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The Journal of Vocational, Adult and Continuing Education and Training

The Journal of Vocational, Adult and Continuing Education and Training (JOVACET) recognises the need for critical engagement through studies in technical and vocational education and training (TVET) and adult and continuing education and training, and for encouraging critical scrutiny of this expansive knowledge area on the African continent.

The voices and experiences of practitioners, reflecting on all aspects of teaching and learning within vocational education and adult education settings, should be heard through the publication of empirical and robust research. While the journal wishes to take forward academic scholarship, it also seeks to strengthen opportunities for reflective practice that makes a scholarly contribution to the field. New knowledge emerging out of complex developmental contexts has significant value and needs to be showcased beyond existing geographical and political boundaries. The journal is therefore committed to also supporting the development of emerging researchers by providing them with a space to present and defend their research amongst a network of global scholars. Within the field of vocational and continuing education there is substantive 'grey literature' that remains in project report form. The journal is potentially a vehicle for the translation of this important work into an academic contribution to a wider community of practice, thereby enhancing its value.

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EDITORIAL

Joy Papier

Editor-in-Chief

This issue of JOVACET is its 11th since the journal was established in November 2017 and since its first publication in 2018 (there were two special issues: one in 2019 and another in 2024). Our next year, 2027, therefore, is an important milestone, marking the first decade of *JOVACET*. Compared with one of our sister journals, the *JVET* in the United Kingdom, which is approaching 80 years, *JOVACET* is very young, but it holds a critical space for TVET (technical and vocational education and training) in the south and on the African continent. We are hopeful that it will be nurtured and sustained well into the future.

In this volume 9(1) (2026), we see a range of what would seem to be fairly diverse themes in vocational education and training. On closer inspection, however, the interdependence of the issues that have been interrogated by our authors becomes clearer. For instance, TVET pedagogies often depend on what is available to vocational teachers and students: whether in the form of infrastructure, equipment, materials in print or digital format (the latter becoming more prominent in recent times) or simply an environment that is conducive to achieving curricula and policy objectives. As can be gleaned from the brief overview of our articles that follows, there is ample illustration of the many intersections among the purposes, policies and practices of TVET across contexts.

We begin with Zungu and Hugo's (2026) comparative case study of three TVET colleges that investigated whether, and how, colleges utilised the technology that was available to them on the campus. While the necessary infrastructure was physically present, the study showed that digital utilisation could not be inferred from the presence of infrastructure, from an existing policy or from a platform in place. Across the three colleges, the technology only became employed in teaching practice when three conditions were in concert: technical reliability (dependable networks, support staff), institutional ownership (an office with authority and resources for implementation of the tools) and curricular compulsion (the willingness of students and lecturers to integrate the technology into teaching and learning). Without one or the other of these conditions being present in the institution, utilisation of the technology

stalled. Of course, unequal student access to devices, connectivity and data presented a further limitation in the form of social circumstances that could not be overcome by the colleges.

Continuing the theme of digital resources, Makandwa, Zisengwe, Makonya and Nangi (2026) explored institutional readiness for online formative assessments in Zimbabwean vocational training centres, specifically with regard to inclusive access and adaptations for student diversity in Tourism and Hospitality training programmes. As found in other studies in developing contexts, while urban-based students reported relatively easy access to Internet-enabled devices and stable Internet connectivity, their rural counterparts faced significant challenges. Limited access to reliable electricity, high mobile-data costs and lack of technological devices hindered students from participating fully in remote learning. Female students, in particular, reported lower engagement rates in online assessments, attributed primarily to competing domestic obligations arising from childcare responsibilities, household management duties and expectations of women within family structures. These findings illuminate again how traditional gender roles create new forms of gendered educational inequality.

On the theme of inclusivity, Mdiza, Mathebula, Nyewe and Chigona's article presents a closer look at how a Western Cape college is faring with regard to accommodating students with disabilities despite rising enrolment of such students at TVET colleges. In a small, targeted study of purposively selected students with a variety of disabilities, it was disheartening to note that, so many years after education policy attempts at inclusivity, there are still inaccessible buildings and learning materials, limited classroom affordance and non-inclusive teaching practices, especially for those with hearing and visual impairments. TVET students with disabilities had to deal not only with their individual impairment, but also with the interconnected institutional, environmental and systemic factors. Several participants said they were reluctant to disclose their disabilities because of fear of discrimination, stigmatisation or breaches of confidentiality. Those who chose to disclose their disability reported receiving little or no institutional follow-up or appropriate support. It would appear there is still work to be done in terms of embedding inclusive practices across diverse TVET settings.

On the topic of vocational pedagogies and educator approaches to teaching and learning, three articles take us to the classroom coalface and curriculum development. First, Kammeyer and Zinn explored the adoption of experimentation and discovery-based teaching methods in Engineering education among German and South African TVET lecturers in a comparative study. Findings were that the majority of South African and German TVET lecturers could incorporate technical experiments into their teaching, but this knowledge had been obtained mainly outside formal teacher training. The use of experiments, however, depended largely on available resources such as materials, personal experience and institutional conditions such as class size and time-tabling. Despite higher academic qualifications than their SA counterparts, German lecturers also had not dealt with conducting technical experiments during their teacher training programmes.

This exploratory research indicated that, while technical experiments are regarded as important by TVET lecturers, the availability of materials and lecturer competence were barriers to their systematic application, thus potentially depriving students of effective learning methodologies in technical education.

In the second article on teaching applications, our authors Zwane, Ramorola and Sibanda (2026) foreground the importance of visual literacy (VL) as an essential skill for students entering dynamic and complex workplaces and they explore how multimodal instruction can provide opportunities for visual literacy learning among TVET students in English First Additional Language (EFAL) classrooms. They found the teaching of visual texts to be fragmented and superficial, rather than a systematic and theoretically informed component of EFAL pedagogy in the TVET context. As a result, students showed significant difficulty in interpreting verbal and non-verbal cues in body language and facial expressions, with little pedagogical practice being offered. Through a structured intervention of relevant materials development for teaching VL, the researchers found notable improvement in teaching and learning approaches by both lecturers and students when multimodal texts were utilised. Structured VL tools enabled students to engage more confidently with complex visual texts, supporting both their interpretive skills and their ability to produce meaning across modes. These approaches scaffolded learning, fostered collaboration and critical thinking, and increased motivation.

The third instance of curriculum-related research intertwines educator agency, collaborative learning and learning for sustainability in a secondary document analysis undertaken by De Souza (2026). This study examined how educator-led 'change projects' enacted Education for Sustainable Development in selected TVET institutions in Botswana, Namibia and Zimbabwe. The wide-ranging projects addressed training in entrepreneurship, community-service learning, engineering redesign, repair cafés, information and communications technology-supported teaching, industrial attachment through beekeeping and water management engineering. Analysis across seven cases in the report revealed three pedagogical orientations: participatory and community-engaged learning, curriculum innovation for sustainability, and experiential, practice-based learning. Educator agency was found to be an interpretive and collaborative process through which ESD could be addressed pedagogically, in that collaborative professional learning informed pedagogical judgement and supported local curriculum and assessment innovation.

Our final two articles in this issue are aimed at structural issues in TVET that have been subject to ongoing scrutiny and surfacing from time to time. The first of these two deals with work-based learning (WBL), also referred to as work-based experience (WBE), which has long been a source of frustration for students and lecturers alike, notwithstanding the length and breadth of research that emphasise its importance in vocational education. Engelbrecht and Garraway (2026) conducted research among TVET college lecturers to uncover restrictive practices at the micro level which impede the implementation of work-based experience in the college tourism programme (as opposed to the macro level where the impediments to

student placement in industry are more familiar). At the micro level, lecturers argued for their inclusion in college engagement with industry, not least so that they could advocate for their graduates in the industry, but also to assist employers to understand the nature of the college tourism qualification. The researchers hold that addressing big-picture, macro-level restrictive practices is insufficient when internal micro-level barriers continue to impede effective WBE implementation.

Last but certainly not least, Desai (2026) takes up the TVET 'supply vs demand' debate in terms of South Africa's student enrolment targets set in official policy. Showing a 2025/26 college headcount enrolment still well below the state's National Development Plan (NDP) 2030 target, the article argues that the binding constraint on enrolment is a supply- rather than demand-side failure, the latter being the more popular argument based on TVET college attractiveness and so on. In a structured analysis of publicly available secondary data, the author constructs a conceptual model that identifies three primary domains influencing TVET enrolment. While demand-side factors are significant, the evidence suggests that the major constraint is supply-side: enrolment capping driven by funding limitations, lecturer vacancies and institutional capacity deficits that prevent the TVET system from absorbing the latent demand that exists. These supply-side constraints generate demand-side effects through the feedback mechanisms identified in the model. While the strategies proposed are not new, for example lifting enrolment caps, expanding NSFAS (National Student Financial Aid Scheme) capacity, professionalising TVET lecturers and managing the QCTO (*Quality Council for Trades and Occupations)* qualification transition, the systems perspective embedded in the conceptual model highlights the need for a coordinated, multipronged approach rather than ad hoc interventions.

That's it, folks, for 2026. We hope that you find value in these pages and that you will be encouraged and inspired to submit your articles to *JOVACET*. Thank you to our authors who entrust us with their research efforts, our tough but fair reviewers who keep our journal on track, and you, our loyal readership. Let's continue to ask the hard TVET questions and to celebrate the role that our journal plays in ensuring that we all participate in thinking about the answers. We look forward to your submissions for our 10th year of publication in 2027. Thank you one and all!

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The conditions for digital integration: A comparative case study of three TVET colleges in KwaZulu-Natal

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ABSTRACT

Digital technology has spread unevenly through South Africa's public technical and vocational education and training (TVET) colleges. This article examines what determines whether the technology available to a college becomes part of everyday teaching. It reports on a comparative study of three public TVET colleges in KwaZulu-Natal (KZN), ranging from a well-connected urban college to a dispersed rural college, drawing on interviews with managers, institutional documents and three complementary theoretical perspectives. The analysis identifies three conditions that must be secured together: technical reliability, institutional ownership and acurricular compulsion. The cases do not support a fixed sequence in which these conditions develop; instead, each college was constrained by a different condition. Student access remained a separate but interacting material constraint. The comparison therefore supports a diagnostic approach that identifies which condition remains insecure in a particular college, what institutional action could secure it, and where wider public provision is required.

Keywords: Technical reliability, institutional ownership, curricular compulsion, student access, material constraint, diagnostic approach

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Introduction

South Africa's public technical and vocational education and training (TVET) colleges teach the practical trades on which much of the economy depends and they do so for students drawn largely from the country's poorer communities. For most of their history, these colleges have taught in workshops and classrooms, face to face, and the digital technology available to them served administration more than teaching. Bringing that technology into teaching itself was, until recently, a slow aspiration, encouraged by national policy and by the wider talk of a fourth industrial revolution (4IR), but pursued unevenly and without urgency. When the lockdown of 2020 closed down contact teaching, colleges that had never taught online had to go on teaching without classrooms and a shift that policy had imagined as gradual became, almost overnight, a necessity.

Colleges entered the lockdown with very different capacities for online teaching. Some had the equipment to move online but found that lecturers did not use it; others had little equipment and improvised with what their students already had. Possession of technology did not establish whether it could be used for teaching and the differences between colleges were not readily explained by their equipment or location. By requiring every college to attempt at once what it had previously deferred, the pandemic exposed a gap that ordinary conditions had allowed to remain unexamined. It also showed that technology alone did not determine whether that gap closed.

Digital integration in colleges of this kind is often approached as a question of access: whether an institution and its students have the infrastructure, devices and connectivity that online teaching presupposes. Access is necessary and its absence can halt integration, but the pandemic showed that it is not sufficient. This article therefore examines the institutional conditions that determine whether digital technology becomes part of ordinary teaching, asking why colleges governed by the same national policy and equipped with digital tools integrate them so differently.

The study compares three public TVET colleges in KwaZulu-Natal (KZN), chosen to span settings from a well-connected urban college to a dispersed rural one and focuses on the institutional decisions that shape technology use before they reach the classroom.

Literature review

Over the past two decades, research on digital technology in education moved away from treating access as the whole of the problem. Early work equated the digital divide with the presence or absence of infrastructure and connectivity, but a substantial body of scholarship came to hold that access, while necessary, was far from sufficient for meaningful use (Norris, 2001; Pick & Sarkar, 2015; Van Dijk, 2020; Warf, 2013). Van Deursen and Van Dijk (2010) distinguished a first-level divide of access from second- and third-level divides of skills and of actual usage, and Warschauer (2003) and Selwyn (2013, 2021) argued that the value a

technology yielded depended not on its features but on the social and institutional systems in which it was embedded. Reviewing the field after the pandemic, Lythreatis et al. (2022) sorted the drivers of the divide into nine categories and noted new forms of it emerging, while Van Deursen and Van Dijk (2019) showed that even first-level access endures as a divide, present now less as the bare absence of a connection than as unequal material access to devices and the means to keep them running. Information and communications technology (ICT) provision alone, this body of work established, said little about whether teaching had changed; what mattered was what a college and its people did with the technology available to them.

The vocational sector has drawn far less of this attention than schools or universities and the South African TVET colleges less still, despite a strong policy push toward digital transformation from the Department of Higher Education and Training (DHET) and, at continental level, the African Union (African Union, 2025; DHET, 2020). In a survey of all 50 public TVET colleges conducted as the pandemic forced the issue, Hugo and Louton (2021) found the sector split roughly in half, with about 40% of colleges having launched e-learning, a fifth on the point of doing so and the remaining two-fifths still in the early stages or not yet beyond discussing it.

Much of this ambition has travelled under the discourse of a 4IR, and the distance between its promise and what colleges can do with it runs through the South African evidence. Writing as the pandemic forced the question, Mhlanga and Moloi (2020) found the rhetoric of 4IR-driven transformation running well ahead of the sector's capacity to deliver it. Denhere and Moloi (2021) document the same gap between 4IR policy and the readiness of lecturers on the ground, and Kana and Letaba (2024) note that colleges have taken up the language of digitalisation while pedagogical change stays limited. Interviewing managers, lecturers and students across five South African campuses, Magadza (2025) finds 4IR technologies able in principle to widen access and improve employability yet held back by the familiar constraints of patchy infrastructure, uneven digital literacy and outdated curricula. Internationally, Yang and Wu (2024) report the UNESCO Chair's attempt to steer TVET digitalisation through cooperation, itself an admission that the ambition has run ahead of the means. Across these accounts, the 4IR reaches the colleges first as policy language, and whether it reaches their teaching depends on conditions that language does not itself provide.

Infrastructure remains a real constraint, distributed unequally across urban and rural campuses and undermined by outdated equipment, thin bandwidth and power interruptions (Aina & Ogegbo, 2022). Hugo and Louton (2021) found that, while most colleges reported Internet access, few had the infrastructure to support online or blended teaching at scale, and that provision varied sharply within colleges, with central offices having the fastest connections and rural campuses the slowest. The learning platforms that access is meant to enable are themselves often ill-suited to vocational teaching, for they are generic systems into which practical, competency-based training does not easily fit. In consequence, they are used as repositories for notes rather than as environments for teaching and lecturers fall back on

familiar tools such as PowerPoint and WhatsApp (Denhere & Moloi, 2021; Khan, 2023; Ramoroka, 2021). Educators' own readiness varies widely, with many using digital tools for administration or the transmission of content rather than for teaching and being constrained less by individual skill than by uneven training, heavy workloads and weak institutional support (Mbatha, 2024; Razak et al., 2022). In the vocational sector specifically, Barboutidis and Stiakakis (2023) found students' digital competence shaped as much by age and prior use as by access, a reminder that provision and competence move separately.

Students add a further constraint in that the sector cannot easily reach them. Many TVET students come from poor households with little prior exposure to digital tools and without reliable devices or data of their own, so that moving teaching online risks excluding the very students it is meant to serve unless their access is deliberately secured (Holler et al., 2023; Jita & Munje, 2020). Schlebusch and Manyarela (2024), in studying a predominantly rural South African TVET college, trace how sparse devices and connectivity shape what e-learning can reach – the same constraint that this study meets on the student side. The vocational character of the sector runs through all of this. TVET teaching joins theoretical instruction to practical, workshop-based training, and the frameworks used to think about technology in general education, such as the technological, pedagogical and content knowledge of Mishra and Koehler (2006), require adaptation to a setting where much of what must be taught is done with the hand and the machine (Khan, 2023; Mbele, 2021). The colleges themselves have been clear that the answer is not to move teaching wholesale online – since a large part of vocational learning is practical and cannot leave the workshop – but to blend digital and contact teaching.

Across these components, the literature increasingly locates the decisive factor at the level of the institution. Whether a college turns digital inputs into changed teaching depends on its commitment, its leadership and its governance, and colleges that pursue digitalisation without translating it into resourced and enforced institutional arrangements tend to see it remain peripheral (Selwyn, 2021; Van Deursen & Van Dijk, 2010). Van Dijk (2020) names a common pattern of symbolic policy compliance, in which institutions adopt surface-level digital strategies to meet national expectations without embedding them in their core work, while Van Deursen and Van Dijk (2010) describe institutional digital divides that separate the colleges able to convert ICT into educational outputs from those that remain at the level of access. Hugo and Louton (2021) found e-learning driven, at some colleges, by a single champion with little institutional backing and at others carried by a dedicated unit that nonetheless lacked the infrastructure, policy or standing to make headway; and they found repeatedly that, where an e-learning policy existed but was not enforced and where academic and IT structures worked in silos rather than together, even willing staff could make little progress. Beyond South Africa, Regassa and Desissa (2025), in surveying students across five Ethiopian TVET colleges, found that access to devices and connectivity predicted little about their outcomes, while management support, instructor readiness and curriculum alignment did the explaining, placing the decisive factors in the institution rather than the equipment.

The divide has been theorised well past bare access, the institution named as the level that decides and the vocational sector's own obstacles catalogued; what remains scarce is close comparative data from inside the colleges where these conditions are supposed to operate. Even the recent reappraisals keep to the individual or the national scale. Pick and Sarkar (2025) reopen the agenda on global digital divides and Korovkin et al. (2023) rebuild the concept around the separation of digital supply from demand, yet the single institution, where a college's provision either reaches its teaching or does not, stays comparatively unexamined. The evidence draws disproportionately on the Global North and, within South Africa, on a handful of well-resourced urban colleges, so that the rural and under-resourced institutions that make up much of the sector are little studied and it rarely sets colleges within one system beside each other, leaving the sector unable to learn from its own variation. This study takes three colleges under one provincial authority, equipped on the basis of the same policy and drawing students from the same kind of community and explains in detail what each did with the technology it had, so that the institutional conditions the literature points to can be seen working, or failing to, in specific colleges.

Theoretical framework

The adoption of digital technology has a technical aspect in the properties of the tool and what it makes possible, an institutional aspect in the rules, resources and authority that shape its adoption and maintenance, and a human aspect to how lecturers understand the tool and its relation to their work. The study therefore draws on three complementary theories: diffusion of innovations examines how technology use spreads across and at colleges; affordance theory examines how potential users perceive and enact what a tool offers; and institutional design theory examines how organisational structures enable, direct or constrain both processes.

Diffusion of innovations

Diffusion of innovations treats adoption as a social process rather than a technical consequence of provision (Rogers, 2003; Wejnert, 2002). A technology spreads when users judge it to be compatible with their work and when champions or change agents carry it beyond isolated use. Below a diffusion threshold, adoption remains dependent on continual pressure; beyond it, use begins to sustain itself. Rogers' (2003) idea of reinvention also matters in these colleges, because lecturers and institutions adapt tools to local constraints rather than adopting them unchanged.

Affordance theory

Affordance theory defines an affordance as an action possibility arising in the relation between a tool and a user, not as a capability residing in the tool alone (Gaver, 1991; Gibson, 1979; Norman, 2002, 2013). It therefore separates what technology makes possible from what lecturers perceive and can enact. Whether a learning platform is used depends on how users understand it, whether they have the capacity and conditions to act on it and whether it fits

the work they are trying to do (Davis & Chouinard, 2017). This matters in TVET because a tool is judged against demonstration, calculation and workshop practice rather than by technical sophistication alone.

Institutional design theory

Institutional design theory explains how rules, authority and organised responsibility shape what members of a college do and what they regard as appropriate (March & Olsen, 2005; Scott, 2005). For digital integration, the central issue is whether a college assigns ownership of the work and backs it with resources and authority or leaves adoption to individual discretion. The theory also identifies decoupling: a college may adopt a policy formally while everyday teaching remains unchanged (Meyer & Rowan, 1977). Lipsky's account of frontline discretion helps explain how lecturers can enact, adapt or set aside a mandate when the machinery that makes it obligatory is weak (Lipsky, 1980).

An integrated framework

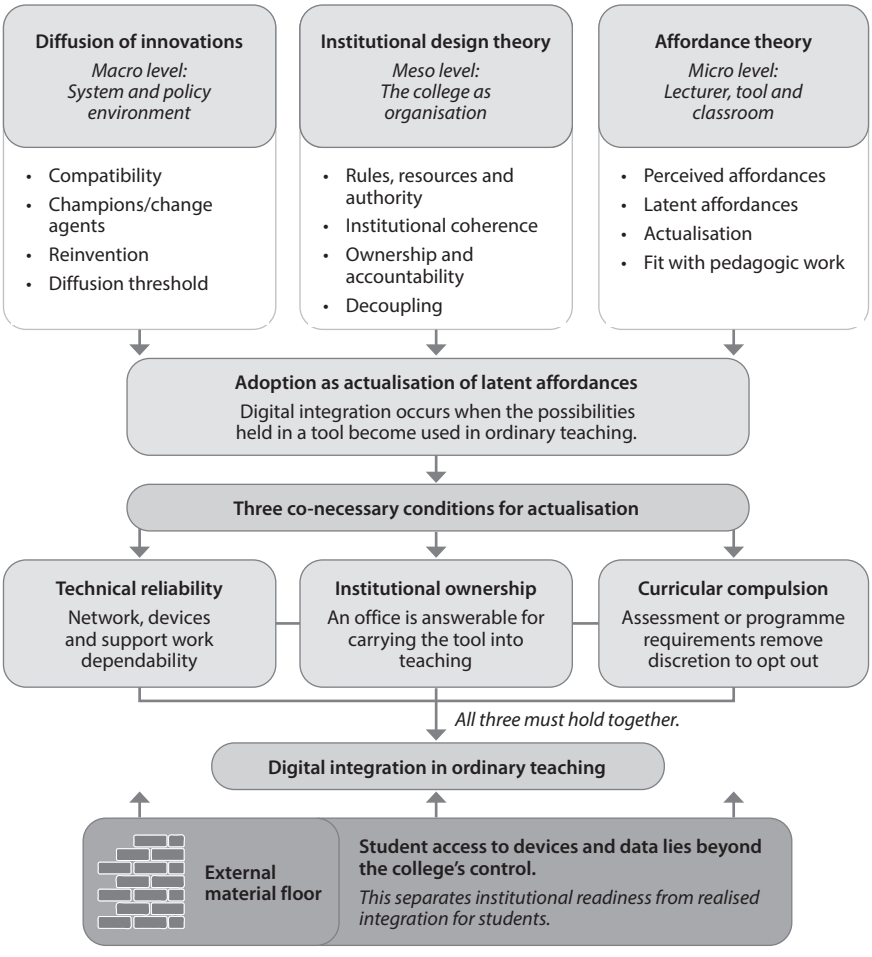
The three theories are used to follow one process across different sites of action. Affordance theory begins with the relation between a lecturer and a tool, where a technical possibility becomes pedagogically meaningful or remains unused. Institutional design theory follows the same possibility into the organisation of the college, where individual use is supported, directed or left optional. Diffusion of innovations follows whether such use remains local or becomes established across the institution. These are not successive stages: a constraint at one level can interrupt the process despite enabling conditions at the others. The framework therefore treats adoption as the actualisation of a latent affordance and uses the three theories to locate where that passage is blocked. The diagram in Figure 1 represents this relation, while placing access outside the institutional conditions as a separate material limit.

The presence of a technically capable tool does not establish that it is used. The framework therefore asks whether the possibilities afforded by a technology have entered teaching. It describes unrealised possibilities as latent affordances: a learning platform that could support whole courses but does not or a computer that could mediate teaching but is used only as an object of instruction. The term directs analysis from the presence of a tool to the conditions under which its capabilities are enacted.

The framework uses actualisation to describe the passage from a latent affordance to an established use. Three conditions shape that passage, one derived from each theoretical perspective: users must recognise a pedagogically valuable use; the institution must support and organise that use; and adoption must spread sufficiently to persist. These conditions are analytically distinct and need not arise in a fixed order. If any one remains insecure, a technology may continue to be used only intermittently even where the other two are present. This helps explain how a college can provide laptops for every lecturer and adopt a digital strategy while its learning platform remains peripheral to teaching.

Institutional coherence is the degree to which a college's stated strategy and daily practice coincide; a college may have a serious digital strategy on paper while nothing in its everyday operation requires or rewards the tools that strategy names and where the two come apart the benefit the strategy promised never arrives. A diffusion threshold is the level of uptake below which an innovation cannot yet sustain itself; short of that level, use survives only under continual pressure and lapses the moment the pressure is lifted – and only beyond it does practice begin to carry its own weight. Adoption is the actualisation of latent affordances and analysing a college means identifying which affordances remain latent and which condition is holding them there.

