funding and access to workplace knowledge. This connection suggests that professional development should be

evaluated in relation to the teaching opportunities it enables rather than participation in workshops alone.

This interpretation connects changing environmental skill demands discussed by Pavlova (2019) with the institutional greening discourse reviewed by Albertz and Pilz (2025). It yields a proposition for future testing: green skills learning opportunities are more likely to be sustained when curriculum interpretation, professional support and practical resources are jointly organised. The present qualitative accounts motivate this proposition but do not test its causal effects.

Implications for practice and scholarship

Campus leaders could map where existing prescribed outcomes permit sustainability-focused tasks, then connect those tasks to lecturer development and available equipment. Such mapping should distinguish what can be contextualised locally from changes requiring approval at other levels. An implementation review should ask whether students can practise relevant tasks, rather than recording only the number of sustainability initiatives.

College and system leaders should consider coordinated investment in professional learning and practical provision. Partnership agreements could specify learning purposes, supervision, access criteria and responsibilities for reviewing student opportunities. These recommendations follow from the reported constraints and interdependencies; they should be adapted to programme requirements rather than applied as a uniform intervention.

For scholarship, the study offers three linked contributions. It provides a situated account of institutional agency within the constraints of limited curriculum autonomy. It distinguishes commitment and reported enactment from demonstrated learning. It interprets unequal implementation conditions as a question of educational opportunity through Fraser's framework. These are bounded analytical contributions, not evidence that a new universal model has been validated.

Limitations and future research

Seven purposively selected accounts cannot represent all Tshwane campuses or the South African TVET sector. The study combines leadership, practitioner and oversight perspectives, but the reported case-by-case evidence is insufficient for institutional comparisons. Quotations are concentrated in P1, P2 and P7, limiting the public evidential visibility of the other four accounts. This limits the range of perspectives that readers can independently assess.

The reporting does not specify a documentary inventory, interview dates, duration and mode, recruitment outcomes or a detailed positionality account. Their absence limits methodological appraisal. The findings concern reported practices; there are no student interviews, classroom

observations, competency assessments or employment outcomes with which to establish effectiveness. Institutional naming and specialised roles also limit the degree of anonymity achievable through pseudonyms alone.

Future research should examine student experiences, observed learning tasks and assessed green competencies across programmes. Comparative studies could test whether coordinated professional support and practical resources improve access and learning. Research involving student voice would also strengthen analysis of recognition and representation, the least directly evidenced dimensions in this study.

Conclusion

The study examines how institutional leaders and curriculum practitioners report operationalising green skills within prescribed TVET curricula. Participants connect sustainability with changing work and describe interpretation, lecturer support, partnerships and resource mobilisation as important practices. Nevertheless, implementation remains uneven in their accounts, with facilities, funding and professional development constraining provision.

Institutionally enabled curriculum mediation explains the relationship between these practices and the conditions that support them. The central implication is that sustainability commitments require coordinated material and pedagogical support to become accessible learning opportunities. This conclusion is bounded by seven participants and reported practice; demonstrated learning outcomes remain an important focus for subsequent research.

Declarations

Data availability

The datasets generated during and/or analysed during the current study are not publicly available due to participant confidentiality, the risk of deductive identification within a small professional sample, and restrictions imposed by the University of South Africa ethics approval, but are available from the corresponding author on reasonable request, subject to explicit consent from the relevant participants and Unisa, applicable institutional permission, and approval of the proposed disclosure. Only suitably de-identified data may be considered for access; no request guarantees release.

Ethical Approval and accordance

The parent study was approved by the University of South Africa College of Education Ethics Review Committee under reference 13481, with approval valid from 18 April 2026 to 17 April 2029. The approval requires conduct in accordance with the Unisa Policy on Research Ethics, the approved protocol and applicable legislation, including the Protection of Personal Information Act 4 of 2013.

Gatekeeper permission was granted by Tshwane North TVET College. Participation was voluntary and informed, and pseudonyms were used to protect confidentiality.

I confirm permission covering Tshwane South, and all reported participant categories, together with any approved protocol amendments.

Ethical Statement

The study protocol was approved by the University of South Africa (UNISA), College of Education Ethics Review Committee (approval reference: 13481; approval period: 18 April 2026–17 April 2029). I attached copy of ethical clearance. The research was conducted in accordance with the UNISA Policy on Research Ethics, the approved study protocol, and the requirements and conditions stipulated by the committee. All participants received information about the study and provided informed consent before participation. Participation was voluntary, and confidentiality was protected through the use of pseudonyms and secure handling of research records.

Consent to participate

All participants received information about the study, participated voluntarily and provided informed consent before participation.

Consent to publish

I the supplied approval and gatekeeper documents do not establish participant consent to publication of quotations or potentially identifiable findings. Confirm the scope of the signed consent forms. If supported by those records, replace this note with: “Informed consent for publication of de-identified findings and quotations was obtained from all participants.” Otherwise obtain the necessary consent or revise the publication material in consultation with the ethics committee.

Competing interests

The author declares no competing interests.

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Author contributions

The author was responsible for conceptualisation, methodology, investigation, data curation, analysis, interpretation, and writing and revision of the manuscript.

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