Figure 1
Integrated conceptual framework for digital integration in TVET colleges



Methodology

This article draws on the second phase of a larger doctoral study of digital technology adoption across KZN's TVET colleges (Zungu, 2025). The study used a two-phase comparative case design (Yin, 2009) to examine adoption as the situated product of what colleges perceive, decide and can do. The first phase surveyed the ICT systems of all nine public colleges in the province, establishing what infrastructure each had and how its systems were configured, supported and strained. The second examined three colleges as institutional cases. Phase one provided the baseline for selecting the cases and locating them within the wider provincial sector. The study's stance was interpretivist in both phases: its central concern was how colleges understood and used the technology available to them. The descriptive statistics from the first phase mapped the distribution of infrastructure; the case analysis examined why each college did or did not use that infrastructure for teaching.

That first phase was conducted in concert with a national study of Internet use across South Africa's public colleges, carried out by the South African Broadband Education Networks (Hugo & Louton, 2021), in which all 50 colleges took part. The researcher was embedded within that study, conducted its technical surveys in KZN and was granted the use of its validated data for the doctoral work. The instruments, a pair of semi-structured questionnaires, one for academic staff and one for information technology staff, were developed from a background study and the literature on ICT infrastructure in South African education and then administered through videoconferencing during the pandemic closure. Drawing on 22 officials across the nine colleges, with at least one academic-services official and one information technology official at each, the questionnaires yielded an inventory of hardware, network configuration and support arrangements for every college, captured and analysed in spreadsheets question by question and college by college.

The three case colleges were chosen from the nine – which were anonymised alphabetically as KZN TVET A to I – based on two criteria drawn from the study's theoretical commitments. The first was geographic, since the scholarship on the digital divide holds that location conditions access (Warf, 2013) and the selection took one college in an urban setting, one in a rural setting and one whose campuses span both. The second was socio-economic, since diffusion theory holds that the character of a social system conditions its rate of adoption (Rogers, 2003) and the economic profile of each college's setting was compiled from district-municipality data covering dominant economic activities, income distribution and demographic composition. Applied together, the criteria yielded three colleges of markedly different circumstances: one in an industrial zone with campuses in urban and township areas, designated KZN TVET B; one in a predominantly agricultural region with dispersed rural campuses, designated KZN TVET F; and one in a mixed industrial and commercial zone with campuses distributed across urban, township and rural areas, designated KZN TVET D. Between them, the three colleges have 19 campuses, eight, five and six, respectively, spread across six district municipalities, a spread that carries

much of the province's geographic and socio-economic range. The cases are set out in what follows from the most rural of the three to the most urban.

At each college, the study attended to the actors who direct and administer digital strategy, based on the reasoning that the decisions which govern whether a technology is taken up are made at the institutional level before they are felt in the classroom. The evidence drawn on here rests principally on semi-structured interviews with those actors, eight participants in all: at each of the three colleges, the deputy principal for academic services and the manager responsible for information technology, together with the curriculum specialist at one college and the assistant director for support services at another. The interview guides, developed from the literature and the study's theoretical framework, were reviewed and approved by each college's principal through the gatekeeper application and were then sent to participants to preview beforehand so that any items they found unclear could be refined before use.

The main interviews were conducted in 2022, with follow-up interviews in 2023, each lasting between 45 minutes and an hour. The interviews were held via videoconferencing and, where circumstances allowed, on-site. They were audio-recorded with consent, transcribed in full and supported by field notes. These accounts were triangulated against documentary evidence, among it the colleges' own ICT policies and strategies, the national policies that bind them and teaching materials. These were the documents participants referred to during the interviews, gathered into a dossier for each college, read against criteria drawn from the framework and the study's objectives, indexed to the same themes as the interview material and cross-referenced with it so that what participants reported could be set against what the institutions had committed to paper. The larger study also engaged lecturers directly; the present article concentrates on the institutional level, where the conditions that shape adoption are set, although the larger data set did inform this article.

The material was analysed using the five stages of the framework method (Gale et al., 2013; Ritchie & Spencer, 1994). A first familiarisation with the transcripts, inventories and documents was followed by the construction of a thematic framework from the recurring concerns of the data and the concepts of the study's theory; that framework, which brought the constructs of the three theories together with the study's own, took the form of an analytical matrix developed for the larger doctoral study and it was against this matrix that the material was then indexed. The indexed material was charted into a grid that set each college's evidence out side by side and a final mapping and interpretation drew out and read the patterns across the three colleges. The work was carried out in a colour-coded spreadsheet that set each college's material side by side for charting and comparison.

Following Shenton (2004), credibility was sought through triangulation of the institutional interviews against one another and against the documentary record, so that no single account stood unchecked and through member checks in which each participant reviewed the transcript of their own interview; transferability was established through close description of each college's circumstances; and dependability and confirmability were ensured through an audit trail

linking each interpretive claim to the indexed and charted evidence from which it was drawn. The study was conducted under ethical clearance from the University of KwaZulu-Natal's Humanities and Social Sciences Research Ethics Committee, with gatekeeper permission granted by the principal of each participating college and voluntary, informed consent obtained from every participant, none of whom received material benefit. The colleges and the individuals there are identified throughout by anonymised codes, a practice required as a condition of participation by one of the colleges and extended to all for consistency and fairness.

Findings

KZN TVET F

Distance governed everything at KZN TVET F. Its campuses were scattered across three of the province's northern district municipalities, the farthest being more than 300 kilometres, one way, from the central office by road, in a catchment of some 1.4 million people where the poverty rate reached as high as 79% in places and where, as the deputy principal for academic services (DP0006) put it, a student who wanted a usable signal would 'have to climb a hill to get' it, a thing 'out of our control'. It was the only college in the study with every campus in a rural area and with the widest spread of any in the province. For all that distance, the college's digital equipment was extensive and almost unused. It had a learning management system (LMS) that, by its information technology manager's (IT0006) account, lacked nothing: it 'allows our lecturers to put in the content, to capture the videos, to open study guides, to send assignments' and students could download the guides and 'upload their scripts', so 'the system itself is sufficient'. 'The LMS is there,' he said, 'but at the moment we don't use it that much'; teaching thus proceeded by hand, 'with the blackboard', because 'we have not accepted it one hundred per cent'.

The network ran intermittently across those distances and no permanent technical staff were available to maintain it; the college leant on a yearly intake of interns who, in the deputy principal's words, 'come and go', so the work became 'redoing everything for the next group'. Furthermore, the providers who could mend a fault were themselves hundreds of kilometres off, a repair entailing a wait that the college could ill afford. Behind the idle platform lay a poverty the college could do nothing about. Most students had no devices and the national scheme meant to supply them had been slow to do so. Consequently, even a working system reached almost no one once a student went home.

The college's answer to scarcity was to reverse the order that the richer colleges followed. Rather than hand out devices and hope competence caught up, the information technology manager held that 'we need to train them first before we can give them those laptops', since a laptop in untrained hands was one its holder 'will not be able to use' and so 'a waste of money' a poor college could not afford. This sequence reflected an attempt to avoid spending scarce funds on devices that staff or students could not yet use effectively. The deputy principal's central task was to rebuild the college's governance to fit its geography. The old

arrangement had run everything from the centre, leaving campus managers with 'a conveyor belt of messages [and] not taking ownership of their campus'; she pushed authority back out, so managers had 'leeway to make decisions aligning to the policies' while the centre kept 'the support function' of 'policies and monitoring'. A college too dispersed to be run from one point was being remade to act as one and by her account it had worked.

A certified digital skills course, delivered through an external provider, had a champion at one campus who went to the provider's meetings and reported back to the others and an official at the centre who drove the initiative. Consequently, the college received a certificate for how well it had done. In contrast, the LMS had neither; it had only an outside provider who, though paid 'to ensure that this is working', delivered a system that 'wasn't' and was ultimately let go. The different outcomes of the two initiatives suggest that adoption depended on internal responsibility for implementation as well as the formal availability of a system. The deputy principal was moving to bridge this gap, appointing an official to 'specifically drive' e-learning and bringing the platform in-house to 'people that understand education'.

Scarcity produced improvised sharing arrangements. 'If you don't get it immediately,' the deputy principal said, 'you make another plan': a single projector set up in a shared room, with lecturers taking turns. That improvisation reached toward the one thing digital technology could give a college like this that no workshop of its own could: a way to put a distant workplace in front of students who had no means to reach it. Its students, she said, were held back by distance from the industries they trained for, many having never left their home town, so a far country or an unfamiliar workshop 'means nothing' to them until they see it, when 'it comes alive'; a lecturer could show hospitality students 'what big kitchens look like' though they had never stood in one. That use, though, still lay well beyond what the college's network and its students' devices could carry.

This progress nevertheless remained strongly dependent on the deputy principal. She was 65, and near retirement, and said only that she 'would love to leave' the work in place before she went. Her approaching retirement exposed the fragility of arrangements that had not yet been embedded beyond individual leadership.

KZN TVET B

KZN TVET B's eight campuses spanned from the central business district of a coastal city, through the townships on the metro's edge and into deep rural areas where network signals came and went. The communities served by these campuses lived for the most part on the metropolitan fringe; while they were near enough to commute in for work, they were poor enough that most students had no digital access beyond what the college provided. What proximity to the metro brought the college was reliability, stable infrastructure and service providers that the remoter colleges could only envy and on that firm ground it had provisioned on a scale none of them could match. Facing the closure of contact teaching, it 'took a decision in 2020 to purchase laptops for all our lecturers, over three hundred of them' (DP0002) and did

not stop there, adding routers and monthly data, projectors on every campus, an LMS and training. Its information technology manager (IT0002) pronounced the job done in the language of steps: 'The groundwork has been done; the foundation has been set.'

However, the foundation carried the college no further because of a habit older than the pandemic. For years, the college had owned computers and taught students to use them, to type a document, to work on a spreadsheet, to run the particular software a trade required; what it had never done was teach anything else through them. Technology, its information technology manager said, was for 'when technology is required, [such as when] they're learning a specific software'; the college 'didn't use technology to deliver teaching and learning'. The machines had therefore been treated as objects of instruction rather than as media through which other subjects could be taught. There was, he said, no 'culture in providing the resources and the devices to the lecturers to do teaching and learning online'. Provision had preceded any institutionally established pedagogical use.

When teaching face to face stopped, that habit was worked around rather than broken. Lecturers reached first for the college website, then for the channel already in their hands, 'form[ing] WhatsApp groups with their class', a thing that was 'there informally' for reminders now pressed into teaching; some even recorded themselves and posted the video 'on to the group'. WhatsApp was accessible because it ran on the phones students already carried, cost little in terms of data, functioned on a weak signal and required no additional training. Across South African education, it has become the tool teachers use when students cannot be reached through formal platforms – and students themselves have often preferred it for the same reasons (Mpungose, 2020; Rambe et al., 2020). The college called the whole arrangement 'paper-based remote learning'. With campuses limited by social distancing, students were split into groups that alternated between attending in person and staying home and those at home were given their activities on paper. The arrangement preserved teaching under pressure but relied principally on paper because many students lacked devices.

The hardware itself could not always be trusted. The oldest lab computers were more than 10 years old, their operating systems unable to run current teaching software. Meanwhile, the bandwidth that had served ordinary operations buckled as teaching moved online, being slower in class and slower still in examinations. Furthermore, the remotest campuses relied on microwave links that municipal power failures and the theft of tower batteries could drop without warning. A lecturer working under those conditions kept paper within reach.

What the college had not built was something to carry the tool from strategy into teaching. Its information technology function called itself 'a support structure, a technical advisory structure'; the work of turning provision into practice thus fell to a curriculum manager who 'has always been there'. Because the institution had never created the specialised post that other colleges had – and was 'still pondering' doing so – its curriculum unit was, by its own account, 'at an early stage'. This left the unit caught on a plain difficulty: with the students themselves without devices, it was not yet clear what the lecturers' devices were for.

KZN TVET D

KZN TVET D sat within a manufacturing region built on steel, chemicals and textiles, where its long-standing ties to those industries had kept it abreast of technical practice. Consequently, the other colleges of the province named it, unprompted, the sector's leader in digital integration. Its lead was associated with a working division of labour between the people who knew teaching and those who knew technology.

Rather than buy a learning platform ready-made, KZN TVET D built its own and kept control of the development. The two functions in the college divided the work cleanly: the information technology department led on the technical side, as the deputy principal (DP0004) put it, 'because they are experts on the technical side', while the curriculum function 'indicated this is what we want and this is how far we [want] to go'. The curriculum specialist described the same division from her side, with her department deciding 'what it must be able to do, not how it must be done' (CS0004). Caught by the pandemic without a system, the college first improvised one. It then spent close to a year building a full platform from scratch, directing the hired developer to build around what its own lecturers asked for, rather than taking a product off the shelf. As each part came together, the lecturers who would use it 'were called in to engage with the service provider' and would say, 'We are happy with this, but do away with this', since, in the deputy principal's words, 'the clients are the lecturers and students'. The same instinct put frontline staff – not 'management sitting and discussing' – in the room when a campus reported trouble. Control of the platform stayed inside the college and the tool was made to fit its users before they were asked to use it.

The reliability beneath the platform was the firmest in the study because the college had begun long before the pandemic forced the issue. Until 2018, it had no information technology department of its own, only technicians posted to campuses and reporting to another division. In that year, it established a stand-alone department and set about standardising a stock of machines that had been 'very old and sometimes … miscellaneous equipment' with 'no form of standardisation' and a different make in each room. It then outsourced its data centre to end a chronic downtime that had once stretched a two-week registration 'into a month and a half' (IT0004). By the time online teaching was needed, that groundwork was already years old and, by the study's end, the college's campuses carried the fastest connection of the three.

Despite this infrastructure, access remained weak. Among lecturers, the deputy principal said, the technology 'has really been a positive addition', letting them 'network with each other' and 'share best practices'; but 'on the student population we haven't really touched the net', since 'most students don't have devices and we are still stuck with the Wi-Fi connectivity at some campuses'. In one class, a lecturer 'trained the students on how to access [the] LMS for this lesson' and 'only maybe five out of a class of, say, 33 were able to log on', so the lecturer 'had to revert [back] to their face to face again'. The tool worked on the lecturer's side, who had the device and the connection, but failed on the student's, whose laptop the

national scheme had not sent, whose campus signal was weak and whose platform had lost its lockdown zero-rating so that reaching it now cost data.

The college had also drawn up its own blended-learning policy, which plainly stated that lecturers were to keep their material on the platform. However, lecturers were 'focusing more on face-to-face teaching', the college had 'not really started implementing online assessments' and those who had gone furthest under pressure now drifted back to the physical way of doing things. The return to the classroom was not simply a loss. It restored the human contact that practical training depends on – and for much vocational work there is no substitute for it. What it cost was less visible: every lesson taught in the room rather than through the platform left no record behind, which meant the store of data that steady online use would have built, went unmade. The platform could carry quizzes and automated homework, but nothing required their use and what was optional slid toward the safer channel of the classroom. The curriculum specialist put the gap between policy and practice in a phrase: the work was 'in policy, they are supposed to be doing it' and yet 'you can't force a lecturer', so the mandate was 'just not … biting'. Part of the reason was that the necessary authority was not yet in place: the heads of department had only lately been made permanent and the senior lecturers who would hold subjects to the policy had not yet been appointed.

Uptake appeared to divide along lines of vocational identity. The more a lecturer was 'business-related', the deputy principal found, 'the more receptive and positive' they were, while those who were 'more … engineering-inclined tended to be more resistant'. Business lecturers, whose trades already involved working at a computer, took the tool up readily while Engineering lecturers, whose skill lay in the hand and the machine rather than the screen, held back; when pressed, they gave a reason that went beyond simple reluctance. While a theory lesson went onto the platform easily, with pictures and links dropped in, engineering figures and mathematics did not. Furthermore, a subject like technical drawing could hardly be transferred to a screen at all. Besides, not all of these lecturers were computer literate to begin with. Ultimately, they were refusing a tool that, for the work they did, fitted worse and offered less – which is why the college had begun hunting for other software rather than pressing harder.

A further constraint was the college's weak connection to current industry practice, as a result of which its vocational curriculum had fallen behind the trade it served: the training vehicle in the workshop still ran on 'plugs, points [and] condenser', while 'we … are [now] sitting at electronic cars' and 'the industry [is] not giving us cars for us to train the [students on]'. Thus a college blamed for not 'linking up with industry' could reasonably ask whether 'industry [is] giving us the tools that we can show the students' (CS0004). Furthermore, the syllabi lagged behind the technologies that the sector used; a qualification had been 'gazetted, withdrawn and re-gazetted' because 'the department hadn't consulted with industry sufficiently'; and the lecturers meant to teach current practice were themselves seldom placed in it. Digital technology could give students access to current practices that the college's workshops could not reproduce, but this required stronger alignment among industry, the

curriculum and lecturers' workplace exposure. For KZN TVET D, the question had therefore moved beyond whether digital technology could be adopted to whether its educational use was sufficiently connected to contemporary vocational practice.

The lecturers, the information technology manager said, 'have been capacitated with the tools of [the] trade, the ICT tools … the laptops, the routers and the data – they have all of that' and still 'you will find that [they] do the manual processes again', keeping an attendance register by hand where the system would take it live, so 'it defeats the purpose of them having the ICT'. The college had the equipment, platform and institutional alignment but no curricular mechanism made their use obligatory.

Synthesis: The conditions of digital integration

Across the three colleges, a technology became part of ordinary teaching only where three conditions held together: technical reliability, institutional ownership and curricular compulsion. Technical reliability is more than the presence of infrastructure: the network, machines and support staff must work dependably before teaching can rely on them. Without a network that stays up, nothing built on it can run. Institutional ownership requires an office with the authority and resources to carry the tool from strategy into teaching. A technology can run perfectly and still go nowhere when no one is responsible for moving it. Curricular compulsion works less directly than the phrase suggests, because a curriculum compels nothing on its own. A tool becomes non-optional through the machinery that enforces the curriculum, such as an assessment that must run through the platform or an accreditation that turns on its use. Without that machinery, use remains a matter of each lecturer's discretion and tends to drift towards the easier channel.

KZN TVET D makes the study's central distinction clear. It had drawn up its own blended-learning policy, which required lecturers to keep their material on the platform, yet its curriculum specialist still described the policy as not biting because nothing removed a lecturer's discretion to ignore it. The condition was present formally but did not govern classroom practice. Institutional theory describes this gap as decoupling. The distinction matters because adoption on paper does not establish integration unless a condition is sufficiently embedded to shape routine practice.

The three colleges formed different configurations of these conditions rather than three points on a path. KZN TVET B had the reliable base, an infrastructure the province's remoter colleges could not assume, and a provision of laptops, routers and data that reached every lecturer, but no office owned the passage into teaching and nothing in the curriculum required the tool; it had secured one of the three and not yet the other two. KZN TVET F was its mirror – a college that had built institutional ownership on ground that would not yet bear it, a governance redesign returning authority to the campuses and a post created to drive e-learning, a network that ran intermittently across great distances and a curriculum that compelled nothing; it had secured a different one of the three but not the other two. KZN

TVET D had both the reliable base and the institutional ownership, the firmest infrastructure in the study and a built division of labour between those who knew teaching and those who knew technology. Only compulsion was missing – a curriculum that required the platform its policy merely recommended. What each college lacked was not the whole of a condition but its securing and the condition or conditions it had not yet secured which differed from one college to the next.

The three configurations might be read as stages in a sequence, with a college first establishing a reliable technical base, then creating an office to take responsibility for integration and finally requiring digital use through curriculum and assessment. However, the evidence does not support that interpretation. KZN TVET B began with technical reliability and KZN TVET F with institutional ownership; in neither case did the starting condition produce the other. At KZN TVET D, the combination of reliable infrastructure and clear institutional ownership made the absence of curricular compulsion more visible and more actionable, but the cross-sectional design cannot show that these two conditions will produce the third. The cases therefore support a configurational account in which colleges can enter the process from different points and the practical priority is determined by the condition that remains insecure.

Student access lies partly outside these institutional conditions and remained the strongest limit on realised integration. Students' access to devices and connectivity reflected household income and national provision as well as college arrangements. KZN TVET D had secured more of the internal conditions than the other cases yet reported that it had 'not touched the net' among students. The platform could be actualised on the lecturer side, where devices and connectivity were available, while remaining inaccessible to students whose laptops had not been delivered and whose access required paid data after zero-rating ended.

Taken together, the cases support a diagnostic rather than a stage model. They show where each college stood at the time of the study; determining how these configurations change requires longitudinal evidence across a larger number of colleges.

Conclusion

The comparison shows that digital integration cannot be inferred from the presence of infrastructure, a formal policy or an adopted platform. In each case, one institutional condition remained insecure. KZN TVET B had reliable infrastructure but no unit responsible for converting provision into teaching practice. KZN TVET F had begun to establish institutional ownership but lacked dependable infrastructure. KZN TVET D had secured both conditions, but curricular and assessment arrangements still left use largely to lecturer discretion. The cases therefore support diagnosis rather than a general measure of digital readiness: action should be directed towards the condition that constrains use in the particular college.

This diagnosis extends research on the digital divide by specifying the institutional work through which access becomes routine teaching: maintaining reliable systems, assigning responsibility and authority for integration and embedding digital use in curriculum and assessment. The cross-sectional cases do not establish a universal sequence or show that securing two conditions causes the third. Testing that relationship requires longitudinal research across a wider range of colleges. The study instead offers a framework for identifying where formal adoption remains decoupled from practice.

Student access places a further limit on this institutional account. Unequal access to devices, connectivity and data reflects household income and national provision and cannot be treated simply as a failure of college implementation. Colleges can mitigate these constraints but cannot remove their structural causes. Digital integration in TVET therefore requires action at two levels: college measures that secure technical reliability, institutional ownership and curricular use; and public provision that enables students to participate. The distinction clarifies responsibility while recognising the practical interdependence of the two levels.

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Exploring inclusivity of online formative assessments in vocational training centres

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ABSTRACT

Vocational training centres (VTCs) in Zimbabwe have embraced blended learning approaches beyond the COVID-19 pandemic. Consequently, formative assessments have been conducted on different e-learning platforms to gauge the students' preparedness for final examinations and the effectiveness of the online teaching methods being applied by lecturers. Previous research has focused on identifying the e-learning platforms adopted by most universities during the pandemic and on the online learning experiences of students. However, the effectiveness of formative assessment in achieving equity among diverse students has been overlooked. The present research is informed by inclusive pedagogy to assess the inclusivity of formative assessments conducted on different e-learning platforms in the context of gender and rurality. Data was collected from students using semi-structured interviews and focus-group discussions. The results revealed that VTCs in Zimbabwe were not prepared for exclusively online formative assessments. Therefore, the advantages of online formative assessments identified in other studies seem to diminish in value, while disadvantages become more prominent. The dominant aspects that hinder online formative assessment were technical issues, lecturers' lack of technical skills, and the format of formative assessments being incompatible with online learning. Based on these findings, research implications for universities and researchers are discussed.

Keywords: Online formative assessments, vocational training centre (VTC), inclusive pedagogy, online learning

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Introduction

Globally, the emergence of the COVID-19 pandemic in 2020 resulted in disruptions in the education system (Mahlangu & Makwasha, 2023). Owing to restrictions imposed by the World Health Organization in an effort to reduce the wide spread of the virus, face-to-face classes in education institutions were brought to a halt. Moreover, typical face-to-face assessments were suspended by many higher and tertiary institutions (HTIs) from the first quarter of 2020 due to the pandemic (Shariffuddin et al., 2022). Many HTIs therefore resorted to online assessment in order to evaluate students' performance. Since then, tertiary institutions in Zimbabwe have adopted the use of online platforms to assess the performance of their students as well as their readiness for examinations (Chitanana, 2024). Several online assessment platforms have appeared and these include Quizlet, Socrative, iSpring Suite, Google Forms, Microsoft Forms and Qorrect for online assessments (Kaputa, 2021; Mahlangu & Makwasha, 2023). Amakali et al. (2026) reveal that Moodle is the dominant platform for online assessments in Namibia. The present study, however, identifies online formative-assessment platforms that are used by vocational training centres (VTCs) in Zimbabwe. This is crucial in understanding the existing platforms that are used for online formative assessments.

Previous research focused on academic dishonesty in online assessments (Shariffuddin et al., 2022), lecturers' perceptions of online assessments in Lebanon (Mirza, 2021) and factors that influence the adoption of online formative assessments in Africa (Pete & Soko, 2020). In the Zimbabwean context, research has focused on how information technology bridges the distance barrier, on the integrity of online assessments and on challenges faced in the adoption of online assessments (Kaputa, 2021; Kurehwatira & Hlongwane, 2024; Muchemwa, 2023; Mutseekwa & Mudavanhu, 2021). However, the adoption of online formative assessments among tourism and hospitality students has been overlooked (Mawuye & Mushoriwa, 2023; Nyika & Modise, 2023). Our research focuses on the inclusivity of online formative assessments that have been adopted by VTCs and which offer tourism and hospitality management programmes in Manicaland Province, Zimbabwe. To ascertain their performance in final examinations, it is imperative to appreciate how students from diverse backgrounds have embraced online formative assessments.

To do this, this article employs a qualitative approach to exploring the inclusivity of online formative assessments that have been adopted in Zimbabwe. Prior research has focused on secondary research to draw conclusions (Dzingirayi & Musemburi, 2021; Sudakova et al., 2022). A qualitative dimension thus helps to appreciate inclusivity of online formative assessments in the context of gender and spatial dimensions.

The article explores the following key areas:

1. The platforms used for online formative assessments; and
2. The inclusivity of platforms used for online formative assessments.

The following research questions were identified in the study:

1. What are the platforms widely used for online formative assessments in VTCs?
2. How do spatial differences influence inclusivity of online formative assessments among students enrolled with VTCs?
3. In what ways does gender influence inclusivity of online formative assessments among students enrolled with VTCs?
4. What are the experiences of tourism and hospitality management students who utilise online platforms for formative assessments?

Literature review

Baleni (2015) defines online formative assessment as the use of information and communication technologies (ICT) to support the learning process and evaluate learning outcomes. It is a systematic process that allows lecturers to continuously gather evidence of students' learning using relevant technologies (Simon, 2019). In this study, online formative assessment refers to a series of carefully planned instructional activities that utilise digital technologies to monitor students' learning progress and subsequently enhance their understanding and skills. Discussions regarding students' performance, as well as subsequent feedback, are facilitated through web-based ICT. Furthermore, assessments are done while lecturers and students are separated by time and space, enabling rapid, specific feedback to be given to large cohorts of students on their performance (Sudakova et al., 2022).

The integration of online formative assessments in educational institutions has become a global trend, driven by advancements in technology and the need for flexible, inclusive learning environments (Pete & Soko, 2020). Ibnatul et al. (2022) identify Socrative, Google Forms and Geddit as the online platforms that are commonly used to facilitate formative assessments. The creation of open-source learning management systems such as Moodle have enabled higher and tertiary education institutions to offer online tutorials (Kaputa, 2021). The online platforms facilitate both formal and informal formative assessments (Nagandla et al., 2018). The formal formative assessments contribute to the final examinations and include written tests, exercises, assignments and quizzes. The informal formative assessments facilitate comprehension, creativity and understanding and examples include oral presentations, discussion forums, group tasks, drama and puzzles (Asamoah et al., 2022).

In Zimbabwe, polytechnics and VTCs have increasingly adopted online formative assessments to enhance teaching and learning processes (Mahlangu & Makwasha, 2023; Nyika & Modise, 2023). However, the inclusivity of these assessments remains a critical concern, particularly in a context marked by socio-economic disparities, limited digital infrastructure and varying levels of digital literacy. The present study examines the inclusivity of online formative assessments in Zimbabwean VTCs, with a particular focus on rurality and gender dimensions.

Inclusivity in education refers to the removal of barriers that prevent students from fully participating in educational activities, regardless of their socio-economic status, geographic location, or physical and cognitive abilities (UNESCO, 2020). In the context of online formative assessments, inclusivity involves designing assessments that are accessible, equitable and responsive to the diverse needs of students (Boiral et al., 2021). Consequently, formative assessments must be adapted to online environments in ways that do not disadvantage specific groups of students. Amakali et al. (2026) advocate for assessment frameworks that are inherently accessible rather than requiring post-hoc accommodations. Additionally, Bearman et al.'s (2023) digital accessibility framework provides crucial insights into how online environments can either perpetuate or eliminate educational barriers, establishing that true inclusivity requires proactive design considerations.

Adoption of online formative assessments in Zimbabwe

The acceleration of online formative-assessment adoption in Zimbabwe reflects both global digitalisation trends and local contextual imperatives. Chitanana (2024) reveals that the COVID-19 pandemic exposed fundamental disparities in digital readiness across Zimbabwean educational institutions. This aligns with regional research by Awajan (2023), who identified similar patterns across sub-Saharan Africa, where emergency remote teaching highlighted pre-existing infrastructural deficits.

Chitanana (2024) provides crucial, context-specific insights, demonstrating that, while VTCs recognised the scalability potential of online assessments, implementation faced significant obstacles that included unreliable electricity supply, limited bandwidth and inadequate device accessibility. Ngema (2024) observes that post-pandemic adoption patterns reveal persistent institutional capacity challenges that continue to impact on assessment inclusivity. The transition from emergency remote teaching to sustained online assessment practices has proven more complex than initially anticipated, with many institutions struggling to maintain the digital infrastructure necessary for consistent assessment delivery.

Benefits of online formative assessments

Contemporary literature demonstrates significant benefits of inclusive online formative assessments, particularly in addressing barriers faced by non-traditional students. Temporal and spatial flexibility emerges as a primary advantage, enabling participation among students who often balance employment and caregiving responsibilities (Baleni, 2015; Zigama, 2025). Joseph (2023) indicates that asynchronous assessment options increase completion rates among working students by up to 35%, highlighting how flexible scheduling can accommodate diverse life circumstances that traditionally exclude students from formal assessment processes.

Personalised learning pathways facilitated by digital platforms represent another significant inclusivity benefit, allowing for individualised feedback mechanisms that address diverse learning needs (Livingston-Galloway & Robinson-Neal, 2021). Advanced analytics platforms, as explored by Chen et al. (2026), enable real-time adaptation of assessment difficulty and format based on individual performance patterns. This creates a responsive learning environment that can accommodate different learning paces and styles. This personalisation extends beyond simple difficulty adjustment to include varied presentation formats and response mechanisms that can better serve students with different preferences and abilities (Shafraeli et al., 2026).

Furthermore, multimodal assessment capabilities accommodate varied learning preferences and accessibility requirements through multimedia integration (Gikandi & Morrow, 2016). Recent developments reported by Shafraeli et al. (2026) show that incorporating audio, visual and interactive elements can reduce assessment anxiety while improving comprehension across diverse student populations. This multimodal approach is particularly valuable in vocational education contexts, where practical-skills assessment can benefit from video demonstrations, interactive simulations and other media-rich formats that better reflect real-world application scenarios.

Theoretical framework

Crawford (2020) defines a theoretical framework as the underlying structure that scaffolds a study. The theoretical framework serves as both the foundation upon which research is constructed and the guideline that researchers follow to make their contribution. The present study is based on the assertion that online formative assessments use Internet and computer technologies to facilitate interaction between students and lecturers (Banji et al., 2021). It seeks to understand students' experiences of participating in online formative assessments, with a view to promoting inclusivity. Amakali et al. (2026) indicate that inclusivity is a principle that supports and welcomes diversity among all students.

This study adopts an inclusive pedagogical approach in order to examine the outcomes of formative assessments administered via online platforms. Inclusive pedagogy acknowledges the individual differences among students and enables active participation. Alordiah (2025) notes that inclusive pedagogy aims to eliminate social exclusion based on race, gender, ethnicity and social class. In this context, Joseph (2023) presents narratives of formative assessments involving students with disabilities in vocational education. This study also considers barriers arising from gender and spatial differences among students enrolled in VTCs in Zimbabwe, with the aim of ensuring that all students attain high grades. Thus, inclusive pedagogy is grounded in equity, where student diversity is valued and lecturers seek to create rich learning opportunities that are available to all students to stimulate their participation in the classroom community.

Methodology

This study employed a qualitative research design in order to investigate the inclusivity of online formative assessments adopted by VTCs in Manicaland Province, Zimbabwe. A qualitative approach is appropriate for exploratory and interpretive inquiries into human behaviour and social contexts (Nimehchisalem & Mat Hussin, 2018). This is ideal given the nature of the research question, which seeks to understand the inclusivity of online formative assessments from the perspectives of students and lecturers. According to Cresswell (2013), qualitative research is well suited for exploring complex phenomena in educational contexts where numerical data may not capture the depth of participants' lived realities.

The study was anchored in the interpretivist paradigm, which posits that reality is socially constructed and best understood through the subjective experiences of individuals. Interpretivism emphasises understanding how people make sense of their world within specific cultural and social contexts (Calás et al., 2013). This paradigm was appropriate for the study, as it focuses on gaining in-depth insights into how students from different backgrounds experience and perceive online formative assessments. By adopting an interpretivist stance, the researchers were able to engage with participants empathetically, aiming to co-construct knowledge and interpret the meanings they attached to their assessment experiences (Taherdoost, 2017).

The qualitative design enabled the researchers to examine how gender and spatial differences influence access to, and experiences with, online formative assessments. It also allowed for the collection of rich, narrative data through open-ended interactions with participants, thereby providing a comprehensive picture of inclusivity challenges and opportunities in the transition to online formative-assessment platforms.

The study targeted students and lecturers from selected VTCs in Manicaland Province, Zimbabwe. The institutions were chosen owing to their increasing reliance on online platforms for formative assessments, particularly in response to the COVID-19-induced shift to digital education methods. The institutions were also selected primarily because they offer tourism and hospitality courses accredited by the Higher Education Examinations Council (HEXCO). Such institutions included Mutare Polytechnic, Magamba VTC, Marange VTC, Manica Skyview School of Hospitality and Tourism (MSSHT) and Simukai VTC. The focus on tourism and hospitality students reflects the recent surge in enrolment experienced by institutions, buoyed by the country's tourism growth trajectory. A purposive sampling strategy was intentionally adopted to select participants with direct experience of online formative assessments. According to Patton (2015), purposive sampling is effective for identifying information-rich cases in qualitative research. The sampling was also stratified to ensure diversity in terms of gender (male and female students) and spatial background (urban and rural students). A total of 40 participants were drawn from the identified institutions, comprising 36 students

(eight males and 28 females) and four lecturers involved in course delivery and assessment. This sample size was sufficient to reach data saturation, where no new themes emerged during data analysis. The sampling approach ensured representation across different demographic and institutional characteristics while maintaining a focus on participants with relevant experience in online formative-assessment contexts.

Semi-structured interviews and focus-group discussions (FGDs) were used to collect data from the lecturers and students, respectively. The interviews allowed for consistency in questions while permitting flexibility to probe further into emerging topics. The interviews explored lecturers' perspectives on institutional readiness for online assessments, on challenges in ensuring inclusive access and on pedagogical adaptations for diverse students from spatial and gender dimensions. Each interview lasted approximately 45 to 60 minutes and was audio recorded with participants' consent. The interviews were conducted in English at the participants' host institutions and during the time convenient to them.

Three FGDs were conducted with student participants, providing a platform for dynamic discussions and collective reflection on the inclusivity of online formative assessments. The discussions were undertaken virtually in order to include individuals from diverse locations. The topics covered included access to devices and Internet connectivity, digital literacy and technical support, and perceptions of fairness, flexibility and anxiety during online formative assessment. The FGDs helped to capture a wide range of experiences and fostered participant interaction that enriched the data. Each discussion lasted approximately 90 minutes and was moderated by the researcher using a pre-tested discussion guide.

Data from interviews and FGDs were transcribed verbatim and analysed using thematic analysis, following Braun and Clarke's (2006) six-phase approach: familiarisation with the data through repeated reading; generation of initial codes; searching for themes among codes; reviewing themes for internal coherence; defining and naming themes; and producing the final report. The researchers listened and relistened to the recorded audios to familiarise themselves with the data and points that emerged from both the interviews and FGD sessions. These were then captured on computer. Thereafter, similar points were grouped together to facilitate interpretation and analysis. The analysis was both inductive (data-driven) and deductive (guided by research questions), allowing for flexibility as well as responsiveness to emerging issues. Coding was done manually and patterns were cross-validated through peer debriefing to enhance analytical rigour. Key themes included accessibility, equity, digital readiness and gendered experiences.

To ensure the trustworthiness of the findings, the study applied Lincoln and Guba's (1985) framework. Credibility was ensured through prolonged engagement with participants, triangulation of data sources (interviews and FGDs) and member-checking where participants reviewed summaries of findings for accuracy. Transferability was enhanced by providing rich, contextualised descriptions of the study setting, participants and assessment platforms used. Dependability was achieved by documenting all stages of the research

process in detail, thereby allowing for an external audit if necessary. Confirmability was maintained through reflexive journaling by the researchers to bracket biases and by maintaining an audit trail of decisions made during data collection and analysis.

Ethical clearance was obtained through appropriate institutional channels and several ethical principles were observed throughout the research process. All participants were provided with detailed information sheets and signed consent forms prior to participation, thereby ensuring informed consent. Data were anonymised and pseudonyms were used in reporting to protect participant identity, thus maintaining confidentiality throughout the study. Participants were informed that their involvement was voluntary and that they could withdraw at any point without penalty. All digital recordings and transcripts were securely stored in password-protected files accessible only to the researchers, ensuring appropriate data protection in compliance with relevant guidelines.

Results and discussion

Case setting

The study focused on exploring the inclusivity of online formative assessments among VTCs that offer tourism and hospitality management programmes in Manicaland Province, Zimbabwe. Manicaland Province, which is located on the eastern border with Mozambique, comprises seven administrative districts, namely Buhera, Chipinge, Chimanimani, Makoni, Mutare, Mutasa and Nyanga (Makonya & Makandwa, 2025). Notable VTCs that offer tourism and hospitality management courses are Mutare Polytechnic, Magamba VTC, Manica Skyview School of Hospitality and Tourism (MSSHT), Marange VTC and Simukai VTC. The institutions offer HEXCO-accredited courses that range from a professional-competence certificate to a national foundation certificate, a national certificate, a national diploma and a higher national diploma. Only Mutare Polytechnic offers higher national diploma programmes. Students can enrol for an array of courses that include tourism and hospitality management, professional cookery, food and beverage services, travel and leisure management, and bakery studies.

The HEXCO courses include both formative and summative assessments. However, this study focused on formative assessments only. The former contribute 60% towards the final mark and are structured as follows: 20% theory assignments, 20% practical assignments and 20% tests. Continuous assessment is done for each and every module from national foundation certificate to higher national diploma. The researchers observed that students maintain a physical file and that two assignments are submitted for each subset of the continuous assessment. The present study focused on both curriculum-embedded and informal formative assessments.

Online platforms adopted by VTCs in Manicaland

The research findings reveal that online platforms adopted to support formative assessments were Google Forms, Google Meet, Zoom, WhatsApp, email, Google Classroom and Moodle. Students indicated that they used WhatsApp because it was relatively cheap when compared with other online platforms. One student further added that WhatsApp 'enables them to discuss anytime'. These findings align with Ngema's (2024) assertion that flexibility promotes inclusivity and equity in vocational education through the elimination of the need for physical presence. One female participant explained that online formative assessments (OFAs) allow her to do household chores first and then complete the assessments. The OFAs enable female participants to demonstrate their knowledge and skills in their own time and in ways that best suit their circumstances. Muwaniki and Matara (2025) also indicate that social media enhances vocational education by fostering greater accessibility, engagement and independent learning.

All the lecturers concurred that the WhatsApp platform facilitates informal formative assessments that help them to gauge student understanding and comprehension. The researchers further noted that Moodle and Google Classroom were the least-adopted online platforms. Although two lecturers confirmed that their institutions had facilitated training in the use of Moodle, they assumed that it was complicated. This reinforces Pedrotti and Nistor's (2016) assertion that technology adoption is affected by how users perceive its usefulness. The researchers also noted that students were reluctant to adopt Moodle and Google Classroom, This further supports Singh et al.'s (2023) conclusion that lecturers should be at the forefront of technological adoption. This should be supported by well-structured assessments that are easy to navigate and clearly articulated (Shafraeli et al., 2026).

The findings reveal that access to online formative-assessment platforms among students in VTCs in Manicaland Province is uneven. While urban-based students reported relatively easy access to Internet-enabled devices and stable Internet connectivity, their rural counterparts faced significant challenges. Limited access to reliable electricity, high mobile-data costs and lack of technological devices hindered students from participating fully in online formative assessments. Consequently, spatial disparities emerged as a critical barrier to inclusivity. Despite this, male students based in Marange and Nyanyadzi acknowledged that improvements such as the use of solar energy in rural homes, the electrification of local schools, and the establishment of village information centres had positively facilitated their online participation. However, one lecturer highlighted that, despite these infrastructural improvements, 'participation of rural students in online assessments remains limited, particularly for the female students who are expected to perform household chores during the weekends'. Evidence from the study supports Kaputa and Ndabambi's (2018) conclusion that cultural background influences students' use of ICTs.

Rural students reported losing connection during critical assessment periods when using Moodle and Google Classroom. This was attributed to low bandwidth that characterises

rural communities. The low participation of rural students on Moodle, for example, may be attributed to Muwaniki and Matara's (2025) conclusion that the cost of data is beyond the reach of many individuals in rural communities. From this perspective, the online formative assessment process becomes discriminatory. Moreover, the digital divide was exacerbated by socio-economic inequalities. One participant from a rural community indicated that he uses a mobile phone that does not support Internet access. Students from low-income families were less likely to own personal computers or smartphones, relying instead on shared community resources such as Internet cafés (UNESCO, 2020).

Online formative assessments adopted by VTCs

The research findings revealed that online formative assessments adopted by VTCs include tests, quizzes, assignments, discussions and checklists. Both students and lecturers revealed that practical assignments, such as food preparation, were done physically. This can be attributed to the lack of requisite infrastructure for most students to conduct such practical assignments from their homes. Furthermore, one lecturer aptly stated: '[T]he infrastructure at the school presently cannot accommodate online supervision of practicals conducted from multiple locations.' Another lecturer also noted that 'the coordination of the purchasing of ingredients needs to be centralised to ensure fairness'. Thus, participants indicated that curriculum-embedded online formative assessments were limited to theory assignments and tests across all case institutions. The researchers observed that different online platforms were used for different classes at the same institution and across institutions.

The dominant online formative assessments were theory assignments and tests and all students acknowledged participation in these assessments. One student explained that theory assignments are shared via email and are required to be submitted within a prescribed period. Another student indicated that they receive and submit theory assignments using Google Classroom. One participant indicated that they use Google Classroom to write in-class tests. Two lecturers revealed that they make use of Google Forms to conduct tests and exercises. Participants noted that the online submission of theory assignments and tests enables them to maintain an online record that they can refer to at any time.

The study findings reveal that participants undertake both planned and spontaneous online formative assessments. In this case, students from all institutions confirmed participation in online discussions, quizzes and oral tests. One student indicated that they undertake an oral examination on a weekly basis via Google Meet. Lecturers indicated that online discussions are used to gather information regarding students' progress. Although these do not contribute towards the final mark, online discussions provide feedback on students' performance. This provides guidelines for improving students' understanding and skills. Online assessments also help to develop students' creativity and stimulate classroom participation regardless of spatial detachment (Asamoah et al., 2022).

The researchers noted that participants at three VTCs are involved in informal online formative assessments, which are largely spontaneous and unexpected. These informal assessments, which include oral tests, narratives and group tasks, are characterised by a recap of the day's activities. They are conducted using WhatsApp, with participants sending both texts and audio notes. One student explained that WhatsApp enables her to keep track of the discussions, which improves her ability to comprehend a particular topic. One lecturer indicated that he uses Google Classroom to share quizzes.

Inclusivity of online formative assessments adopted

Gender dynamics played a significant role in shaping the inclusivity of online formative assessments. Female students reported more challenges in engaging with online platforms compared with their male counterparts. This supports Mahlangu and Makwasha's (2023) assertion that cultural expectations and domestic responsibilities disproportionately limit the time female students allocate to online learning. Female students reported lower engagement rates in online assessments, attributed primarily to competing domestic obligations, including childcare responsibilities, household management duties and cultural expectations regarding women's roles within family structures. These findings illuminate how traditional gender roles translate into digital educational spaces, creating new forms of gendered educational inequality.

Furthermore, issues of online harassment and a lack of gender-sensitive support systems also emerged as deterrents to female participation. One female stated: '[T]he language used in WhatsApp groups is intimidating, especially when we are discussing such modules as hospitality law and economics.' However, in institutions that provided structured support, such as digital literacy workshops and online counselling services, female students demonstrated performance levels comparable to those of male students. This aligns with prior studies advocating for institutional interventions to mitigate gender disparities in online education (Mahlangu & Makwasha, 2023). The research also documented successful institutional interventions that effectively mitigated gender disparities. Educational institutions that implemented comprehensive support systems, including dedicated digital literacy programmes for women, flexible assessment scheduling and robust online safety protocols, achieved near-parity in male and female participation rates.

These interventions proved particularly effective when combined with mentorship programmes that paired female students with successful alumni and when technical support was provided through culturally sensitive channels. The data suggest that gender disparities in online formative assessment are not inevitable consequences of technological adoption but rather addressable challenges that require intentional institutional commitment and resource allocation. The research findings support earlier observations that gender differences influence technology acceptance (Alblooshi et al., 2019; Attuquayefio & Addo, 2014) and, consequently, the adoption of online formative assessments.

The study findings revealed that 20 students were drawn from Manicaland's rural districts and four students were from rural communities outside Manicaland. One lecturer explained that differences in areas of origin result in language differences among students, particularly 'in Manicaland where we have the Ndau, Manyika and Barwe dialects.'. These language dialects are noticeable during informal online assessments, as they are characterised by wide use of indigenous languages. 'My peers associate my tone with backwardness and I rarely talk during online conversations that are held on Google Meet,' explained one student. Another student added that she prefers sending her feedback using WhatsApp texts so that other students do not hear her tone. This indicates that social background negatively affects students' participation during informal online formative assessments. However, as clarified by another student, this is the case 'when the online conversations are not moderated by a lecturer'. From this perspective, the researchers noted that the effect of the students' areas of origin on the adoption of online formative assessments is amplified by habits perpetuated during informal online conversations. Olayemi et al. (2021) explain that training and workshops help to ease individual differences that may hinder online learning.

Students' perceptions of the effectiveness of online formative assessments varied considerably. Many students appreciated the flexibility and immediate feedback provided by platforms such as Google Forms and Google Classroom. However, concerns were raised about the authenticity and fairness of assessments. Cases of academic dishonesty, such as impersonation and collusion, were reported, challenging the reliability of online evaluations. The study findings revealed that academic dishonesty was rampant in curriculum-embedded assessments regardless of gender. For instance, one female student indicated that her sister completes quizzes and tests that are conducted on Google Classroom, as she herself needs to score high marks. The situation transcends both gender and spatial differences as students aim to obtain high marks. This echoes Muchemwa's (2023) call to implement measures that safeguard the integrity of curriculum-embedded online formative assessments.

Conclusions and recommendations

The adoption of online formative assessments in VTCs is dependent on lecturers' skills and willingness to embrace technology. Infrastructural improvements in rural communities have helped students to participate in online formative assessments. However, female students remain burdened by household chores, which limit their online participation, especially after school hours. Online platforms such as WhatsApp and Google Classroom help students to complete tasks during their free time. The WhatsApp platform is widely used by students because it is cost-effective and is perceived to be simple and easy to use. Its adoption and use require monitoring in order to overcome language differences inherent among students. The findings collectively suggest that online formative assessment represents both significant opportunity and substantial risk for educational equity. Technological capabilities offer unprecedented opportunities for personalised feedback, flexible engagement and enhanced learning outcomes. These benefits are realised where online formative assessments are inclusive and address individual inequalities.

The research underscores the critical importance of comprehensive institutional support and deliberate attention to equity considerations in the design and implementation of online formative assessment systems. Success requires not merely technological adoption but a fundamental reimagining of how educational institutions support diverse student populations in digitally mediated learning environments. Emerging technological solutions show promise for enhancing assessment inclusivity through more sophisticated and adaptive approaches. Artificial intelligence-driven adaptive assessment platforms, as explored by Rambharose (2025), provide personalised feedback mechanisms and adjust assessment complexity in real time based on individual student responses and performance patterns. These systems have the potential to create more responsive and inclusive assessment experiences that can accommodate diverse learning needs automatically.

Future research directions emphasise the need for context-specific evaluation frameworks that measure inclusivity outcomes rather than merely technological adoption rates. These frameworks must consider the complex interplay between technological capabilities, institutional capacity and individual student needs to provide meaningful assessments of whether online formative assessments are truly achieving their inclusivity potential. Research must move beyond simple adoption metrics to examine whether technology implementation is actually removing barriers to educational participation and improving learning outcomes for traditionally marginalised student populations.

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Challenges in provision of institutional support and inclusive pedagogy: Voices of TVET students with disabilities in the Western Cape

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ABSTRACT

Despite rising enrolment of students with disabilities at technical and vocational education and training (TVET) colleges, many still experience significant challenges there. This article explores the challenges experienced by TVET students with disabilities in the Western Cape. The article adopted a qualitative case study design. The study was conducted at a selected college, with six participants purposively sampled. Data were gathered through semi-structured interviews supported by document analysis. Thematic data analysis revealed ongoing challenges, including non-disclosure owing to stigma, poor communication systems, inadequate infrastructure and limited lecturer training. Drawing on Bronfenbrenner's system theory, the analysis revealed personal, institutional and broader systemic factors affecting students' everyday experiences. The findings emphasise the significance of TVET colleges adopting a holistic and proactive approach to inclusive education, including improving accessibility, providing targeted professional training for lecturers and strengthening advocacy. Ultimately, fostering such inclusive environments contributes to improved educational outcomes and social justice in the TVET sector.

Keywords: TVET college, disability, student with disability, inclusion, inclusive education

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Introduction

South Africa is constitutionally committed to inclusiveness and equal access to education for all students, regardless of their ability, age, religion, race or gender. Education is recognised as a fundamental right by the Constitution of the Republic of South Africa (Republic of South Africa, 1996a). Higher education in South Africa includes not only universities, but also technical and vocational education and training (TVET) colleges, which are mandated to offer occupational and vocational programmes aligned with labour market needs. Despite this mandate, significant challenges persist in ensuring equitable access and success for students with disabilities in the TVET sector (Sako, 2020).

Globally, there has been a steady increase in the enrolment of students with disabilities at higher education institutions, including students with physical, visual and hearing impairments (McKinney & Swartz, 2020; Ntombela, 2019). Ferguson and McKenzie (2019) similarly reported consistent growth in the participation of students with disabilities in post-secondary education worldwide. In the South African context, Sako (2020) reported a notable increase in the enrolment of TVET students with disabilities. According to the Department of Higher Education and Training (DHET, 2023), enrolment figures for students with disabilities increased from 0.32% in 2018 to 0.8% in 2023. During this period, TVET colleges enrolled a total of 556 415 students across all programmes. However, despite this increase, students with disabilities still constitute less than 1% of the total student population, which highlights persistent access barriers and systemic exclusion.

Beyond access, students with disabilities continue to encounter significant challenges once enrolled in higher education institutions, particularly at TVET colleges (Ntombela, 2020). These challenges are demonstrated by lower retention and graduation for this group (Safer et al., 2020). Although Education White Paper 6 (Department of Education, 2001) aims to address these issues by removing systemic barriers and responding to diverse learning needs, its implementation remains inconsistent. The difficulties encountered by students with disabilities are often linked to inconsistent application of inclusive education policies, limited institutional awareness, inadequate staff training and lack of accountability mechanisms for lecturers (Delubom et al., 2020; Ntombela, 2019).

Furthermore, insufficient provision of reasonably accommodating the needs of students with disabilities, lack of assistive technologies and inadequate disability support services continue to hinder meaningful participation and academic success of students with disabilities (Munyaradzi, 2021). These challenges are compounded by structural constraints at TVET colleges, including inaccessible infrastructure, rigid curricula and limited financial and human resources (Ntombela, 2020). As a result, students with disabilities often experience exclusion, marginalisation and reduced opportunities for social and academic integration.

Despite global and national commitment to inclusive education, the challenges faced by TVET students with disabilities remain under-researched and inadequately addressed

(McPherson, 2021). There is limited understanding of the complex challenges affecting their academic progress, social inclusion and overall well-being (Ntombela, 2020). This research gap impedes the development of effective interventions, policy reforms and support mechanisms to create inclusive learning environments. Addressing these challenges is crucial for strengthening equity in the TVET system and enabling students with disabilities to fully realise their educational and societal potential. The present study was guided by the following research questions in order to address this gap and better understand the challenges experienced by TVET students with disabilities.

Research questions

The research questions underpinning this article can be posed as follows:

1. What challenges do TVET students with disabilities in the Western Cape experience regarding institutional support, policy implementation and inclusive pedagogical practices?
2. What institutional factors contribute to challenges in institutional support and inclusive pedagogy for TVET students with disabilities?

Theoretical framework

Bronfenbrenner's (1994) ecological system theory was adopted to explore the multi-layered challenges experienced by students with disabilities in institutions of higher learning.

Bronfenbrenner's ecological system theory is crucial for this article, as it emphasises the relationship between individual development and the broader social context in which TVET students with disabilities are situated. The theory explains that students with disabilities are affected by interconnected systems, including institutional factors, interactions, accessible infrastructure and inclusive education policies (Bronfenbrenner, 1994). Furthermore, this is a multifaceted human development model in which changes in one system influence other systems, shaping growth and development (Smit et al., 2020). For example, inefficiencies in the South African national education system, such as lack of funding, inadequate lecturer training and poor policy implementation, may negatively affect the capacity of institutions of learning to support students with disabilities (McPherson, 2021). According to Sako (2020), students do not exist in isolation as educational structures, lecturers and TVET institutions can significantly affect their academic performance. As a result, this theory serves as a guiding framework to explore how immediate individual and societal factors collectively shape the challenges experienced by students with disabilities in higher education institutions (El Zaatari & Maalouf, 2021).

The article applies the five levels of Bronfenbrenner's ecological system theory to explore the lived experiences of TVET students with disabilities. These five interconnected systems are briefly explained below.

Microsystem

The microsystem includes direct interactions with peers, support staff, lecturers and infrastructure, which directly influence the academic performance and well-being of students with disabilities.

Mesosystem

The mesosystem highlights challenges arising from poor coordination and communication between TVET college departments, support services and external disability organisations.

Ecosystem

This encompasses external factors indirectly affecting students with disabilities in higher education institutions, including societal attitudes, policies, funding, assistive technology and reasonably accommodating students with disabilities.

Macrosystem

The macrosystem encompasses the broad social, cultural and historical influences shaping attitudes to disability.

Chronosystem

The chronosystem refers to changes over time and interactions among systems, examining how historical and developmental shifts influence the challenges encountered by students with disabilities.

By framing this article within ecological system theory, the challenges encountered by TVET students with disabilities are understood as systemic rather than isolated, requiring a holistic approach. This theory serves as a lens for exploring the complex challenges experienced by students with disabilities. El Zaatari and Maalouf (2021) state that the theory enables the researcher to examine how interacting environmental systems shape the experiences of students with disabilities. The five interconnected systems guide the analysis of both immediate and broader contextual factors that influence students' social and academic lives. Importantly, this theory supports an in-depth understanding of students' lived experiences by situating their voices in the broader environmental contexts that shape their realities.

Literature review

Historical and policy context of inclusive education in South Africa

South Africa's education system was characterised by segregation and inequality throughout the apartheid years (Juan et al., 2021). The government institutionalised racial discrimination resulted in a deeply divided education system (Smit et al., 2020). Under the Bantu Education Act of 1953, black students and those with disabilities were offered inferior education intended for a situation of servitude (Ntombela, 2020). Furthermore, special needs education was largely neglected and most children with disabilities had no access to formal education (Sedibe & Fourie, 2018). However, the end of apartheid initiated significant transformation in the education system. Although progress has been made, the system remains shaped by the country's sociopolitical history (Masoga & Maoto, 2021), particularly the transition to democracy (Walton & Engelbrecht, 2022). Ntombela (2020) notes a shift from exclusionary practices to inclusive policies aimed at improving access for all students regardless of their abilities. The democratic government emphasised human rights and equity, dismantling the racially segregated education system (Lawson & Beckett, 2021). South Africa's Constitution underpins all policies, ensuring basic education for everyone (Republic of South Africa, 1996a), while the South African Schools Act mandates all public schools to admit and accommodate students with disabilities without unfair discrimination (Republic of South Africa, 1996b). This was further emphasised by the Education White Paper 6 on special needs education (Department of Education, 2001). By contrast, post-apartheid policies have for the most part focused on redressing historical marginalisation (Walton & Engelbrecht, 2022), though challenges to fully implementing inclusive education still persist (Mahlangu & Mtshali, 2024).

Furthermore, despite these post-apartheid policy frameworks, institutions of learning in South Africa still encounter significant challenges when implementing inclusive education (Lindner et al., 2022). These challenges stem from several issues like poor accessibility, a lack of reasonably accommodating students with disabilities and limited resources (Masoga & Maoto, 2021; Sako, 2020). Owing to certain challenges like those outlined below, TVET colleges continue to marginalise and exclude students with disabilities.

Policy implementation gaps

South Africa has adopted several policies intended to support inclusive education, although their implementation remains ineffective, particularly at TVET colleges, as they are not specifically tailored for this sector (Sako, 2020). The lack of clear and TVET-specific policy guidelines negatively affects the provision of reasonable accommodation of students with disabilities (Ndlovu, 2023). Similarly, Ntombela (2019) reported that inclusive education in TVET colleges is hindered by the lack of a dedicated legislative policy framework. As a result, institutions adopt different and inconsistent implementation approaches due to unclear guidance (McPherson, 2021). These policy and legislative gaps result in significant challenges,

including limited direction regarding inclusive practices and inconsistencies across colleges, which undermine effective implementation (DHET, 2019). Such shortcomings restrict the development and sustainability of inclusive education in the TVET sector (Ntombela, 2020). Addressing these challenges requires the development of comprehensive and context-specific policies and legislative frameworks for inclusive education at TVET colleges.

On the other hand, the Department of Basic Education's Screening, Identification, Assessment and Support (SIAS) policy does provide strategies to promote inclusion, including the establishment of a disability unit to accommodate students with disabilities, assistive technologies and support services (DBE, 2014). Despite this, a DHET survey revealed that most colleges lack disability units, posing significant challenges to effectively addressing the needs of TVET students with disabilities (DHET, 2019).

Physical-accessibility challenges

Physical accessibility is a key aspect of inclusive education, as it allows students with disabilities to access lecture rooms, workshops and other learning spaces alongside their peers (Smit et al., 2020). The United Nations Development Programme (2017) emphasises that inadequate, inaccessible facilities and physical barriers in buildings can impede the effective implementation of inclusive education. TVET colleges also limit students with disabilities from fully participating in educational activities, as well as accessing necessary resources (Sako, 2020). According to Ndlovu (2023), investing in accessible infrastructure is crucial for ensuring that all students can engage fully in learning environments. Infrastructure challenges are widely recognised as a major obstacle to TVET colleges' preparedness for inclusive education (Delubom et al., 2020). As a result, TVET institutions have a responsibility to create environments that are both welcoming and supportive, thereby promoting success for all students, including those with disabilities (McKinney & Swartz, 2020). Despite this responsibility, limited physical accessibility remains a persistent challenge, preventing the full realisation of inclusive education at South African TVET colleges (Munyaradzi, 2021). Addressing these infrastructural challenges is therefore crucial to fostering equitable opportunities for students with disabilities.

Negative attitudes and stereotypes

Among the significant challenges that students with disabilities may encounter at TVET colleges are attitudinal barriers (Mahlangu & Mtshali, 2024). Ntombela (2020) echoes this sentiment by stating that negative attitudes, stereotypes and resistance to change are some of the attitudinal obstacles that may prevent TVET colleges from successfully implementing inclusive education. Sako (2020) supports these views, stating that one of the major difficulties that students with disabilities encounter is negative attitudes. Raising awareness and prompting positive attitudes among students and college employees are strategies that can be used to address attitudinal barriers (Ferguson & McKenzie, 2019; Ndlovu, 2023).

Inadequate support services

All students should be welcomed into educational institutions, programmes and teaching strategies that create a caring environment, one that responds effectively to their diverse needs (McPherson, 2021). Ferguson and McKenzie (2019) argue that the integration of students with disabilities into mainstream educational settings is often hindered by insufficient support services. Furthermore, Sako (2020) emphasises the establishment of disability units as a crucial mechanism for promoting inclusion of all TVET students, regardless of their abilities or disabilities. Ndlovu (2023) explains that disability units play a crucial role in ensuring that students with disabilities can access the necessary resources and support services. The absence of such units in South African TVET colleges limits the participation and success of students with disabilities in vocational education training (Ndlovu, 2019). As a result, without dedicated structures to address disability-related issues, TVET colleges are failing to provide appropriate and effective support for students with disabilities (Mahlangu & Mtshali, 2024).

Insufficient training of TVET lecturers

According to Williams (2021), TVET lecturer training has historically focused on mainstream teaching approaches, often leaving lecturers without the necessary knowledge, skills and confidence to implement inclusive education. Research indicates that many TVET lecturers continue to struggle to accommodate students with disabilities in their classrooms (Mahlangu & Mtshali, 2024; Msimango, 2019). This lack of preparation often contributes to negative attitudes towards inclusive education, as lecturers are not adequately trained in inclusive practices (Delubom et al., 2020). Additionally, the quality of lecturers, including their skills and qualifications, plays a crucial role in students' academic success (Williams, 2021). Lecturers are key implementers of inclusive education in TVET colleges. Therefore, their attitudes and perceptions are critical in fostering inclusive learning environments. Nkumane (2025) emphasises that the successful integration of inclusive education at institutions of learning depends mainly on lecturers' attitudes.

However, TVET students with disabilities often receive limited or no academic support because of lecturers' inability to incorporate inclusive strategies into their teaching (Munyaradzi, 2021). This challenge is linked to the background of many TVET lecturers, who are trained primarily in vocational fields and often lack formal pedagogical training (Ntombela, 2020). Although some achieve teaching qualifications such as a postgraduate certificate in education, inclusive education is often not adequately addressed (Nkumane, 2025). As a result, lecturers remain insufficiently equipped to support TVET students with disabilities (Williams, 2021). This concern was reinforced by Ntombela (2019), who reported that accommodating students with special educational needs was historically lacking in lecturer training programmes.

Societal and cultural determinants of inclusive education

Societal and cultural factors play a crucial role in shaping the implementation of inclusive education in South African TVET colleges (Nkumane, 2025). These factors may either impede or promote the effectiveness of inclusive education policies and practices (Williams, 2021). Munyaradzi (2021) supports this view by stating that societal perceptions of disability strongly influence the educational experiences of students with disabilities. Historically, disability has been mainly understood through a medical model, which views disability as a deficiency requiring treatment or correction (Masoga & Maoto, 2021). This perception often results in the marginalisation of students with disabilities and restricts their access to inclusive learning environments (Smit et al., 2020). McKinney and Amosun (2020) argue that a transition towards the social model of disability is therefore essential, as it focuses on removing environmental and attitudinal barriers while promoting equal participation.

Cultural beliefs and practices further negatively affect inclusivity in education (Ndlovu & Nyoni, 2021). In some African countries, disability is associated with superstitions or is viewed as a punishment for wrongdoing, which reinforces exclusion and discrimination (Mutlaneng, 2020; Ndlovu, 2023). These beliefs may also intersect with gender norms, further limiting educational opportunities for persons with disabilities (Walton & Engelbrecht, 2022). According to Ndlovu (2023), stigma and discrimination remain major impediments to inclusive education in TVET colleges. Furthermore, negative stereotypes can lead to exclusion, bullying and low expectations for students with disabilities. Moreover, they can negatively affect their academic performance and self-esteem (Ndlovu & Nyoni, 2021; Nkumane, 2025; Safer et al., 2020). Addressing these challenges requires legislative support, community engagement, adequate resources and ongoing professional development (Dube & Baleni, 2022).

Methodology

A qualitative research approach employing a case study design was employed to gain an in-depth understanding of the lived experiences of students with disabilities within their specific contexts. Case studies are particularly useful for examining real-life problems (Baskarada, 2014). The study aimed to explore the challenges faced by students with disabilities in a selected TVET college in the Western Cape. This institution was considered appropriate for the present study as it accommodates a significant number of students with disabilities. It was also chosen based on its characteristics, including its environment, infrastructure and culture. Six students with disabilities who met the study's inclusion criteria were selected as participants from this college using a purposive sampling method. Participants were enrolled at the selected TVET college, self-identified as having a disability and were willing to participate in the study. They were selected because they had lived experiences of the institutional support and inclusion at the college and were able to provide relevant insights into the phenomenon being studied. Therefore, this method was suitable for this study

because the researchers specifically needed students with disabilities to achieve the main objective of the study. It was hoped that this sampling method would enhance the richness and depth of the findings, as it enables researchers to select participants who can provide in-depth and insightful information (Creswell, 2013).

The criteria ensured that participants aligned with the study's objective of exploring challenges faced by TVET students with disabilities. Selecting currently registered students with disabilities enhanced the credibility of the data, as they were able to provide first-hand experiences of challenges experienced within the college environment.

Semi-structured interviews were used to gather data from TVET students with disabilities. This method was chosen as a tool because it is flexible. The flexible nature of semi-structured interviews allowed the researchers to probe for a more detailed explanation, fostering a thorough understanding of the participants' experiences (Creswell, 2013). Open-ended questions were used, allowing the researchers to gather further data as expressed by the participants. The college boardroom was chosen as it offered a quiet, suitable environment for interviews. An audio recorder was used to capture the interview session and all recordings were subsequently transcribed. The data were interpreted and analysed using the thematic data analysis method to explore participants' personal experiences of the challenges they encounter at TVETs. According to Braun and Clarke (2006), thematic data analysis refers to a method of analysing, identifying and reporting themes or patterns in the data.

Ethical considerations

Ethical considerations ensure that research aligns with the requirements of the institution concerned, including obtaining approval from an ethics committee (Anney, 2014). Prior to data collection in the present instance, ethical clearance was obtained from the college's Ethics Committee, following a full review of the research proposal and compliance with all ethical guidelines. The study was formally approved and registered under the ethics clearance number EFEC04-07/2004. Permission to conduct the research was also sought and granted by the participating college and approval was obtained from the relevant institutional authorities. This process ensured that the study complied with the college's policies and procedures. All participants were fully informed of the purpose, objectives and procedures of the study before participation. Informed consent was obtained and participants agreed voluntarily to take part in the research. Participants were informed of their right to withdraw from the study at any stage without providing a reason. Confidentiality and anonymity were strictly maintained, as the study involved potentially sensitive information. Pseudonyms were used and participants' identities were protected throughout the research process. Data were securely stored in a locked cabinet and electronic data were password-protected. Participants were also given the opportunity to confirm that the findings accurately reflected their views, thereby ensuring credibility and ethical integrity.

Findings

Demographics of participants

This section presents the demographic profile of the participants in the study. Such information is provided to contextualise the findings by offering insight into the students' backgrounds, particularly their age, gender and disabilities, which are essential in understanding their perspectives and experiences. The participants included three males and three females, aged between 19 and 31 years. Furthermore, a detailed description of each participant's disability is provided to offer a deeper understanding of their individual experiences and challenges. All the names used in this article are not the real names of participants. A summary of the participants' details is presented in Table 1.

Table 1
Participant's background

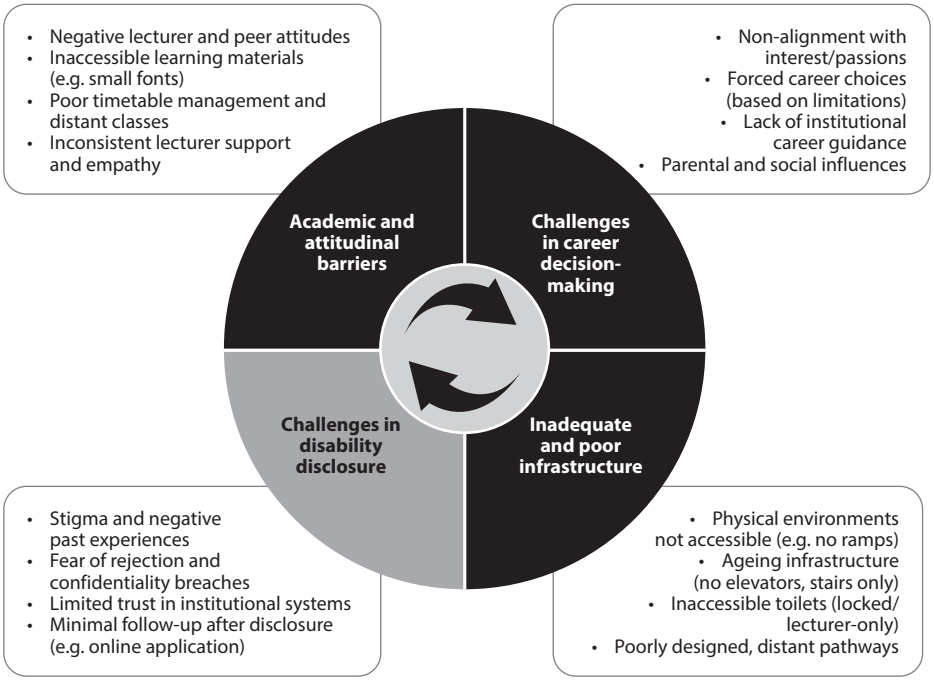
Participant	Gender	Age	Disability	Disabilities in detail
1. John	Male	31	Visually impaired	Decreased ability to see that cannot be fully corrected through standard methods such as glasses.
2. Mary	Female	21	Anisomelia	A condition where one limb is shorter than the other.
3. Sipho	Male	28	Using crutches	Using assistive devices to help with mobility.
4. Siya	Male	19	Mild cerebral palsy	Neurological condition that affects muscle control and movement.
5. Amanda	Female	20	Visually impaired	Decreased ability to see that cannot be fully corrected through standard methods such as glasses.
6. Zanele	Female	23	Partially deaf	Decreased ability to hear, but not completely deaf.

Key barriers to academic and social participation

This section presents findings on the challenges encountered by TVET students with disabilities, guided by the two research questions that sought to identify the key barriers affecting their academic and social participation. These results highlighted persistent challenges related to non-disclosure of disability owing to stigma, poor communication systems, inadequate infrastructure and limited lecturer training in inclusive practices. Participants further noted negative attitudes and low expectations on the part of lecturers and peers, which contributed to social isolation and low self-esteem. These challenges were further compounded by institutional barriers such as inadequate infrastructure,

poor disability support services, and inconsistent implementation of inclusive education policies. Understanding these challenges is pivotal to developing effective interventions that promote inclusion and provide all students with full access to enable them to benefit from TVET opportunities. The themes and their subthemes are represented graphically in Figure 1.

Figure 1
Graphic representation of the themes and their subthemes



Source: Authors.

Challenges in career decision-making

An interesting pattern emerged regarding programme selection among participants. Most participants (83%) were registered for business-related programmes, not because these aligned with their interests or aspirations, but because they were perceived as more manageable in relation to their disabilities. This suggests that one of the initial challenges encountered by TVET students with disabilities was making career choices that did not necessarily reflect their passions but rather their physical or contextual limitations. For instance, Amanda, a visually impaired student who was studying human resource management, shared that she had always aspired to study electrical engineering. However, her parents discouraged this choice, citing the demanding working conditions and job requirements associated with this field.

As Amanda explained:

> I always had a dream of working for Eskom. But because my parents advised me about the working conditions … My parents told me I would need to have a driver's licence to work for Eskom, which I could not have.

Similarly, participants reported that career decisions were often shaped by personal assessments of their conditions, by family advice and by societal expectations rather than institutional career guidance. Mary explained that she deliberately chose a field that would allow her to work in a seated position, stating:

> So, seeing the nature of my disability, I decided that I needed to study for a job where most of the times I have to sit so that I don't strain my leg even more.

Siya added that, although the college did not provide career guidance, he selected a course that he believed was suitable for his condition, stating:

> No, the college did not offer me any career advice, but I did not really need the career advice since I'm already knowledgeable about my condition and which careers would suit me best.

These findings illustrate how students with disabilities are often forced to compromise their ambitions, pursuing careers that are imposed either extrinsically or intrinsically. According to Walton and Engelbrecht (2022), educational barriers, societal expectations and insufficient support often limit career choices of students with disabilities, leading to decisions that are shaped by external circumstances instead of individual ambitions. This process can be emotionally challenging. As Amanda reflected, 'That was not nice at all but I had to adjust to the present conditions'. Overall, these findings demonstrate how disability-related constraints and social influences interact to limit career choices and shape educational pathways for TVET students with disabilities.

Challenges regarding disability disclosure

As part of the application/registration process, prospective students are required to disclose any disability (McPherson, 2021). However, the findings reveal that several students with disabilities chose not to disclose. Non-disclosure emerged as a hidden but significant challenge, influenced by negative experiences, stigma and limited trust in institutional systems. Consequently, many students missed opportunities to access support and being accommodated.

Amanda explained that her past experiences at school discouraged her from being open about her condition:

> When I got to college, I decided not to disclose my condition. Reason being, when I was in high school, I disclosed about my condition, and I could hear other teachers, [whom] I did not tell, talking about my condition.

This highlights how breaches of confidentiality can undermine trust and reinforce silence, preventing students from seeking assistance. Similarly, Zanele chose not to disclose her disability because she feared rejection, stating:

> No, I did not disclose to the college because I was scared that I [would] get rejected and it [would] stop me from achieving my goal.

These narratives suggest that the absence of clear institutional assurance regarding confidentiality discourages disclosure.

Conversely, some participants disclosed their disabilities during the online application, motivated by the expectation of receiving support. John noted: 'I chose to disclose my disability status to the college. It was a matter of wanting knowledge, wanting support.' Siya added that online disclosure felt less intimidating, as it did not require face-to-face interaction. Despite this, both reported limited follow-up from the institution. Siya explained:

> As I mentioned earlier, when I applied to the college, I indicated that I have a disability yet no one asked me [about] support or accommodation that I would need.

Other participants echoed similar concerns. Mary expressed disappointment because, although she had disclosed her disability online, the institution did not engage with her regarding suitable courses or accommodating her needs. She stated, 'I expected them to confirm that the course I chose [was] suitable for my disability first.' Zanele and Sipho also reported only receiving basic information about the programmes, with no disability-related guidance. Zanele explained, '[T]hey only told me the difference between NATED and NCV.' In other words, this was information about different qualifications that had no bearing on her particular needs. Sipho added that 'they only explained to me about the requirements of the courses they have'.

These findings reveal a pattern of minimal communication on the part of the college. While disclosure is required, institutions lack proactive engagement regarding career guidance, support and accommodating students with disabilities (McKinney & Amosun, 2020). This lack of follow-up not only undermines the purpose of disclosure but further complicates students' adjustments to college life, thus reinforcing exclusion.

Inadequate and poor infrastructure

The findings indicate that inadequate and poorly maintained infrastructure remains a major problem for the implementation of inclusive education in TVET colleges. Participants consistently highlighted the inaccessibility of physical environments, including the absence of ramps and elevators, inaccessible toilets and poorly designed pathways. These structural limitations restrict students' mobility and contribute to experiences of exclusion and marginalisation. This aligns with the United Nations Development Programme (UNDP, 2017), which notes that inclusive education is often undermined by physical barriers at institutional facilities.

Several participants described how outdated design of college buildings negatively affected their daily academic experiences. Sipho emphasised that the ageing infrastructure was not suitable for students with disabilities, which made movements between classes challenging. He advocated for structural adjustments to improve accessibility:

> The college has got old buildings which are not suitable for someone like me. … I'm struggling to move from one class to another between periods. … I would suggest that the classes must be at the ground level in order to accommodate the students with disabilities.

Similarly, Mary explained how the lack of elevators and long distances between classrooms caused her to arrive late:

> I struggle to arrive on time to classes, especially when they are far apart, or I have to go up the stairs because it's not easy for me to go up the stairs … there are no lifts at all.

John echoed these sentiments by highlighting the challenges posed by the college layout, explaining that navigating between distant classrooms required constant self-adjustment:

> I have to educate myself; it's a problem – it's a very, very big problem because you have to know the area, [your] distance … from class [to] class and all those things.

Siya also echoed these concerns, observing that the college environment failed to accommodate physical disabilities, particularly wheelchair users:

> Even when I got to the college, I could see that the infrastructure does not accommodate any form of physical disability. For example, there are no ramps for people with wheelchairs.

Zanele described how access to certain classrooms and cloakrooms was only possible via stairs, limiting both academic participation and campus activities. She also raised concerns about restricted access to designated disability facilities:

> The college does have a bathroom for people with disability, but the problem is it's always locked and it's only used by the lecturers … At the back of the classes, we have another block of classes where it is only accessible using stairs … Even bathrooms in the same floor, you must only use stairs to get in.

These findings demonstrate gaps in the implementation of inclusive policies, which undermines efforts to address the diverse needs of students with disabilities at TVET colleges. Furthermore, these infrastructural gaps reflect systemic neglect of the diverse needs of students with disabilities at TVET colleges. According to the UNDP (2017), inclusive education requires removing physical barriers through infrastructural investments to ensure equity, dignity and equal opportunities beyond mere policy compliance.

Academic and attitudinal barriers

TVET students with disabilities reported a range of academic challenges that negatively affected their learning experiences. These challenges were influenced by both environmental conditions and the attitudes of lecturers and peers. Negative attitudes, stereotypes and resistance to change remain key attitudinal barriers that hinder the effective implementation of inclusive education at TVET colleges (Ntombela, 2020). Participants highlighted inaccessible learning materials, poor timetable management and inconsistent lecturer support as major academic challenges.

A recurring concern was related to the format of learning materials, particularly for the visually impaired. Amanda described her challenges with small fonts used in handouts and textbooks:

> The biggest challenge of all is in the classroom where I have to struggle with the font that is used most of the time. Printout work for us that is not in the right font for me. And having to read textbooks that have a very small font … I struggle to read, even with glasses.

Similarly, John explained how limited visibility affected his participation: 'I cannot see from the distance; I cannot rely on the board or anything that is written on the board'. Although some lecturers made efforts to enlarge text, this accommodation was not consistently applied. These accounts highlight how unsuitable learning-material formats and poor consideration of seating arrangements continue to disadvantage visually impaired students.

Poor timetable management also emerged as a significant academic challenge. Several participants described physical exhaustion and time pressure when moving between

classrooms located far apart within short intervals. Mary explained: 'If the lecture ends at 10 and the other one starts at 10, then I do not have enough time to move between the classes'. Sipho echoed this concern: 'I'm struggling to move from one class to another between periods … because there is not enough time'. Such scheduling practices fail to consider mobility needs and place additional strain on students with disabilities. Ntombela (2020) is of the opinion that poorly coordinated timetables may impede participation by limiting access to support services, accessible venues and reasonable accommodation of the needs of students with disabilities.

Inconsistent support from lecturers further compounded these challenges. While some lecturers were understanding and accommodating, others demonstrated limited awareness or empathy. Siya highlighted this inconsistency:

> Some give me notes. … Others even give me extra time … . However, since my condition is not really visible, some lecturers assume that I'm faking it and do not really provide much support.

He noted further that support appeared to depend on lecturers' willingness rather than obligation, leaving students uncertain about whether their needs would be met or not.

Amanda expressed similar frustration: 'Some lecturers will not print the right font, but there are other lecturers who will provide the good font'. *Z*anele, a partially deaf student, shared that her needs were often overlooked: 'They forget that I'm partially deaf … so I end up getting lost'. These experiences point to limited implementation of inclusive practices and to inadequate training in disability-related issues.

Sipho emphasised the role of ubuntu in shaping lecturer support, stating that accommodating their needs depended on whether lecturers demonstrated compassion and understanding. However, Zanele's view reflected broader institutional shortcomings, as she stated: 'No, they do not [accommodate] … because the college and the policies do not force them to do so'.

Overall, these findings demonstrate that academic challenges experienced by these students are intensified by systemic barriers that restrict their full participation in academic activities. Nkumane (2025) echoes these sentiments by stating that ineffective inclusive pedagogical practices reinforce academic barriers, restricting TVET students with disabilities from participating fully in teaching and learning.

Discussion

Research has consistently demonstrated that South African TVET students with disabilities continue to encounter challenges that impede their participation and success. In a study by Ntombela (2020), it was found that inadequate institutional support, inaccessible environments and limited lecturer capacity to implement inclusive practices remain a

major obstacle to inclusive education. Similarly, Sako (2020) and Mahlangu and Mtshali (2024) found that poor infrastructure and negative attitudes continue to hinder students' educational experiences in TVET colleges. The findings of the present study support these concerns, highlighting that the experiences of students are shaped by interacting personal, institutional and social factors.

Challenges in respect of career decision-making

One of the key findings was that participants' programme choices were shaped more by disability-related barriers than by their personal aspirations. Additionally, their educational choices were influenced by family advice, anticipated workplace challenges and a lack of disability-responsive career guidance, often requiring them to compromise their ambitions. The present findings corroborate those of Walton and Engelbrecht (2022), who emphasise that students with disabilities often experience restricted career opportunities owing to environmental and societal barriers rather than their abilities. These findings highlight the dynamic interactions between the microsystems and mesosystem, demonstrating how family expectations and institutional practices collectively shape students' educational pathways. The lack of career guidance that is responsive to disability further indicates how institutional support structures indirectly affect students' opportunities. As a result, students may enrol in programmes that do not align with their interests, potentially affecting their motivation, academic engagement and future employment opportunities. The findings of the present study emphasise the significance of strengthening inclusive career guidance services to ensure that students' aspirations are supported and reflect both their abilities and career ambitions.

Challenges relating to disability disclosure

Research suggests that disclosure should facilitate access to appropriate support services (McPherson, 2021) and that meaningful institutional engagement is crucial for promoting inclusion (Mckinney & Amosun, 2020). However, the findings indicate notable gaps in institutional disability-disclosure processes. Although institutions require students to disclose their disabilities during admission, the findings reveal that disability disclosure remains a significant challenge. The findings reveal further that disclosure does not necessarily translate to meaningful support and accommodating students with disabilities. Several participants were reluctant to disclose their disabilities because of fear of discrimination, stigma and breaches of confidentiality, while those who did disclose reported receiving little or no institutional follow-up, thereby undermining access to appropriate support.

Similarly, in a study by Ndlovu (2023), it was found that stigma continues to discourage students with disabilities from accessing available support. The lack of coordinated follow-up after disclosure suggests further that institutional processes often fail to translate policy commitments into effective support and reasonably accommodating students with disabilities. These findings also suggest that disability disclosure is treated as an administrative requirement

rather than as the first step to a structured support process. As a result, students remain uncertain about the benefits of disclosure, reducing opportunities for institutions to identify and respond to individual support needs. Therefore, TVET colleges should establish student-centred systems that foster trust and confidentiality, ensure timely communication, provide support and accommodating towards students with disabilities throughout students' educational journey.

Inadequate and poor infrastructure

Previous studies have consistently identified poor infrastructure as one of the most significant challenges to inclusive education at South African TVET colleges (Ndlovu, 2023; Sako, 2020). Similarly, the UNDP (2017) highlights that inaccessible physical environments restrict the ability of students with disabilities to participate equally in educational opportunities. Consistent with these studies, another key finding of the present study was the persistence of inaccessible infrastructure across the college. Participants reported that inaccessible classrooms, toilets and pathways, and the lack of ramps and lifts, restricted their mobility and participation in academic activities. These findings emphasise that inclusive education cannot be achieved through policy commitments alone while the physical learning environment remains inaccessible. Incorporating Bronfenbrenner's ecological theory into this finding demonstrates that students' learning experiences are shaped by the interaction between the individuals and the environment around them. These findings further highlight the significance of infrastructure planning that accommodates the diverse accessibility needs of TVET students with disabilities. Therefore, improving infrastructure should move beyond legislative compliance and become the priority of the institution that promotes participation and equal educational opportunities for all students regardless of their abilities.

Academic and attitudinal barriers

In studies by, Mahlangu and Mtshali (2024), Nkumane (2025) and Williams (2021), inaccessible learning materials, inadequate lecturer preparation and negative attitudes were identified as major challenges to inclusive education in TVET colleges. Consistent with these studies, another important finding of the present study is that participants experienced academic and attitudinal challenges that limited their participation in teaching and learning. Participants reported inaccessible learning materials, poor timetable management, limited classroom adaptation to different student needs and non-inclusive teaching practices, especially for those with hearing and visual impairments. Ntombela (2020) supports this notion by affirming that inadequate lecturer awareness and training result in inconsistent implementation of inclusive teaching practices, thereby limiting students' ability to fully participate in classroom activities.

In a study by McPherson (2021), it was found that, when lecturers are not adequately prepared to support diverse learning needs, students are more likely to experience challenges that undermine their academic success. Although some lecturers demonstrated empathy by providing enlarged font size in learning material and additional time for

activities, others failed to provide the necessary accommodation of the different needs of students with disabilities or questioned the legitimacy of students' disability. These findings therefore suggest that reasonable accommodation of the needs of students with disabilities often depends on individual lecturers' willingness rather than institutional policies and procedures. The findings thus underscore the need for continuous professional development in inclusive education in order to strengthen accountability and the establishment of disability support structures that ensure consistent implementation of inclusive pedagogical practices across all programmes.

Recommendations

Based on these findings, several recommendations are proposed. First, TVET colleges must strengthen disclosure processes by ensuring confidentiality and clear communication regarding available support services, along with proactive follow-up after disclosure. Second, TVET institutions should prioritise infrastructure improvements to remove physical barriers through provision of elevators, ramps and accessible facilities. Third, continuous and compulsory training in inclusive education and disability awareness should be offered to all lecturers to implement consistent and inclusive teaching practices. Finally, TVET colleges should strengthen accountability and monitoring mechanisms to ensure effective implementation of inclusive education policies. Addressing these challenges is crucial for creating equitable conditions and enabling TVET environments that can support the success of all students.

Conclusions

Research on the experiences of South African TVET students with disabilities remains limited, especially in relation to how institutional support and inclusive pedagogical practices influence their educational experiences. The present study has demonstrated that the challenges encountered by TVET students with disabilities are solely rooted in individual impairments but arise from interconnected institutional, environmental and systemic factors. Guided by ecological system theory, the study demonstrates how interactions with and across multiple ecological systems shape students' access, participation and success at TVET colleges. The findings indicate that meaningful inclusion cannot be achieved through policy commitments only. Instead, it requires well-coordinated institutional responses that improve physical accessibility, provide continuous lecturer development and consistently adapt according to the needs of disabled students. The findings highlight the need for further research to explore strategies for embedding inclusive practices across diverse TVET settings and to examine the long-term educational and employment trajectories of students with disabilities. Although the study was conducted at a single TVET college in the Western Cape, its findings have broader implications for ongoing efforts in advancing inclusive education across South Africa's TVET sector. More broadly, the study provides evidence to support the development of institutional policies and practices that foster equitable learning environments where students with disabilities can fully participate and realise their educational and social potential.

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Technical experiments in TVET: A comparative study with South African and German lecturers

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ABSTRACT

Experiments in scientific and engineering education promote understanding of theory, enable discovery-based learning and focus on the central ways of thinking and working of those disciplines. While there are expansive national and international findings on scientific experiments and their scholarly implementation, the barely differentiated knowledge regarding technical experiments remains limited. A research gap can also be observed in the scholarly implementation of technical experiments in technical and vocational education and training (TVET). This article addresses this gap within the context of educational cooperation between South Africa (ZA) and Germany (DE). It reports on an explorative comparative study, from an international perspective of educational research, with German and South African TVET lecturers (N = 20). The results present current challenges and potentials, provide insight into country-specific differences and similarities and exhibit a research need within technology education.

Keywords: Technical experiment, learning objectives, international cooperation in technical and vocational education and training (TVET), Germany, South Africa

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Introduction

Scientific and technical experiments in class can illustrate central ways of thinking and working in these disciplines (e.g. for science: Kircher et al., 2020; for engineering: Zinn, 2018). Across countries, experiments are employed as an educational method for obtaining knowledge (KMK, 2005; South African Curriculum and Assessment Policy Statements (CAPS)). In this way, experiments provide action-oriented learning opportunities that promote motivational and cognitive learning outcomes (Reiss et al., 2016; Schwippert et al., 2020) while enhancing retention performance and learning motivation (Füller, 1992; Killermann, 1996).

Although field-specific didactics distinguish between scientific and technical experiments (e.g. Zinn, 2026), this distinction has received little attention in vocational education practice (Rauner, 2024). The state of research confirms this: while there are numerous national and international studies on scientific experiments (for overviews, see: Arndt, 2016; Meier & Mayer, 2012; Murer, 2023), research on technical experiments remains limited. This gap exists even though experimentation is considered a characteristic method employed in technology education (Zinn, 2026) and can foster technological and engineering literacy (Brändle et al., 2024). Research gaps concerning technical experimentation encompass, among other aspects, the actual use of technical experiments in vocational education and the experimental competencies of teachers and students. Within the context of international cooperation, there is also interest in country-specific particularities regarding the implementation of experiments in classes at technical and vocational education and training (TVET) colleges.

This article addresses these research gaps through an explorative comparative study conducted with South African and German TVET lecturers (N = 20). The focus lies on generating systematically collected insights about lecturers' familiarity with technical experiments, their use in class and the associated learning objectives. In this research, the results of the study are assumed to:

- Generate a first impression of this largely unexplored topic;
- Yield insights that connect to existing national research gaps;
- Contribute to technology education research within the context of international vocational education and training (VET) cooperation;
- Identify new research desiderata for international teacher education research; and
- Offer points of reference for bilateral research and development projects of South Africa and Germany.

Following this introduction, the article outlines the theoretical background on international cooperation in vocational education and discusses the role of experiments in class. It then examines the current research status in the corresponding research field. Building on this foundation, the text describes the methodological approach of the empirical study, which is followed by the presentation of the study's results. The article closes with a summary of the central findings, a reflection on the limitations and a discussion of the results.

Theoretical background

International cooperation in vocational education and training

This study is situated within the context of international VET cooperation between Germany and South Africa, which is based on the German Federal Government's 2013 strategy for coordinated international VET cooperation (Deutscher Bundestag, 2013). Within this framework, international VET research has increased in importance, including the German–South African partnership because of, among others, its designation as a central action field in the German government's Africa Strategy, which anchors the systematic promotion of VET and VET research (BMBF, 2018). Despite initial research dating back to the 1990s (Stockmann, 1992), international VET research has long gone unnoticed (Gessler et al., 2021). Its renewed prominence since the 2010s is attributed to increased political attention and expanded research funding, although a substantial need for comparative and critically reflective international and intercultural VET research remains (Gessler et al., 2021). Such research should emphasise reciprocal learning and exchange along dimensions of similarity and difference in order both to foster cross-national understanding and support targeted development goals (Evans, 2020).

The selection of participating countries is grounded in substantive and research policy considerations. Germany's dual system is widely regarded as an international reference model for practice-oriented VET (Euler, 2013). South Africa, on the other hand, plays a key role in international VET cooperation owing to its extensive partnerships (BMBF, 2018). Both countries are linked through long-standing bilateral agreements concluded in 1996 (BMBF, 2023), with the current focus being on the professionalisation of South African TVET lecturers (GOVET, 2025). Comparing countries' observations reveals structural and substantive differences in teacher qualifications. Germany follows a structured three-phase model comprising universities, preparatory service and vocational schools (Tramm, 2003). After completing a five-year master's degree at university, candidates undergo a one-and-a-half-year traineeship. This traineeship involves collaboration with the State Institute for Teacher Education and Training and a designated TVET college. Candidates alternate between these two learning environments, gaining practical teaching experience at the TVET college and knowledge about teaching methods and subject-specific pedagogy at the state institute (BSPO, 2023/10. October 2023). However, South Africa has a more heterogeneous landscape (e.g. Zinn et al., 2019), where TVET lecturers often only hold academic or occupational qualifications, with pedagogical and didactic training frequently lacking (DHET, 2017).

In light of these differing professionalisation frameworks, the question arises whether distinct views on technical experiments in teaching are evident and how a bilateral German–South African comparison can generate impulses for research and practice in international VET cooperation. The study aims to identify similarities and differences without normative judgement, thereby deepening understanding of the conditions and potentials of teacher

education systems in an international perspective. Such insights emerge only through cross-national comparison and bilateral collaboration (Lauth et al., 2015).

Experiments in class

Experiments are a versatile teaching method that can motivate students, support discussion and learning, or serve as part of technical design and optimisation tasks (Zinn, 2018). Classroom experiments address cognitive, affective and psychomotor learning domains equally and contribute substantially to their attainment (Bruchmüller & Haug, 2001). In this way, a distinction is made between scientific and technical experiments. Technical experiments examine means–end relations to identify applicable solutions or dimensions (Zinn, 2018): for instance, the insulation-material experiment in the field of civil engineering from the AdUmint project focuses on finding the optimal insulation material for the roof of a residential building (Nell et al., 2023). Heating a small-scale wooden house creates a controlled testing environment. The independent variable consists of the different types of insulation materials applied to the roof, while temperature measurements are used to quantify the dependent variable, namely the heat loss through the rooftop. Scientific experiments, by contrast, aim to explain correlations and confirm laws of nature by proving a hypothesis through cause–effect relations (Rauner, 2024). In the context of the above example, a scientific experiment would focus on the specific thermal resistivity of the materials to identify a universal relationship between their chemical composition and their insulating properties. Consequently, the objectives of scientific and technical experiments diverge. Zinn (2018) identifies seven learning objectives linked to technical experimentation, including fostering *interest* in Science, Technology, Engineering and Mathematics (STEM), acquiring *subject knowledge* and *engineering-related ways of thinking and working*, improving *problem-solving*, reducing *misconceptions*, deepening understanding of the *nature of science and nature of technology*, and strengthening *academic language*.

The process of technical experimentation has been systematised repeatedly in subject-didactic literature (for overview, see: Walker, 2013, p. 31). A foundational model by Schmayl (1982) distinguishes three phases: *preparation*, *execution* and *evaluation*. This tripartite structure remains established but is viewed as a basic framework requiring further differentiation to capture the complexity of technical experimentation. Building on this, Pahl (2013) proposes a more detailed, six-phase model for technical experiments comprising *problem identification*, *clarification and formulation of hypothesis*, *planning*, *execution*, *evaluation* and, finally, *summary,* including transfer. Walker (2013) develops a similar six-phase model which differs mainly as regards the terminology employed. Zinn (2026) likewise outlines a process model for technical experiments comprising *preparation*, *planning*, *execution*, *evaluation* and *testing*.

Scholarly practice differentiates various forms of experimentation, each offering specific methodological possibilities and requirements (Girwidz, 2020). To systematise these forms, Girwidz (2020) classifies the scientific experiment along five aspects: *data collection*,

organisational structure, *teaching phase*, *use of equipment* and *mode of execution*. In relation to these findings from science education, Pahl (2013) adopts two of these dimensions and further specifies them for technical experiments. Therefore, the *use of equipment* is categorised according to the degree of representation, ranging from real-world and model-based to thought experiments. The *organisational structure* is classified by student involvement, spanning teacher demonstrations, partially participatory experiments and fully independent student experiments (Pahl, 2013, pp. 192–193). The remaining three dimensions have not yet been further specified for technical experiments. Pahl's expanded perspective reveals that, although scientific classifications are useful, they require adaptation to meet the specific demands of technical experimentation.

State of research

The empirical research on teaching and learning with engineering-related experiments in general education, especially in vocational technical education, is, based on the available data, limited. As outlined below, a few empirical studies exist that systematically examine the design, use and effects of technical experiments.

The survey by Pätzold et al. (2003) of predominant teaching methods in technical and vocational education showed that around 40% of the 170 participating lecturers at TVET colleges, covering commercial and technical disciplines in Germany, made use of experiments at least once a week. However, the study did not distinguish between scientific and technical experiments. Bleher's (2008) survey, with 211 teachers from secondary schools in south-west Germany, came to similar conclusions. The results showed that technical experiments tended to be used 'occasionally' to 'rarely', placing them at the lower end of the list of teaching methods employed (Bleher, 2008). The document analysis by Schray and Geißel (2016) likewise showed that technical experiments played a subordinate role regarding the methodical implementation of electrotechnical content in technology classes of lower secondary education.

Regarding the effectiveness of technical experiments, several studies show consistent results as outlined below. Bünning (2010) showed that instruction-based teaching in basic building and woodwork training led to no superior effects on the development of declarative knowledge, whereas lessons based on experiments led to significant gains in procedural knowledge. What is remarkable is how weak students were not disadvantaged but specifically supported in their competence development (Bünning, 2010). These findings are supported by Bünning and Jenewein (2008). Two sub-studies from construction engineering prove that action-oriented classes incorporating experiments are not only equal to directive forms of teaching regarding declarative knowledge but even exhibit positive tendencies. Moreover, experimentation sustainably promotes the acquisition of procedural knowledge, enabling independent reproduction, analysis and modification in technical processes. Results regarding the acquisition of problem-solving skills through technical experiments are not yet clear (Bünning & Jenewein, 2008). Walker (2013) likewise

confirms the importance of technical experiments for knowledge development. In a study with 358 students using a control-group design, he found significant learning gains using technical experiments in both declarative and procedural knowledge. Remarkably, this effect occurred regardless of the type of experiment, whether student-led, demonstrative or paper-based. The large effect sizes highlight the potential of engineering-related experiments for developing technical competence (Walker, 2013).

Regarding the phases of experimentation, Bruchmüller and Haug (2001) note that lecturers often prepare, or even predetermine, the initial phases, such as problem identification, formulation of hypothesis and experimental design. Consequently, students are primarily responsible for executing the experiment and integrating the findings into their existing knowledge (Bruchmüller & Haug, 2001). This approach reduces opportunities for independent planning and exploring, potentially limiting the development of deeper problem-solving and planning strategies. As far as design and implementation are concerned, findings by Bodemer et al. (2005) show that targeted instructional support during experimentation can improve learning success. This indicates that a balance between student autonomy and targeted instruction is didactically beneficial for complex technical experiments.

Based on the available data, the state of research regarding the use of experiments in class seems even more limited in southern Africa than it is in Europe. It remains unclear whether this is due to a lack of research focus, to deviating terminology like case studies, assignments, projects, portfolios, demonstrations and group work (Hassan & Wai, 2019) or to hands-on practical activities (Maeko & Makgato, 2014). However, these teaching methods are clearly distinguishable from technical experiments. In his interview-based study (N = 12) with South African physical science teachers, principals and curriculum advisors on key teaching methods in secondary physics education, Zenda (2017) shows that experiments are considered important, yet their implementation fails due to insufficient facilities and limited resources. Magadza and Mampane (2025) conducted a study on teaching methods used in engineering courses at TVET colleges in the province of Mpumalanga. In their study, experiments are neither mentioned in the theoretical examination of possible methods, nor in the empirical findings (Magadza & Mampane, 2025).

As '[t]echnology is interwoven with humans, from the birth of civilization' (Hallström, 2023, p. 348), so is technology education (Mason et al., 2025). The Standards for Technological and Engineering Literacy (STEL) define technology education as equipping students to understand the impact of technology on the environment, society and their personal lives. Additionally, they provide knowledge of technical products, systems and processes (ITEEA, 2020). Experiments are one way of learning about these concepts, as well as how these technologies are used and how they can enhance human capabilities (ITEEA, 2020). At an international level, empirical studies list a country's competitiveness, cybersecurity, business ease, political stability and level of economic development (e.g. developed, emerging or developing nations) as factors that can influence individual technical

experience and the acceptance and adoption of new technologies (El-Masri & Tarhini, 2017; Hooks et al., 2022; Im et al., 2011). These differences are often examined using models such as the Technology Acceptance Model (TAM) by Davis (1989) or the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003), as do Martens et al. (2017) who evaluated the acceptance of mobile payments across Germany and South Africa. Their findings show no correlation between the intention to use new technology and the nationality of the German and South African participants; instead, it is mainly predicted by the perceived usefulness (Martens et al., 2017).

In summary, the literature shows that technical experiments in education play a relevant, though not dominant, role. The empirical findings as presented highlight their potential to support students gain insight and knowledge. It remains unclear which methodological competencies teachers possess and which objectives they associate with using technical experiments. Given the limited data on implementation conditions in TVET concerning the technical experiment, there is a need for systematic, descriptive and explanatory research from the lecturers' perspective. This study addresses this gap by conducting an exploratory comparative study, systematically presented in the following section.

Empirical investigation

Research objective and questions

The study's objective is to generate descriptive and explanatory knowledge regarding the current use of technical experiments in TVET colleges. The study itself focuses on TVET lecturers in Germany and South Africa and their perspective on incorporating technical experiments in class. The study also addresses the following research questions (RQ):

- (RQ1) What **knowledge** do South African and German TVET lecturers possess regarding technical experiments and their use in class?
- (RQ2) How do South African and German TVET lecturers **integrate** technical experiments into their class?
- (RQ3) What **objectives** do South African and German TVET lecturers pursue by using technical experiments in class?

Research design

Considering the current state of research and the lack of empirical evidence, the study adopts an exploratory design. Semi-structured individual interviews are employed, providing room for the participants' personal depictions and reflections while ensuring systematic data collection and comparability (Mayer, 2013). The interview guide is developed based on the theory presented and state of research, alongside RQ 1–3 (see Table 1). The guide enables analysis and comparison of individual interviews by providing a canonised framework, while simultaneously remaining open for detailed follow-up questions according to the

course of the conversation (Bortz & Döring, 2006). The interview guide is structured into four sections: (1) Use of experiments in class; (2) Knowledge of using experiments; (3) Technical experiments in contrast to scientific experiments; and (4) Acquisition of experimental competences.

- The first section, Use of experiments in class, explores how experiments are employed in educational settings. The interview questions address the frequency and purpose of using experiments, their didactic integration, underlying motivations, instructional contexts and intended learning objectives, alongside perceived benefits and challenges.
- The second section, Knowledge of using experiments, focuses on recording participants' theoretical knowledge. Questions cover definitions, structures, phases, and types of experiments and their differentiation.
- The third section examines distinctions between technical and scientific experiments. The aim is to understand whether, and how, lecturers differentiate these forms and where they see potential for incorporating technical experiments.
- The fourth section investigates which substantial, didactic and practical competences lecturers consider necessary for implementing technical experiments, and how, and where, they acquired these competences.

Table 1 presents a sample of guiding questions, including their allocation to the research questions (RQ1 – RQ3) and corresponding intentions.

Table 1
Research and guiding questions

Research question	Guiding question	Comment
RQ1: Knowledge of using experiments	*Please define the experiment (in general).*	The lecturers are asked to provide a known definition of the experiment or to provide their own definition.
RQ2: Class integration	*In what context do you use experiments in class?*	The lecturers are asked to name examples of experiments that they use and to describe the integration of these experiments into classroom teaching.
RQ3: Learning objectives	*Which objectives do/ could you pursue using experiments?*	The lecturers are asked to explain which learning objectives they pursue through the implementation of experiments or, if they do not use experiments, which learning objectives they consider pursuable.

Sample and implementation of the qualitative study

The method of theoretical case selection (Glaser & Strauss, 1999) is employed to obtain a random sample. Participants were selected according to the following criteria: (1) active service at a TVET college; (2) broad variation in teaching experience; (3) teaching in at least one of the four occupational fields of electrical engineering (EE), mechanical engineering (ME), construction engineering (CE) or computer science (CS); (4) participation of lecturers from Germany and South Africa. Following a qualitative logic, additional cases were included until the interviews no longer provided new insights and theoretical saturation was reached.

A total of N = 20 lecturers (m = 17; f = 3) were interviewed. The first data collection took place in South Africa between September and October 2024. N = 10 lecturers (m = 8; f = 2) from five South African provinces (Northern Cape = 3, Eastern Cape = 1, KwaZulu-Natal = 2, North West = 2, Limpopo = 2) participated. The participants' mean age was 35.9 years (SD = 3.21; MIN = 30; MAX = 41), with an average of 9.9 years (SD = 4.18; MIN = 3; MAX = 17) of teaching experience and 3.3 years (SD = 2.05; MIN = 0; MAX = 8) of industry experience. The second data collection took place in Germany from December 2024 to January 2025. Again, a total of N = 10 lecturers (m = 9; f = 1) from the federal state of Baden-Württemberg participated. Here, the mean age of the participants was 46.8 years (SD = 13.07; MIN = 27; MAX = 66), with an average of 14.5 years (SD = 11.17; MIN = 2; MAX = 32) of teaching experience and 5.15 years (SD = 5.48; MIN = 0; MAX = 19) of industry experience. Participation was voluntary and all personal data have been anonymised. Table 2 presents the random sample's statistical data, comparing both countries.

Table 2
Description of the sample

	Age in years			Years of teaching experience			Years of industry experience		
	Total	**ZA**	**DE**	**Total**	**ZA**	**DE**	**Total**	**ZA**	**DE**
$\bar{x}$	41.35	35.90	46.80	12.20	9.90	14.50	4.23	3.30	5.15
SD	10.96	3.21	13.07	8.74	4.18	11.17	4.24	2.05	5.48
MIN	27	30	27	2	3	2	0	0	0
MAX	66	41	66	32	17	32	19	8	19

Table 3 is an overview of the anonymised, occupation-specific characteristics of the participants, including years of teaching experience, highest educational qualification, teaching subjects and whether a vocational qualification had been completed.

Table 3
Profile of participating lecturers

No.	Country	Gender	Years of teaching	Highest qualification	Teaching subjects[1]	Vocational training
L01	ZA	m	11	National diploma	EE	Yes
L02	ZA	f	12	National diploma	EE, P	Yes
L03	ZA	m	8	National diploma	ME, P, M	Yes
L04	ZA	m	11	National diploma	EE	Yes
L05	ZA	f	17	National diploma	ME, M	Yes
L06	ZA	m	14	Bachelor's degree	ME, EE	Yes
L07	ZA	m	3	National diploma	EE, M	Yes
L08	ZA	m	11	National diploma	EE, P	Yes
L09	ZA	m	9	Bachelor's degree	EE, P, M	Yes
L10	ZA	m	3	Bachelor's degree	ME, EE, P, M	Yes
L11	DE	m	32	Master's degree	EE, CS	No
L12	DE	m	27	National diploma	EE	Yes
L13	DE	f	8	Bachelor's degree	EE, P, M	Yes
L14	DE	m	31	Master's degree	EE, CS	No
L15	DE	m	14	PhD	ME, EE	Yes
L16	DE	m	2	Master's degree	EE, D	No
L17	DE	m	13	Master's degree	CE, EBA	Yes
L18	DE	m	2	Master's degree	ME, P	No
L19	DE	m	14	Master's degree	EE	Yes
L20	DE	m	2	Master's degree	ME, P	No

All interviews were conducted by the authors during one-to-one sessions, with an average duration of M = 33:48 minutes (*SD* = 10:52; MIN = 16:45; MAX = 54:14). Each interview consisted of three steps: (1) signing the consent form; (2) completing the paper-based demographic questionnaire (based on TALIS) (Organisation for Economic Cooperation and Development (OECD), 2018); (3) conducting the oral interview. Since the study aims to capture participants' current knowledge (RQ1), no preparatory material is provided. The interviews in South Africa were conducted in English, while those in Germany were

1 *EE* Electrical Engineering, *ME* Mechanical Engineering, *CE* Civil Engineering, *CS* Computer Science, *P* Physics, *M* Mathematics, *D* German, *EBA* Economics and Business Administration.

undertaken in German. The conversation follows the interview guide; all documents (consent declaration, questionnaire, interview guide) are identical in English and German. The interviews were recorded using a voice recorder and transcribed later using f4 software (Version 7.0.6).

Data evaluation

The transcribed data were systematically evaluated according to the qualitative content analysis procedure outlined by Mayring (2022), using the MAXQDA software (version 18.2.4). The coding system encompasses deductive and inductive categories. While deductive categories enable structured, theory-guided analysis but limit openness, inductive categories counter this and increase sensitivity to the data (Bortz & Döring, 2006). After two researchers independently coded three transcripts, results were compared and discussed and the coding system was refined, especially regarding category boundaries. Following Berger (2015, p. 177), a final coding manual was developed, containing three categories with 17 subcategories (deductive: 5, inductive: 12) and their characteristics, definitions and anchor examples (see Table 4). Coding rules specified that no passages may be double-coded and that code overlaps are not permitted.

The category, *Knowledge* (addressing RQ1), was developed deductively and inductively and encompasses eight subcategories. The first subcategory, *Definition of the experiment*, is derived inductively and captures individual understandings of the term. *Phases of experimentation* is deductively derived from established models by Schmayl (1982) and Pahl (2013). Given the limited state of research in engineering education, *Classification of experiments* is adopted from science according to Girwidz (2020). This remains necessary until existing research gaps in technical experiments are closed. The participants' attempts to *differentiate between technical and scientific experiments* are inductively clustered. The subcategory, *Difference known*, consists of the dichotomous variables *yes* and *no*. *Competence acquisition* is again dichotomous, with the variables being *formal* and *informal*. *Experiments in own education* is developed deductively along relevant vocational fields (*EE*, *ME*, *CE*, *CS*), extended by the variables *other* and *none*. Finally, *Competencies of experimentation in teacher training* is coded inductively.

The category, *Integration* (addressing RQ2), is developed primarily inductively and includes eight subcategories concerning the embedding of experiments in educational contexts. *Use in class* is derived inductively and captures scenarios in which respondents employed experiments. *Examples* of experiments used in class is deduced along the vocational fields (*EE*, *ME*, *CE*, *CS*), plus *other*. The subcategory, *Implementation*, is inductively developed and includes differentiated statements on how experiments were carried out (e.g. duration, group size, materials, lecturers' role). When applicable, reasons for *No use* are coded inductively with the dichotomous variables *lack of time* and *other*. Inductively coded, *Advantages* and *Disadvantages* of experiments are based on the participants' subjective assessments, *Method selection* captures statements on how lecturers justify choosing a suitable experiment and

Curriculum integration documents lecturers' assessments of where the curriculum permits the use of technical experiments.

The category, *Learning objectives* (addressing RQ3), is developed deductively based on Zinn's (2018) categorisation, expanded by the category, *Other*. Table 4 presents an exemplary extract of the coding manual.

Table 4
Extract from the coding manual

Category	Subcategory	Characteristic	Definition	Anchoring example
Integration	Integration curriculum	Everywhere	Various possibilities to integrate technical experiments into the curriculum are mentioned.	'Basically, in all subject areas, in some more, in some less. … so one could do experiments everywhere.' (L19 par.: 36, translated)
		Partly	Some ways to integrate technical experiments into the curriculum are mentioned.	'… I'm teaching level 2 and 3. I think it will be only level 4.' (L05 par.: 58)
		Nowhere	No possibilities to integrate technical experiments into the curriculum are perceived.	'For the level that I'm currently teaching, unfortunately, there's none on their syllabus.' (L05 par.: 56)
		Subject-specific	Specific subjects, where technical experiments can be integrated, are named.	'Yes, in the area of strength of materials; I see that.' (L18 par.: 40, translated)
		School type	A school type, where technical experiments can be integrated, is named (e.g. NCV or NATED for South Africa or TG or AVdual for Germany).	'Where one could of course do something would be in the TG [technical secondary school] curriculum…' (L20 par.: 70, translated)

In total, 519 codes were assigned to the three categories and 17 subcategories. The intercoder reliability was computed in MAXQDA using Brennan and Prediger's (1981) kappa, yielding a value of 0.73, which indicates good agreement according to common interpretation guidelines (Rädiker & Kuckartz, 2019, p. 303).

Results

This section presents the results of the empirical study. To ensure a coherent progression from research objectives to findings and discussion, the structure follows RQ1 to RQ3. In each research question, results are systematically compared between South Africa and Germany. Selected quotes are presented with reference to the interviewee. The German quotes were translated as accurately as possible, in accordance with the statement, rather than being translated word for word.

Results of the category, Knowledge/RQ1 (256 codes)

A total of 60% (n = 6) of the surveyed South African lecturers and 30% (n = 3) of the German lecturers defined the experiment as a mere practical verification or implementation of previously learnt theory. Among individual South African participants (n = 4), four other definitions of the experiment are found: collection of information, problem-solving through trial and error, obtaining new knowledge and execution of psychomotor activities. The remaining seven German lecturers described experiments as measuring and comparing, visualising phenomenon using measuring instruments, observing initial and final states of a reaction, testing a hypothesis, live visualisation of physical and technological principles, proving a hypothesis by using components or transferring reality into the laboratory.

> To me an experiment, I would say, is … proving what you've learnt in class. (L06)

When asked about the *Phases of experimentation*, 11 lecturers (55%; ZA = 4; DE = 7) named the trilogy of *Preparation*, *Execution* and *Evaluation*, based on Schmayl (1982). Six lecturers (30%; ZA = 5; DE = 1) mentioned only one or two of these phases. The remaining three lecturers (15%; ZA = 2; DE = 1) failed to mention any phase or saw no need for such segmentation, as the following quote illustrates.

> Phases of experimentation … don't, I think, apply to me. I go into my little room, get what I need and present it. (L11, translated)

The frequencies shown in Table 5 are obtained if the statements are coded according to Pahl's (2013) six-phase model.

Table 5
Frequency of naming the phases of experimentation, with coding based on Pahl (2013)

Phases of experimentation	Named by ZA lecturer	Named by DE lecturer	Total named
Problem identification	3	3	6
Clarification and formulation of hypothesis	1	2	3
Planning the technical experiment	8	5	13
Executing the technical experiment	5	8	13
Evaluation of the experiment	1	4	5
Summary, including transfer and outlook	3	4	7

Nine lecturers (45%; ZA = 4; DE = 2) could name different classifications of experiments according to Girwidz (2020). Eight participants (40%; ZA = 5; DE = 3) did not know of the classifications, while three (15%; ZA = 1; DE = 2) classified experiments by topic and subject area or by the level of instructional guidance (open as opposed to structured). Almost half of all respondents (40% (8); ZA = 20% (2); DE = 60% (6)) indicated that they could not differentiate between scientific and technical experiments and had never heard of this distinction before.

> I can't say I know different types …, I just know an experiment. (L05)

> Well, I couldn't name the difference [between scientific and technical experiments] right now, what the differences are. (L15, translated)

The participants gained their experimental competencies at various stages of their professional careers. Only three German lecturers named university-based teacher education as a formal learning space. In contrast, formal training and continuing education for teachers were mentioned exclusively by four South African respondents. Vocational training (e.g. diesel mechanic) and academic studies (e.g. engineering) not related to teacher training programmes were mentioned eight times (ZA = 3; DE = 5). As informal learning spaces for developing skills to execute experiments with students, extracurricular work experience was mentioned seven times (ZA = 2; DE = 5) and everyday school practice six times (ZA = 1; DE = 5). Four participants (ZA = 2; DE = 2) never conducted experiments during their own post-school education. Regarding teacher training, 45% (9; ZA = 5; DE = 4) indicated not having been trained to conduct experiments with students, while 45% (9; ZA = 4; DE = 5) had been partly trained. Two lectures (10%; ZA = 1; DE = 1) indicated not having received any teacher training at all.

> Well, life experience, because I always try to carry out experiments that are as close to real life as possible. And the proper electrical engineering experiments I conduct, that's simply professional experience as an electrician or whatever. (L13, translated)

> No, I haven't been taught yet. What I did is I used my own knowledge [of] what I've learnt over the years and tried to … take some of the stuff that's in the book, for instance, and make an experiment out of that …. (L04)

Results of the category, Integration/RQ2 (223 codes)

To address the second research question, participants were asked about their use of technical experiments in school. Eight lecturers (40%; ZA = 5; DE = 3) reported using experiments in selected subjects (e.g. physics, metal technology and electronical engineering). Half (45%; 9; ZA = 3; DE = 6) of the lecturers used experiments to achieve specific objectives, such as introducing a problem or topic, illustrating basic principles or theory, or consolidating learning outcomes. Every sixth (15%; 3; ZA = 2; DE = 1) lecturer did not use experiments in class for three main reasons: because the syllabus did not include experiments, because there were no suitable technical experiments related to the teaching content and because there was no time. When asked where technical experiments could be integrated into the curriculum, five respondents (20%; ZA = 2; DE = 3) said they could be integrated *everywhere*, three (12%; ZA = 2; DE = 1) said they could be *partly* integrated, and one (4%; ZA = 1; DE = 0) said that they could be integrated *nowhere*. Eleven participants (44%; ZA = 5; DE = 6) referred to specific subjects (e.g. robotics, electronics, electrotechnology, electric machines, mechatronics, energy technology, strength of materials, control systems), while six (20%; ZA = 1; DE = 5) mentioned particular school types, for example three-year vocational college (*dreijähriges Berufskolleg*), technical college (*Fachschule für Technik*), technical secondary school (*Technisches Gymnasium*) and occupational programmes.

> In connection with the illustration of basic principles of technical system operations in class, experiments are used. (L17, translated)

> Basically, in all thematic areas – in some more, in some less. Here at the school, we place … great importance on the fundamentals, which is why more is done in that area, but, for example, one could also do experiments in other areas, that is, one could conduct experiments everywhere. (L19, translated)

According to the lecturers, experiments in vocational-technical education are conducted in classrooms, laboratories or workshops and are used in all three lesson stages. Regarding organisational structure, both student-centred and demonstration experiments are employed, with demonstrations being carried out either by the lecturer or with student participation. Student-led experiments are typically conducted in pairs or small groups. Ultimately, available time and materials largely determine the choice of organisational structure. While demonstration experiments are considered less time-consuming, student-led experiments are sometimes not feasible due to limited equipment. Consequently, opinions about the suitability of organisational structures vary considerably, as illustrated by the following quotes:

> They do it themselves. I actually do very little because … I can't really remember being in any way interested whenever someone was doing something up front. (L13, translated)

> I … rarely [include] student involvement because I've realised that it brings little benefit, since they also have additional lessons in the workshop … [where] they practise … separately. That's why I usually conduct the experiments myself. [This also avoids] any issues regarding safety concerns…. (L14, translated)

The selection of experiments was primarily guided by the current lesson topic and the defined learning objectives. Additional influencing factors included available resources, time constraints, group size and personal experience. Of the examples mentioned, 23 (66%) experiments can be assigned to the field of electrical engineering and three (8%) to mechanical engineering. Other experiments (9; 26%) originated from areas such as optics, thermodynamics, kinematics, first aid and firefighting. No examples were named related to the subject areas of construction engineering and computer science. The use of equipment ranged from self-made set-ups and everyday objects to videos, simulations, modular experiment kits, complete integrated systems, oscilloscopes connected to projectors and document cameras for visualising small experimental set-ups.

> …the decision is actually made mainly based on them [but] also based on the availability of the experiments. So, which ones, which resources are available to me? (L14, translated)

> Well, … I would bring a cup of coffee and milk and then the temperature would change because I have a thermometer in my glass. So, I would use that to show … [the students] that the temperature changes from that cold milk into the hot coffee and then it's equivalent at the end of the time. (L02)

Regarding the advantages of experiments, the learning effectiveness is emphasised 17 times (50%; ZA = 9; DE = 8) and the promotion of motivation and interest 12 times (35%; ZA = 1; DE = 4). Other advantages (15%; ZA = 1; DE = 4) are: linking theory and practice, understanding functionality, increasing clarity and 'just doing it, just trying things out and perhaps developing an appetite for the topic' (L19, translated). Reported disadvantages included the time required (41%; ZA = 4; DE = 9) and materials required (22%; ZA = 3; DE = 4). Additional challenges (25%; ZA = 3; DE = 5) included potential safety risks, technical problems and insufficient learning outcomes or limited suitability for different students' proficiency levels. Four participants (12%; ZA = 2; DE = 2) indicated that there were no disadvantages to using class experiments.

> Can there be a disadvantage? … I don't think there is a disadvantage [to] doing experiments or any practical [related to] a trade or [something similar]. … I only see [a] positive. (L04)

Results of the category: Learning objectives/RQ3 (40 codes)

To address the third research question, lecturers were asked about learning objectives associated with using experiments in class. The most frequently mentioned learning goal was the acquisition of *subject-specific knowledge* (33%; ZA = 5; DE = 8), followed by the development of *engineering-related ways of thinking and working* (30%; 12; ZA = 4; DE = 8). Other learning objectives, such as fostering *interest*, improving *problem-solving*, reducing *misconceptions* and strengthening *academic language* are named once or twice. Instead of linking learning objectives to the use of experiments, two lecturers considered them a 'means to an end' (L15, translated). No answer could be assigned to the category, *Nature of science and nature of technology*.

> [T]he experiments are … not directly linked to learning objectives but are rather like a … step in between to increase understanding and … to create an example situation, so that I can practically design an exercise which relates to the experiment. (L14, translated)

Summary, limitations and discussion

The study results are summarised below. In addition, its limitations are addressed and the entire work is discussed. In this way, similarities and differences relating to both countries are highlighted and implications for practice and research are outlined to reveal existing gaps in the professionalisation of TVET lecturers.

Summary

The central aim of this study was to generate exploratory and descriptive insights into the actual use of engineering-related experiments in vocational and technical education. Based on the individual findings, the three research questions can be briefly answered as follows:

- RQ1: The majority of South African and German TVET lecturers possess substantial knowledge regarding technical experiments, but this has been obtained mainly outside formal teacher training.
- RQ2: South African and German TVET lecturers primarily integrate experiments as a means to support learning and to foster motivation and interest. Although implementation is diverse, it depends largely on available resources (e.g. materials, personal experience) and institutional conditions (e.g. group size, time frame).
- RQ3: The learning objectives pursued by South African and German TVET lecturers through the use of technical experiments predominantly address *Subject-specific knowledge* and *Engineering-related ways of thinking and working*.

The cross-national comparison between the demographic data of the two participating countries reveals significant differences in the participants' professional profile (see Table 3). For instance, 70% of the South African participants do not have a university degree,

although all have completed formal vocational training. In contrast, 90% of the German participants hold a university degree, while only 50% have completed vocational training. This discrepancy is also reflected in the acquisition of experimental competences. Only three German lecturers mentioned university education and four South African lecturers formal in-service training as relevant learning contexts.

The cross-national comparison analysing the interview data reveals no significant differences between the two countries regarding knowledge, classroom implementation or contextual conditions. One possible explanation for this is that, despite their higher academic qualifications, German lecturers did not acquire specific competences for conducting technical experiments during their teacher training programmes. Consequently, the investigated categories can be considered as independent of systemic factors, thus enabling a combined analysis of the entire sample.

Future research could include a curriculum analysis to systematically identify the extent to which content related to technical experimentation is embedded in vocational teacher education. Another research consideration emerging from this exploratory comparison concerns the empirical validation of existing process and competence models for conducting technical experiments (for an overview, see the subsection, *Experiments in class*). The interview data indicate that the model proposed by Pahl (2013) is only partially reflected in the lecturers' statements.

Limitations

This exploratory comparative study has some limitations that must be considered when interpreting the results. In view of the small sample size, the transferability of the results to the entire teaching staff at TVETs is limited. Furthermore, the sample represents a positive selection, as only lecturers who volunteered to participate were included. This could mean that more committed lecturers, who are highly interested in learning methods concerning experiments, are represented, while sceptical or less-experienced lecturers remain under-represented. Additionally, the four subject areas, EE, ME, CE and CS, are not equally represented. A gender bias can also be observed. While 20% of the South African sample is female, this figure drops to 10% for the German sample. This unequal distribution does not reflect the actual ratio (Statistisches Bundesamt; DHET, 2017), which further limits the representativeness of the study's findings.

Discussion

The results regarding lecturers' knowledge (RQ1) show heterogeneous definitions of experiments, potentially owing to inconsistent definitions in literature and different subject-specific understandings (Philipp, 2013, pp. 16–18). The designation of the phases of experimentation aligned only partly with theoretical models by Schmayl (1982) and Pahl (2013), leaving it unclear whether discrepancies stem from limited knowledge or

divergent school practice. In total, 40% (8; ZA = 2; DE = 6) of participants could neither classify experiments nor distinguish between technical and scientific ones, while others failed to justify their responses with factual knowledge. The poor quality of explanations among those claiming to know the distinction further weakens cross-national differences. Not even half of the lecturers (35%; 7; ZA = 4; DE = 3) acquired knowledge of experiments through formal teacher training. The majority transferred their knowledge from other areas, such as their own vocational training. This indicates that systematic engagement with experiments is rarely incorporated into formal teacher training, resulting in inconsistent understandings of its definition, structure and pedagogical use. Zenda (2017) concludes in his South African study that further professional development is urgently required to strengthen lecturers' didactic and methodological competences, particularly regarding the effective implementation of teaching methods such as experimentation. Besides the named cross-national differences concerning the distinction between scientific and technical experiments, response patterns were largely comparable across both countries, thereby precluding country-specific conclusions.

Despite challenges such as lack of time, most lecturers (85%; 17) reported using experiments in class (RQ2). Besides lesson topics and intended learning objectives, external factors strongly influenced method selection, aligning with findings by Magadza and Mampane (2025). Consequently, the variations in implementation reflect the full range of approaches outlined by Girwidz (2020) and Pahl (2013), with additional perceived opportunities to integrate technical experiments throughout the curriculum. Differences arise in the rationale for organisational structure, where personal factors such as experience and convenience often outweigh pedagogical or didactic considerations. Regarding the frequency of naming exemplary experiments, it is noticeable that mainly electrical experiments are mentioned. Possible causes could be the subjects taught by the sample or the suitability of the subject for experimentation. The reported advantages of experiments closely mirror the four positive effects identified by Hartinger (2003), which are enhancement of understanding through visualisation, increasing motivation, fostering (scientific) reasoning and linking students' experiences to disciplinary methods. Cross-country comparison in the results of the second research question show that all German participants used experiments in class, whereas only 70% of South African lecturers did. The data provide no explanation for this disparity. The most frequent learning objectives associated with technical experiments (RQ3) are the acquisition of subject-specific knowledge (33%) and the development of engineering-related ways of thinking and working (28%), which aligns with previous studies (e.g. Karaböcek & Erb, 2014; Welzel et al., 1998). Rauner's (1975) observation that experiments are primarily used as instructional tools rather than to achieve learning outcomes is also reflected in participants' statements. The objective of fostering key competences through experiments (Bruchmüller & Haug, 2001) was not evident in this study's results.

In summary, the exploratory findings suggest that, while technical experiments are regarded as important by TVET lecturers, both structural (e.g. availability of material)

and individual barriers (e.g. insufficient professional training) limit their systematic use in vocational education. The results highlight the need to place greater emphasis on technical experimentation in teacher education. Expanding professional-development opportunities (e.g. see Van der Bijl & Taylor, 2018) and embedding experimentation more firmly in curricula could promote its sustainable integration into teaching and finally foster students' competence in conducting experiments.

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Visual literacy through multimodal learning: Implications for English First Additional Language teaching in the South African TVET sector

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ABSTRACT

This study responds to the growing demand for 21st-century skills in technical and vocational education and training (TVET), where traditional literacy is insufficient for engaging with multimodal communication environments. It foregrounds the importance of visual literacy (VL) as essential competence for students entering dynamic and complex workplaces. Despite this need, traditional textbook-based pedagogies remain prevalent in TVET colleges, limiting students' opportunities to develop critical VL analysis skills. The study explores how multimodal VL instruction can provide opportunities for learning among National Certificate (Vocational) NC(V) students in English First Additional Language (EFAL) classrooms. A qualitative and design-based research (DBR) approach was employed to mine data through focus groups, interviews, lesson observations and document analysis. Purposive sampling assisted in identifying 63 participants comprising NC(V) Level 2 EFAL students and their lecturers. The data from all the instruments were thematically analysed. Findings indicate both challenges and opportunities in developing VL in the EFAL curriculum at South African TVET colleges. The study concludes that students' difficulties in interpreting body language, facial expressions, cartoon frames, speech bubbles and typographic cues reveal that VL cannot be assumed as an innate skill but is socially and pedagogically mediated.

Keywords: Multimodal learning, visual literacy (VL), English First Additional Language (EFAL), technical and vocational education and training (TVET), National Certificate (Vocational)

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Introduction

Students' capacity to draw meanings from visual texts has become a critical skill (Romero & Bobkina, 2021), emphasising the importance of visual literacy (VL) education in developing students' ability to engage with visual materials for meaning. The concept of VL is not new, having been explored in literature as early as the 19th century (see, for example, Debes, 1969), and it refers to the ability to discriminate and interpret the visual actions, objects and symbols, whether natural or man-made, that individuals encounter in their environment (Debes, 1969, 185). In contemporary education, VL has gained considerable prominence in both teaching and learning contexts (Lundy & Stephens, 2015; Martínez-Cardama & Caridad-Sebastián, 2019; Matusiak et al., 2019; Romero & Bobkina, 2021). There is an emerging pedagogical shift in how VL texts are approached, with students expected to become viewers capable of interacting with both written and visual texts to produce multimodal meanings (Romero & Bobkina, 2021). Reflecting on this evolving perspective, Pena and Dobson (2021) regard VL as both a teachable skill and an innate semiotic activity. Similarly, the board of directors of the Association of College and Research Libraries (ACRL) (2011) highlights that scholarly engagement with images requires interpretation and analytical skills that should be integrated into the curriculum.

Proficiency in VL is widely recognised as a fundamental skill that empowers individuals and contributes to South Africa's broader educational and socio-economic development. However, many students enrolled in South African technical and vocational education and training (TVET) colleges lack the requisite VL skills needed to effectively interpret visual texts prescribed in the English First Additional Language (EFAL) curriculum for the National Certificate (Vocational) NC(V) programme. In the South African education system, English is studied as an additional language by the majority of students enrolled in TVET colleges, whose home language is not English. The intention is to develop proficiency in English as an additional language rather than as a first language. Thus, the NC(V) programme offered at TVET colleges with an EFAL curriculum comprises four language modalities: listening and speaking, reading and viewing, writing and presenting, and language and communication (DHET, 2014, p. 2). Among these, the reading and viewing modality, in which VL is taught, carries the highest weighting, accounting for 40% of the curriculum and approximately 30 notional teaching hours (DHET, 2014). This substantial allocation reflects the complexity of the knowledge and skills required for students to engage effectively with written and visual texts (DHET, 2014). One of the key subject outcomes of this modality requires students to 'read/view and assess visual texts and non-verbal forms of communication and formulate appropriate responses to the intended message' (DHET, 2014, p. 10). This outcome underscores the importance of developing students' VL competencies to enable them to interpret, analyse and respond critically to a wide range of multimodal texts encountered in both academic and everyday contexts.

To support the development of these competencies, DHET (2014) recommends exposing students to a diverse range of multimodal text types. These include, but are not limited to,

(a) visual texts such as comic strips and television advertisements; (b) film elements, including camera angles, shots, movement, framing and composition; (c) visual representations such as mind maps, flow charts and diagrams; and (d) non-verbal forms of communication, including body language and gestures (DHET, 2014, p. 25). These text types are inherently multimodal because they integrate multiple semiotic modes such as audio, visual, gestural, tactile, spatial, spoken and written texts for meaning-making (Magnusson & Godhe, 2019; Niu, 2022). Consequently, effective VL instruction requires students to interpret meaning across multiple modes rather than relying solely on written language.

The teaching of VL in the English curriculum has evolved considerably over time. Mbelani (2019) traces this development, arguing that VL has become increasingly significant in contemporary educational discourse, particularly in relation to debates surrounding the enduring legacies of apartheid and educational inequality in South Africa. Although VL was incorporated into the English curriculum during the 1970s, its implementation was shaped by the apartheid education system, which maintained racially segregated educational departments and prescribed different curricula for different racial groups (Msila, 2007). Consequently, students' access to VL instruction varied substantially according to the curriculum which was prescribed for them. VL was incorporated into the English First Language (EFL) curriculum, which was primarily designed for white students, but was excluded from the English Second Language (ESL) curriculum, which was predominantly offered to black students (Mbelani, 2019). These historical inequalities continue to influence curriculum implementation of VL in post-apartheid South Africa, particularly in under-resourced TVET colleges where many lecturers may have had limited opportunities for sustained professional development in VL, potentially affecting their ability to teach multimodal texts effectively.

Although VL is recognised as a fundamental component of the NC(V) EFAL curriculum, little is known about the pedagogical approaches employed by lecturers to develop students' VL competencies or about the challenges they encounter in teaching this aspect of the curriculum at TVET colleges in South Africa. This lack of empirical evidence highlights a significant knowledge gap and provides the rationale for the present study, which seeks to explore lecturers' pedagogical practices in the teaching of VL in the NC(V) EFAL programme. Therefore, this study responds to the following questions:

- What challenges arise when VL is taught and learnt in EFAL classrooms at TVET colleges?
- What opportunities exist for teaching VL using multimodal approaches in EFAL classrooms at TVET colleges?

The ability to deduce meanings from texts is a critical skill that students in TVET colleges have to master in the 21st century. Rather than just being text readers and writers, students of the 21st century are expected to become viewer–students who are capable of interacting with both written and visual texts to develop multimodal meanings (Romero & Bobkina, 2021). Students in South Africa and many other nations are continuously exposed to images in their daily lives

but they struggle to locate, interpret, assess, use and produce images and visual media (ACRL, 2011). Since English is the medium of teaching in the majority of schools, colleges and universities in South Africa, students who lack VL skills find it difficult to learn EFAL in TVET courses. In fact, there are a lot of images in English teaching materials, and the combination of images and text is evidence of new publishing systems and developing technologies worldwide (Ataie & Mohammadi, 2021). As a result, someone who lacks visual competences may feel alienated and powerless when navigating, discussing and interpreting visual texts.

In order to explain the fundamental pedagogical approaches that offer a framework for VL in the teaching of languages like EFAL content, researchers like Debes (1969) and others studied and developed theories that explain the foundational pedagogical approaches which provide a framework for VL in the teaching of languages such as English in second-language contexts (see Avgerinou & Pettersson, 2011; Golding & Verrier, 2020; Grape, 2020; Lim et al., 2021; Sibanda & Sibanda, 2013; Teane & Gombwe, 2023). VL in vocational education has not received much attention in South Africa. Students need to be viewers and interpreters of texts in addition to readers and writers; hence an investigation of the implications of multimodal learning of VL for the subject EFAL in TVET appears to be crucial. Similarly, Johnson (1977), who explored Debe's decision to promote photographic equipment as a tool for visual communication, raised a concern about the necessity of understanding the nature of VL, noting:

> Through Debes, Eastman Kodak Company became the sponsor of early visual literacy development. Their 'educational' periodical, Visuals are a Language, began using the term in 1967 and continued using it through 1973, usually as a marketing device to encourage teachers to sponsor 'visual communication' projects in which photography could be taught as a language arts and English activity (Johnson, 1977, p. 9).

Although VL is significant to both language arts and English, its meaning and implications have been debated for years because of this expressed concern. This has resulted in an increasing lack of clarity regarding the approaches that should be outlined in an EFAL subject specifically intended for a TVET context. In order to locate VL in the context of multimodal approaches in the EFAL curriculum, this article first presents a review of the literature. It critically engages with key scholarly perspectives on VL, multimodal learning, and teaching and learning in TVET environments by synthesising and aligning these insights with the objectives of the study. That is followed by an outline of the research methodology of the enquiry, a thematic discussion of its findings and the implications for EFAL development, and, finally, concluding observations.

Visual literacy in English First Additional Language TVET classrooms

Students are exposed to visual stimuli, making the ability to derive meaning from images an essential contemporary literacy skill. According to Romero and Bobkina (2021), traditional notions of literacy are no longer sufficient, as students must function as 'viewer–readers' capable

of constructing meaning across multiple modes. This shift has significant implications for English education, requiring an expanded pedagogical focus that integrates reading and viewing through the development of VL. The present study responds to this need by foregrounding the development of VL skills among TVET NC(V) students through structured analysis of cartoons and advertisements. The conceptual foundations of VL can be traced to John Debes (1969), who defined VL as a set of visual competencies developed through sensory integration. Subsequent scholarship has expanded this view, positioning VL as a cognitive and interpretive process involving the decoding, evaluation and creation of visual meaning (Golding & Verrier, 2020; Sibanda & Sibanda, 2013). The ACRL (2011) further conceptualises VL as a set of abilities that enables individuals to find, interpret, evaluate and create visual media, emphasising its importance in academic contexts where visual materials are increasingly pervasive. This broader conceptualisation reinforces the view of VL as an essential component of contemporary literacy, particularly in multimodal learning environments.

The growing prominence of VL is closely linked to the proliferation of visual media (Bautista & Gutierrez, 2022). However, existing literature is largely grounded in first-language contexts, limiting its applicability to EFAL settings, such as South African TVET colleges (Bautista & Gutierrez, 2022; Magnusson & Godhe, 2019). Although visual education is established in early schooling, it tends to diminish in higher education (Kędra & Žakevičiūtė, 2019), where text-based approaches dominate. This creates a disconnect between students' everyday engagement with multimodal content and their ability to interpret visuals in academic contexts. Among NC(V) Level 2 students, high exposure to visual content does not necessarily translate into well-developed VL competencies, particularly in the analysis of cartoons and advertisements, thereby necessitating targeted pedagogical intervention.

Romero and Bobkina (2021) emphasise that students must navigate meaning across both textual and visual modes, yet multimodal literacies remain underemphasised in classroom practice. While VL is recognised as essential for constructing multimodal meaning, it is still insufficiently taught, thereby justifying the need for structured instructional approaches. Avgerinou and Pettersson (2011) conceptualise VL as a holistic, learnable competence encompassing visual perception, language, learning, thinking and communication. The authors argue that, similar to verbal language, visual language possesses its own grammar, vocabulary and syntax, requiring students to decode meaning across both cognitive and affective dimensions (Avgerinou & Pettersson, 2011).

In this study, VL frameworks are used to support students' interpretation of cartoons and advertisements. The focus for cartoons is on elements such as facial expressions, body language, framing, typography and symbolism, in alignment with the ACRL (2011) standards. Prompts for the advertisements were aligned to the attention, interest, desire and action (AIDA) principle. The AIDA principle is a widely recognised framework in advertising theory that aligns with hierarchical models of consumer behaviour which conceptualise progression from awareness to purchase (Baber, 2022; Chaojie, 2015). In the context of TVET colleges, it is incorporated into the NC(V) Level 2 EFAL curriculum, including prescribed textbooks such as *Hands-on training: First additional language* (Wade et al., 2004),

where it functions as both an analytical and pedagogical tool to guide students in critically interpreting and producing advertisements.

Grape (2020) highlights the increasing dominance of visual media alongside the continued marginalisation of VL in formal education, despite its central role in cognition and interpretation. Visual processing plays a critical role in meaning-making, memory and interaction with the environment (Raiyn, 2016). These insights underscore the need for explicit VL instruction. Accordingly, our study foregrounds structured VL analysis frameworks to support students' engagement with cartoons and advertisements as complex multimodal texts.

This body of literature highlights both the importance of VL and the gaps in its implementation in EFAL classrooms, particularly in TVET contexts. While scholars emphasise the need for students to engage with multimodal texts, there remains limited evidence on how VL is effectively taught and what challenges arise in practice. These gaps directly inform the present study, which investigates the challenges associated with teaching and learning VL in EFAL classrooms, as well as the potential of multimodal approaches to enhance VL development.

Multimodal learning in TVET classrooms

The 21st century has witnessed a shift from monomodal to multimodal forms of communication, necessitating broader conceptions of literacy. Contemporary scholarship recognises literacy as extending beyond reading and writing to include the ability to interpret and produce meaning across multiple modes, including visual, auditory and digital forms (Lim et al., 2021; Sibanda & Sibanda, 2013). In this context, multimodal literacy has become essential for students navigating increasingly complex communication environments. However, VL remains underdeveloped in the South African TVET sector, particularly in NC(V) EFAL classrooms. 'Multimodality' refers to the use of multiple communicative modes such as images, gestures, speech and digital media, often engaging several sensory modalities simultaneously (Niu, 2022; Pan & Zhang, 2020). Initiatives such as the University of the Witwatersrand's multimodality project (Archer & Newfield, 2014) demonstrate the relevance of multimodal approaches in linguistically and culturally diverse South African classrooms, promoting pedagogies that accommodate multilingual realities.

As many students do not speak English as their first language, its predominance as the language of teaching and learning presents additional challenges. By incorporating visual and experiential elements into instruction, multimodal approaches offer alternative pathways to meaning-making and can enhance access and inclusivity. Such pedagogies have been shown to increase student engagement and improve reading competency while encouraging active participation (Pan & Zhang, 2020). Despite these benefits, significant challenges remain. Effective implementation is often hindered by teacher resistance, limited pedagogical knowledge and resource constraints (Niu, 2022). Concerns have also been raised regarding disparities in students' cultural capital, which may affect their ability to interpret multimodal texts (Stein & Newfield, 2014). Moreover, tensions persist between innovative instructional approaches and

traditional assessment practices that privilege written modes (Magnusson & Godhe, 2019). In response to these complexities, this study adopts a qualitative and design-based research (DBR) approach to explore how multimodal VL instruction can be effectively implemented in resource-constrained TVET contexts while addressing persistent pedagogical gaps.

Theories underpinning multimodality

Lim (2024) proposes the concept of intersemiosis, referring to meaning that emerges through the integration of multiple semiotic resources. While acknowledging the richness of combining modes, Lim (2024) also emphasises the importance of examining how these resources interact to produce meaning. The present study explores intersemiosis in NC(V) EFAL classrooms, where the integration of diverse semiotic resources for teaching VL remains underexplored in TVET colleges. Magnusson and Godhe (2019) argue that the analysis of multimodal texts should also consider mediation and affordances. 'Mediation' refers to the meaning potential of the different modes, while 'affordances' relates to what can be achieved through a particular mode based on its material and semiotic properties. Semiotic affordances are shaped by historical and social contexts, influencing how meaning is constructed. In English language teaching, teachers can still utilise images, audio clips and graphical representations to engage multiple communicative channels and stimulate students' senses, thereby enhancing engagement and participation (Pan & Zhang, 2020).

Expanding on this perspective, Stein and Newfield (2014) identify multimodal social semiotics as the dominant theoretical framework underpinning multimodal education. They define it as the study of how individuals use various modes, such as speech, writing, images, gestures and sound, as resources for meaning-making. Teaching and learning are inherently multimodal, as meaning is constructed through the interaction of these modes. However, this highlights a gap in TVET teaching practice, where it remains unclear how TVET lecturers fully utilise these semiotic resources to support learning through VL instruction. By examining how multimodal resources are integrated into VL lessons, this study investigates how different modes create layered and meaningful learning experiences, thereby supporting a deeper appreciation of VL.

Teaching and learning in the TVET environment

The shift from lecturer-centred to student-centred pedagogies in the TVET sector is increasingly recognised as a global imperative. International frameworks emphasise autonomous learning through innovative pedagogical models. For instance, Malaysia's competency-based Model of Pedagogical Reasoning and Action and Singapore's 'hands-on, minds-on, hearts-on' approach both foreground student-centred, task-oriented learning designed to meet 21st-century demands (Mohamed & Mohamoud, 2019; Tan & Seet, 2020). Similarly, in China, digital pedagogies such as flipped classrooms and game-based learning reposition lecturers as facilitators of learning rather than mere knowledge transmitters (Chen & Chan, 2024). Despite these advancements, challenges persist due to insufficient lecturer training and low student motivation.

In South Africa, policy interventions by the Department of Higher Education and Training (DHET) aim to enhance teaching quality in TVET colleges; however, entrenched lecturer-centred approaches, resource constraints and exclusion of lecturers from policy development limit effective implementation (Matabane et al., 2022). Additional challenges include diverse student academic backgrounds in NC(V) programmes and the use of English as the medium of instruction, which can exacerbate comprehension barriers and reduce classroom participation (Teane & Gombwe, 2023). Student-centred, multimodal pedagogies, grounded in social constructivist and heutagogical principles, offer potential to enhance engagement and accommodate diverse learning needs, thus aligning TVET education with contemporary educational and workplace demands.

The literature reviewed across VL, multimodal learning and TVET teaching practices highlights both opportunities and constraints in EFAL classrooms. While multimodal approaches offer inclusive and engaging pathways for meaning-making, persistent challenges such as lecturer-centred practices, limited resources and language barriers pose obstacles to effective learning. These insights directly inform the first research question, which investigates the challenges that arise when VL is taught and learnt in EFAL classrooms. Simultaneously, the potential of student-centred, multimodal pedagogies to enhance engagement and comprehension addresses the second research question, which examines the possibilities for teaching VL through multimodal approaches in EFAL classrooms. By exploring both the barriers and opportunities in the TVET context, this study seeks to provide practical strategies for improving VL teaching and learning.

Methodology

The present study was situated in an interpretivist world view and employed an inductive approach integrated with DBR in order to explore the challenges and opportunities of teaching and learning VL through the EFAL curriculum in South African TVET colleges. DBR, characterised by its iterative and cyclical nature (Tinoca et al., 2022), enabled collaboration between lecturers and students in the co-design and development of multimodal strategies to enhance VL among EFAL students. The DBR process was implemented in two cycles. In the first cycle, students completed cartoon analysis frameworks, interpreting visual elements such as facial expressions to infer characters' emotions. These artefacts served as data to evaluate the extent to which students could transfer VL skills beyond guided instruction. In the second cycle, students applied similar analytical frameworks to advertisements they selected. Prompts guided students to interpret visual features such as font, layout and symbolic elements, drawing on the AIDA principles (Chaojie, 2015).

An inductive approach to data collection and analysis was adopted to identify methods of data collection and analysis (Thomas, 2003). Qualitative data were collected through semi-structured interviews with three lecturers, three focus-group discussions comprising six participants each and lesson observations (Baker, 2006; Yulianti & Sulistyawati, 2021). All interviews and the focus-group discussions were conducted face to face on campus using a self-developed interview schedule (Adams, 2015). The sessions were audio-recorded and

transcribed verbatim for analysis. A purposive sampling strategy was used to select NC(V) Level 2 EFAL lecturers and students from one TVET college in South Africa (Campbell et al., 2018; Onwuegbuzie & Collin, 2007). Ethical clearance was obtained from the relevant institutional ethics committee as well as institutional gatekeepers. All participants provided informed consent and were assured of anonymity and confidentiality.

Data were analysed using thematic analysis following the six-phase framework proposed by Braun and Clarke (2006). Codes and categories were systematically developed to organise the data into meaningful patterns. The analysis was supported by ATLAS.ti software, which facilitated the management and organisation of large qualitative datasets (Soratto et al., 2020). Feedback on the analysis is reported in the findings below, in response to the research questions.

Findings

What challenges arise when VL is taught and learnt in EFAL classrooms?

Key themes that emerged from the qualitative data, as expanded on below, were related to the challenge of interpreting verbal and non-verbal cues, to technical understanding of cartoon analysis and to the lack of pedagogical practice. Students expressed significant difficulty in how to interpret 'body language' (1:10 ¶ 92; 2:19 ¶ 68; 2:59 ¶ 93) and 'facial expression' (2:7 ¶ 11; 3:24 ¶ 95; 4:9 ¶ 11; 5:29 ¶ 46) and in acquiring knowledge on 'how to answer questions about verbal and body language' (2:16 ¶ 236) as key semiotic resources in the analysis of cartoon and comic strips. Students acknowledged their challenges of interpreting cartoons and remarked, 'Sometimes you can't interpret the cartoons; it's hard' (2:19 ¶ 68), and 'We tend not to see maybe the body languages or interpret some of the cartoons' (3:24 ¶ 95). Lecturers shared this sentiment: 'They [the students] do not know how to work with cartoons, you know like facial expressions, body language, those things they don't understand most of them' (5:29 ¶ 46; 4:9 ¶ 11). Students' difficulties in interpreting cartoons corroborate Romero and Bobkina's (2021) emphasis of the critical importance of VL education.

The incorporation of VL education into the EFAL curriculum (ACRL, 2011; Mbelani, 2019) would better equip students with the skills required to engage critically with visual materials and construct meaning (Romero & Bobkina, 2021). In this study, students were often unable to determine whether a character was expressing happiness or sadness or to infer the intended message conveyed by the cartoonist through visual cues. One student shared the following:

> Facial expression on how to identify emotions of cartoons and how can we tell when a cartoon character is not happy, how to spot body language when the character is not interested in what is being said; also their interest or posture towards the conversation (3:13 ¶ 13).

From the observations, many students incorrectly responded to the question on how the cartoonist used the speech bubbles to indicate if the characters were shouting, thinking or

speaking. Students lacked the technical understanding of speech bubbles and their function in different contexts of the cartoon or comic strip. For instance, some students were unable to identify the number of frames in a comic strip or cartoon, while others struggled to interpret the meaning of speech bubbles when drawn in varied stylistic forms. Similarly, a smaller number of students could identify how the movement was depicted in a cartoon or comic strips they were analysing. The use of font to emphasise intensity or importance in characters' speech was also problematic. While some students recognised surface-level features such as bold or italicised font, they were unable to articulate the significance of the typographic choices in conveying tone, emphasis or characters intent. This finding resonates with scholarship that positions images as central to meaning-making (Avgerinou & Pettersson, 2011; Grabe, 2020). These authors argue that images function holistically, simultaneously conveying meaning and evoking emotional responses to interpret their environment. Instead, the findings suggest that VL operates as a socially and pedagogically mediated competence, rather than as an inherent skill. Students' interpretations were not only shaped by individual perception, but were also constrained by contextual and material factors, including the quality of the visual artefacts. This highlights how the design and selection of visual materials can either enable or hinder meaning-making processes.

This limited engagement must also be understood in relation to pedagogical practice. The lack of a structured approach to teaching cartoons was identified by students as a significant challenge, pointing to inconsistencies in how visual texts are mediated in the classroom. This suggests that the difficulty is not located solely within the students' interpretive abilities but is also shaped by how VL is taught. This aligns with literature (Mbelani, 2019; Niu, 2022) that points to pedagogical shortcomings in VL instruction. The absence of formal training in VL constrains some lecturers' capacity to teach VL content effectively, thereby limiting students' opportunities to develop critical interpretive skills. Consequently, the teaching of visual texts risks remaining fragmented and superficial, rather than being approached as a systematic and theoretically informed component of EFAL pedagogy in the TVET context.

However, Peña and Dobson (2021:1) posit that 'the first perception of VL is a set of skills and competencies which can be taught formally in the classroom', thereby foregrounding the role of explicit instruction in developing students' visual interpretive abilities. This perspective is reinforced by the findings of the present study, which reveal that students' challenges extend beyond emotional interpretation to include structural and semiotic features of visual texts. Participants explicitly attributed their misinterpretations to the use of unclear, black-and-white cartoons (1:32 ¶ 86), noting that such representations made it difficult to discern the emotions and the expressions. They believed that colourful cartoons might provide them with an idea of 'how a particular cartoon looks or how it reacts' (3:29 ¶ 114; 2:7 ¶ 11). Students further expressed the importance of colourful cartoons:

> Be able to tell if a person is laughing out of happiness or sadness, understand what a cartoonist tries to say using body language (1:10 ¶ 92; 3:34 ¶ 12).

> To know how to answer questions of verbal, body language and visual cues (2:59 ¶ 93; 2:16 ¶ 236).
>
> Facial expression on how to identify emotions of cartoons and how can we tell when a cartoon character is not happy, how to spot body language when the character is not interested in what is being said; also their interest or posture towards the conversation (3:13 ¶ 13).

Students' interpretations were not only shaped by individual perception, but were also constrained by contextual and material factors, including the quality of the visual artefacts. This highlights how the design and selection of visual materials can either enable or hinder meaning-making processes (Magnusson & Godhe, 2019; Niu, 2022).

What are the opportunities of implementing multimodal approaches for teaching Visual Literacy (VL) in English First Additional Language (EFAL)?

The findings were derived from the second cycle of the DBR approach aimed at evaluating the designed intervention. The VL analysis frameworks were perceived to have made a positive impact on the learning of VL by both lecturers and students. The incorporation of multimodal approaches enhanced students' comprehension of VL texts, as well as active participation (Pan & Zhang, 2020). As evidenced by the classroom observations, students engaged with audiovisual texts (2:17 10m 34s; 3:3 6m 6s; 1:10 48m 35s) and developed skills to interpret VL texts for meaning and identify gaps for further support (Lim, 2019; Magnusson & Godhe, 2019). Both students (1:32 ¶ 85; 2:26 ¶ 74) and lecturers (2:18 ¶ 44; 3:16 ¶ 48) noted improved VL examination performance post-intervention from the students who participated in the intervention. The implementation of VL analysis frameworks addressed the VL pedagogy gaps (Bautista & Gutierrez, 2022; Yeh & Lohr, 2010) by providing students with an essential structure to analyse VL text that would otherwise have been difficult to navigate without guidance (2:15 ¶ 50; 3:14 ¶ 41). Students shared that the frameworks provided them with structure, as they did not know where to begin analysing the VL texts without prompts and that the frames made it easier for them to interpret cartoon elements. The following extracts highlight the students' positive reflections:

> I wouldn't know where to start, the analysing … . (2:15 ¶ 50).
>
> Frames aided in advertisement analysis which provided a structured framework to evaluate element (1:29 ¶ 22).
>
> Frames provided a structured lens (1:31 ¶ 77),
>
> Help me to create my advertisement (3:60 ¶ 110).

Other students commented that the frameworks 'broadened the knowledge about advertisements' (1:30 ¶ 44), provided them with 'solid understanding of display, structure and principle of design' (1:5 ¶ 68) and also assisted 'by enlightening me with information' (2:20 ¶ 33).

Additionally, both lecturers and students indicated that the frameworks were beneficial in scaffolding VL analysis. They both confirmed that students performed better in the internal examination written immediately after the implementation of multimodal approaches. One lecturer attested, 'The group that we were doing the intervention with, they performed much better than all the other groups' (2:18 ¶ 44). Two other lecturers shared the sentiment, 'Mostly the "A" group that participated, this time their marks were better than the "B" group so maybe it influenced that' (3:16 ¶ 48), and 'it helped us during our exams as well…' (1:32 ¶ 85). This confirmation was further emphasised by the illustrations in Figures 1 to 3 as guided by the AIDA principle described in the following section. Permission to use the students' activities was granted.

The AIDA principle

The AIDA principle can be explained as follows:

Attention

Figure 1
Student-designed advertisement to address the attention principle

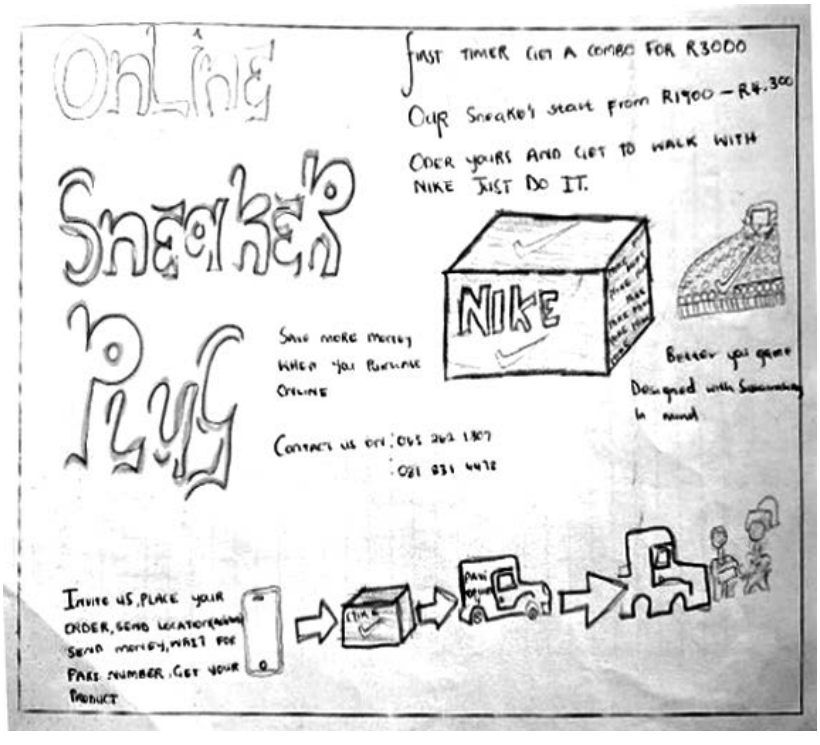


Figure 2
Student-designed advertisement to address the attention principle

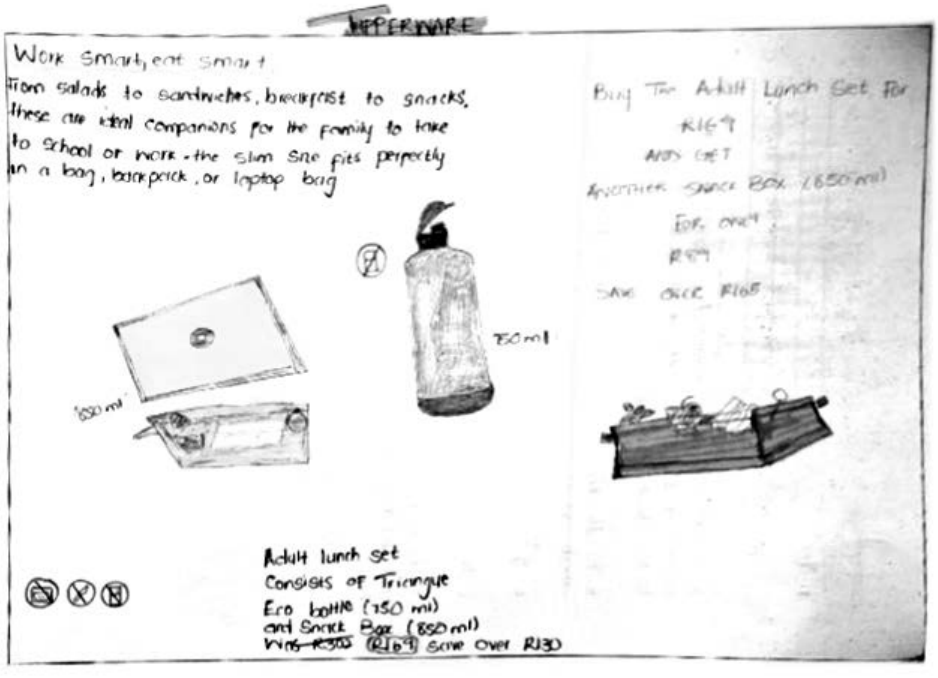


Figures 1 and 2 show how the student implemented the attention principle by employing colour and diverse font styles. In Figure 2, the student addressed the principle of a call to action through offering discounted prices on specific purchases and providing instructions on how to access the advertised goods. The student implemented the attention principle by employing colour and diverse font styles. The inclusion of images is expected to generate interest. The findings reveal that most students could respond correctly, guided by the prompt. For instance, students were prompted to identify how the font was used as a visual

aid to reinforce the message of the advertisement. Some students, although not discussing it in detail, identified that font in the analysed advertisements was used to 'attract customers' (3:17 ¶ 233), and 'used base font to make it stand out' (1:17 ¶ 194). Keeping the focus of visual reinforcement, students were prompted to comment on how the advertisements attracted the attention of the potential consumer. The same prompt was used to guide students towards presenting the same comment on the audiovisual advertisements that were displayed. Similar to the previous prompt, most students could identify the visual elements that attracted the attention of the reader or viewer. They successfully addressed the prompt on visual elements used to attract attention, as they explained: 'used visual elements like bright colours and bold' (1:19 ¶ 405), 'visual elements like font and pictures' (2:20 ¶ 368) and 'showing the car on the ad' (3:20 ¶ 629). This suggests that the use of the advertisement analysis prompts assists students to respond correctly to how the advertisement attracts the attention of the potential consumer for both the print and audiovisual advertisements.

Interest

Figure 3
Student-designed advertisement to address the interest principle



In Figure 3, the student addressed the principle of a call to action through offering discounted prices on specific purchases and providing instructions on how to access the advertised goods. The student employed colour and diverse font styles in the images to generate interest. Students

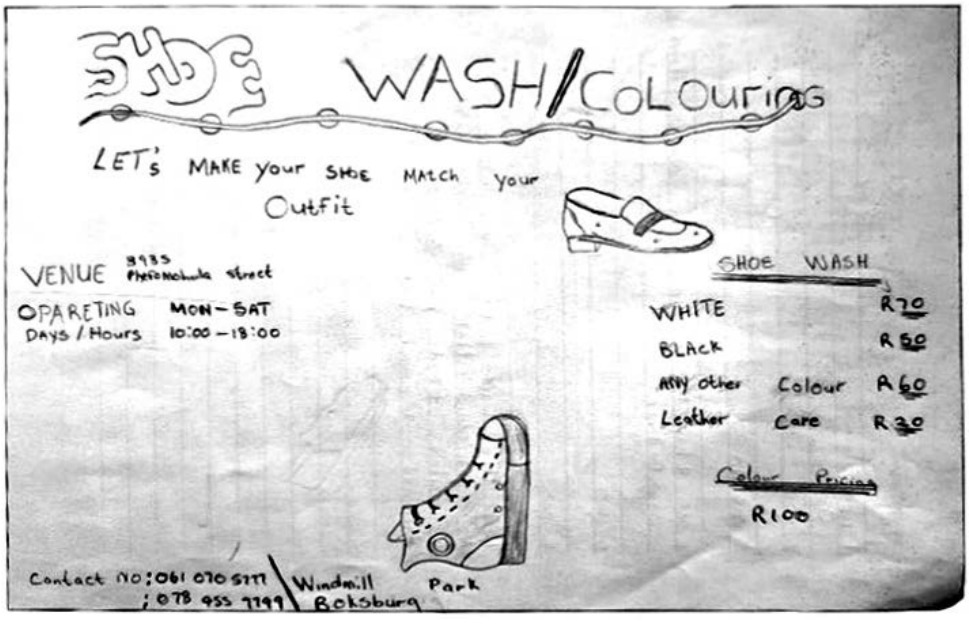
were prompted to discuss how the advertisement managed to sustain the attention of potential consumers. Some students were assisted by the prompt and provided correct descriptions of how the attention was sustained in both print and audiovisual advertisements. There were responses such as: 'attention sustained by mentioning the benefits of the product' (1:20 ¶ 452), 'through latest music and bright colours' (3:23 ¶ 702) and 'by using people that people like to see on TV' (2:21 ¶ 408). What has also possibly maintained the interest of the reader or viewer is whether the advertisement's content is relatable. Students were prompted to comment on the relatability of the advertisements in terms of facial expressions, body language, framing, typography and symbolism in line with the AIDA principle. Some students were able to indicate how the advertisements were relatable by stating, 'the make-up is expensive' (1:14 ¶ 580), while others could not indicate reasons for their interpretation (3:14 ¶ 880; 1:14; 2:15; 3:14).

Desire

Students had to use prompts to interpret how advertisements use various elements to evoke a sense of aspiration in potential consumers. Some students could link the images used to create desire by the advertisement: 'the car parked outside and ready to go and it is written the best or nothing' (1:23 ¶ 234), and 'the lady in the advert is smiling, showing that she is enjoying the aroma' (3:27 ¶ 360).

Action

Figure 4
Student-designed advertisement to address the action principle



The action principle addresses elements in the advertisement that encourage the reader or viewer to purchase the product or service. Figure 4 is relatable to students and the main message is clear. Relatability addresses the principle of sustaining the attention of the potential consumer. While students did not make use of colour, they were encouraged to draw on visual and textual resources that were readily available within their contexts, provided that these supported the application of the AIDA principle. The varied fonts and images attract the attention of consumers. Students also implemented the principle of a call to action by providing details of how to access the product and the event and by also providing prices for the service and the event being advertised. Students were able to identify how the advertisers encouraged a call to action such as through, 'get a big mac when you visit and register' (1:26 ¶ 322), 'call them to schedule a tour' (3:30 ¶ 490) and 'dial the USSD code to win your share of 100 000' (2:10 ¶ 322).

There were palpable improvements in the teaching and learning approaches by both lecturers and students upon the inclusion of multimodal texts. Lecturers explained that 'participation of the students were better in the [uhm] multimodal session' (1:6 ¶ 7). One of the lecturers expressed this thought: 'If I had to rate, I think it was good, because they were engaging, the engagement was there'. (2:2 ¶ 12) Lecturers explored more collaborative approaches and students' participation levels improved. Students' improved participation levels could be attributed to students enjoying the multimodal teaching approach (Niu, 2022; Pan & Zhang, 2020). Additionally, the inclusion of multimodal modes allowed students to express their positive feedback: 'I learned through discussions' (1:19 ¶ 49) 'with friends' (2:27 ¶ 31). Students were actively engaged and exercised critical thinking in the discussion of keywords (3:6 3m 54s, 9:3, 1).

Conclusion

The aim of the study was to explore how VL instruction can provide opportunities for learning among NC(V) Level 2 students in EFAL classrooms at South African TVET colleges. Drawing on the qualitative research approach supported by DBR, the study produced VL analysis frameworks such as the comic strips and cartoons analysis frame and the display advertisement analysis frame to guide students in the analysis and interpretation of visual texts. Within the context of TVET, the findings reveal a clear disconnect between students' everyday exposure to visual media and their ability to critically interpret and analyse visual texts in the EFAL curriculum. This relates to interpreting body language, facial expressions, cartoon frames, speech bubbles and typographic cues. These challenges are compounded by a lack of structured teaching approaches and limited formal training in VL, which constrain lecturers' capacity to scaffold students' interpretive abilities effectively.

In conclusion, this study has demonstrated that VL is no longer a peripheral component of language education but a core competency for students navigating multimodal communication environments in the 21st century. This gap is compounded by persistent lecturer-centred

pedagogies, limited pedagogical training in VL and resource constraints, all of which restrict meaningful engagement with multimodal texts.

Importantly, the study provides empirical evidence that multimodal approaches to VL instruction can significantly enhance students' comprehension and participation. The use of structured VL analysis frameworks enabled students to engage more confidently with complex visual texts, supporting both their interpretive skills and their ability to produce meaning across modes. These approaches not only scaffolded learning, but also fostered collaboration, critical thinking and increased motivation.

However, the effectiveness of these interventions is contingent upon systemic transformation. The findings underscore the need for sustained professional development for lecturers, deliberate integration of VL into the EFAL curriculum and the provision of appropriate multimodal resources. Without such support, VL instruction risks remaining fragmented and inconsistently implemented.

Ultimately, the study affirms that lecturer practices are central to cultivating students' multimodal meaning-making abilities. By embracing student-centred, multimodal pedagogies, TVET colleges can better prepare students for lifelong learning and the evolving demands of the contemporary workplace. Future research should extend this work across diverse TVET contexts to further refine pedagogical models and explore scalable strategies for embedding VL in vocational education.

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Educator agency and collaborative learning for sustainability in southern African TVET: A communities of practice perspective

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ABSTRACT

Technical and vocational education and training (TVET) has become important in efforts to advance sustainable development, but little attention has been given to how educators translate education for sustainable development (ESD) into vocational pedagogy. This study examines how educator-led Change Projects enacted ESD in selected TVET settings in southern Africa. A qualitative secondary document analysis was undertaken of seven Change Projects from Botswana, Namibia and Zimbabwe documented in the Sustainability starts with teachers (SST) evaluation report. The projects addressed entrepreneurship, community-service learning, engineering redesign, repair cafés, information and communications technology-supported teaching, industrial attachment through beekeeping, and water management engineering. Cross-case analysis identified three pedagogical orientations: participatory and community-engaged learning, curriculum innovation for sustainability, and experiential and practice-based learning. Interpreted through Wenger's Communities of Practice (CoP) framework, these orientations demonstrate how collaborative participation, negotiated educational purpose and shared pedagogical resources shaped educators' responses to sustainability. The study argues that educator agency is an interpretive social practice through which sustainability acquires vocational meaning in particular institutional contexts.

Keywords: Change project, communities of practice (CoP), education for sustainable development (ESD), educator agency, southern Africa, technical and vocational education and training (TVET)

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Introduction

Historically, technical and vocational education and training (TVET) has been associated primarily with occupational preparation, employability and economic development (Allais, 2022; McGrath, 2012; McGrath et al., 2020). While these remain central purposes, contemporary ecological and social challenges have expanded expectations of TVET to include climate change, sustainable livelihoods, resource use and social justice (Marope et al., 2015). Reflecting this shift, Moso-Díez et al. (2025, p. 340) identify sustainability in TVET as a 'critical area of research'. In Africa, this expanding agenda has prompted renewed attention to the educational purposes of TVET. Majola (2026a; 2026b) challenges narrowly employment-centred conceptions of vocational education by emphasising agency, participation and socially responsive pedagogy. He argues for TVET that develops 'reflective, critically conscious citizens' (Majola, 2026b, p. 529). These developments highlight the need to understand how educators interpret sustainability in curriculum, pedagogy and assessment, since it is through their professional practice that sustainability aspirations acquire educational meaning.

The post-2015 sustainability agenda has bolstered this expectation. Sustainable Development Goal (SDG) 4.7 calls for students to develop the knowledge, skills, values and dispositions required to contribute to sustainable societies (UNESCO, 2017). In sub-Saharan Africa, Monk et al. (2023) similarly position TVET as an important praxis arena for environmental learning, sustainability innovation and livelihood development while cautioning against viewing vocational education as an autonomous solution to structural social and environmental challenges. Their analysis in the Ugandan context directs attention towards the situated processes through which educators translate sustainability into vocational learning.

This study examines those processes through the Sustainability Starts with Teachers (SST) programme, a partnership between UNESCO's Regional Office for Southern Africa and Rhodes University's Environmental Learning Research Centre implemented across 11 southern African countries (De Souza, 2024; Lotz-Sisitka et al., 2022). Using qualitative secondary document analysis, the study analyses seven educator-led TVET Change Projects from Botswana, Namibia and Zimbabwe involving entrepreneurship, community-service learning, engineering redesign, repair cafés, information and communications-supported learning, industrial attachment through beekeeping and water management engineering. The study examines how educators enacted education for sustainable development (ESD) through documented pedagogical, curricular and assessment practices.

The analysis is informed by Wenger's (1998) CoP framework, which provides a lens for understanding how collaborative professional learning shaped these initiatives. Cross-case analysis identified three pedagogical orientations: participatory and community-engaged learning, curriculum innovation for sustainability, and experiential and practice-based learning. These orientations are interpreted through the concepts of mutual engagement, joint enterprise and shared repertoire in order to explain how sustainability-oriented pedagogical knowledge was collaboratively developed. The study asks: How do educator-led

Change Projects enact ESD in southern African TVET and how does a CoP perspective explain the collaborative learning processes underpinning participatory and community-engaged learning, curriculum innovation for sustainability, and experiential and practice-based learning? The study argues that educator agency is expressed through the collaborative interpretation of sustainability in particular vocational contexts. Instead of implementing ESD as a predetermined agenda, educators negotiated locally meaningful pedagogical responses that connected sustainability with disciplinary knowledge, curriculum, assessment and workplace practice. The study contributes an educator-centred account of how collaborative professional learning shapes the situated enactment of sustainability.

Literature review

The relationship between TVET and sustainable development has attracted substantial scholarly and policy attention over the past two decades. Earlier conceptions of TVET were shaped strongly by employment, occupational competence, industrialisation and economic growth (Akoojee, 2016; Allais, 2022; McGrath, 2012). These purposes remain important in societies confronting unemployment and skills shortages, but climate change, ecological degradation, inequality and insecure livelihoods have enlarged the educational questions associated with work. Moso-Díez et al. (2025) reviewed research published between 2003 and 2024 and retained 82 publications after applying relevance and quality criteria. Their analysis characterises sustainability in vocational education and training (VET) as multidimensional and 'often approached in a fragmented way' (Moso-Díez et al., 2025, p. 340). Research on TVET is therefore substantial, although its conceptual emphases are dispersed across economic, social and ecological interpretations.

Economic perspectives often connect TVET with green jobs, labour market adaptation, new occupations and the capabilities required in changing production systems. Social perspectives emphasise inclusion, equity, citizenship and human development, while ecological perspectives give greater attention to environmental knowledge, sustainability competencies, curriculum, pedagogy and institutional practice (Moso-Díez et al., 2025). These distinctions intersect in vocational education. Occupational competence involves technical knowledge, material judgement, ecological consequences and social responsibility. Sustainability therefore concerns the substance and purposes of vocational knowledge. A strict opposition between employability and sustainability is conceptually inadequate because employment occurs within ecological, social and economic relations. McGrath and Powell (2016) locate TVET in a wider human-development perspective, while Ramsarup et al. (2024) connect vocational learning with sustainable futures. Moso-Díez et al. (2025, p. 342) similarly identify approaches in which sustainability enters 'the curriculum, pedagogy, and institution'.

The SDGs strengthen this wider educational orientation. SDG 4.7 identifies knowledge, skills, values and dispositions associated with sustainable development, human rights, gender equality, peace, global citizenship and cultural diversity (UNESCO, 2017). Green-skills research adds occupational concerns associated with climate mitigation, changing energy

systems and environmentally responsible enterprise (De Otero, 2019; International Labour Organization (ILO), 2019, 2022). TVET is consequently expected to connect occupational preparation with ecological and social responsibility. African research has contributed substantially to this reconceptualisation. Monk et al. (2023) present TVET as an important undertaking for environmental learning and sustainability innovation, especially where livelihoods are exposed to ecological disruption. Their analysis also cautions against assigning education an autonomous capacity to solve structural environmental and socio-economic problems. Educational initiatives operate in political–economic conditions and within institutional resource constraints, social inequalities and unequal access to productive opportunities.

This caution establishes an important principle for analysing educator-led change. Local pedagogical experimentation may reveal possibilities for sustainability-oriented TVET without demonstrating transformation of institutional systems, policies or professional identities. Evidence of situated practice must therefore be distinguished from claims of systemic change. The distinction is methodological, but it is also conceptual because educational change occurs across different levels and timescales.

Sustainability policy acquires educational substance through interpretation. Curricula may prescribe competencies, institutional policies may endorse ESD and international frameworks may define broad ambitions, but educators decide how these aspirations encounter particular subjects, students, workshops, assessment practices and local problems. Educator agency therefore occupies an intermediary position between policy language and educational experience. Moso-Díez et al. (2025) identify curriculum development, teacher training, professional development, pedagogical practice, institutional sustainability and student consciousness among established areas of research. Their review confirms that educators are present in the literature. The unattended issue concerns how their collaborative professional activity becomes a praxis where sustainability is interpreted, pedagogically reconstructed and translated into vocational practice.

Recent critical TVET research amplifies the importance of agency. Majola (2026a) argues that vocational education should engage critical consciousness, social responsibility and structural questions alongside occupational preparation. Majola (2026b) critiques policy narratives centred narrowly on economic growth, employability and labour market alignment and calls for greater attention to participation, human development and critical consciousness. These arguments raise a further question: what forms of educator learning make such pedagogies possible? ESD is not self-executing. Educators in engineering, entrepreneurship, information and communications technology (ICT) and other vocational fields must interpret sustainability through disciplinary knowledge and make decisions about learning activities, assessment, resources and relationships together with workplaces or communities. These decisions involve professional judgement and often require negotiation with colleagues because curriculum, assessment and institutional routines are socially organised.

Fullan (2016) places educator agency in broader accounts of educational change, while transformative learning discourse emphasises critical reflection, dialogue and the reconsideration of established assumptions (Cranton & Taylor, 2011; Mezirow & Taylor, 2009). These perspectives are relevant because sustainability may be encountered either as additional content or as a problem that calls existing practices into question. The second possibility makes educator learning central to curriculum change. Monk et al. (2023) add an epistemic dimension through their discussion of participation, knowledge and informal learning networks. Their work shows how vocational learning can become connected with community needs, livelihoods and environmental innovation. Expertise does not flow only from institution to student; communities, students and educators also contribute occupational, ecological and experiential knowledge.

Educator agency is therefore best understood as the situated capacity to interpret problems, exercise pedagogical judgement, work with others and construct educational responses in enabling and constraining institutional conditions. Collaboration becomes important because sustainability problems cross disciplinary and institutional boundaries. Professional dialogue, experimentation and exchange create spaces where new pedagogical meanings can be negotiated. The SST programme illustrates this through Change Projects that invited educators to develop responses involving curriculum, pedagogy, assessment and institutional practice (De Souza, 2024; Lotz-Sisitka et al., 2022; Van Staden & Lotz-Sisitka, 2023). Their conceptual significance concerns what they reveal about learning through collective educational practice. Collaborative experimentation should, however, be distinguished from institutionalisation. A new teaching activity, assessment routine or community partnership may constitute evidence of pedagogical innovation without proving durability, diffusion or incorporation into formal policy. An educator's report of changed thinking may likewise indicate professional learning without substantiating completed professional identity transformation. Educators work in curricula, qualification structures, institutional hierarchies, resource conditions and policy expectations. Collaboration may enlarge what they can imagine and attempt, but innovation remains shaped by these structures.

The literature also cautions against romanticising local agency. Sustainability initiatives encounter unequal institutional capacity, financial constraints, curricular rigidity, infrastructure shortages and uneven participation (Allais, 2022; Rosenberg et al., 2020; Tikly, 2019). Global sustainability concepts may provide common direction, but their educational meaning remains incomplete until interpreted through local ecological conditions, labour markets, communities and institutional histories. Tikly (2019) warns against reform models detached from African socio-economic realities, while Monk et al. (2023) connect environmental learning with livelihood formation and community futures. The just-transition literature adds that green economic change requires new occupational capabilities, while also raising questions of inclusion, distributive justice and social participation (ILO, 2019, 2022).

The literature therefore presents TVET as an expanding field with substantial work on sustainable development, green skills, social justice, curriculum reform, student agency, institutional constraints and the purposes of vocational education. Educator development and pedagogical practice are also recognised. One of the remaining knowledge gaps concerns how TVET educators collectively interpret ESD, construct pedagogical responses and generate situated professional knowledge through collaborative practice in southern African institutions. The present study addresses this gap through secondary qualitative analysis of seven educator-led SST Change Projects in Botswana, Namibia and Zimbabwe. Wenger's (1998) CoP framework provides the conceptual basis for interpreting collaborative educator learning and the pedagogical enactment of ESD.

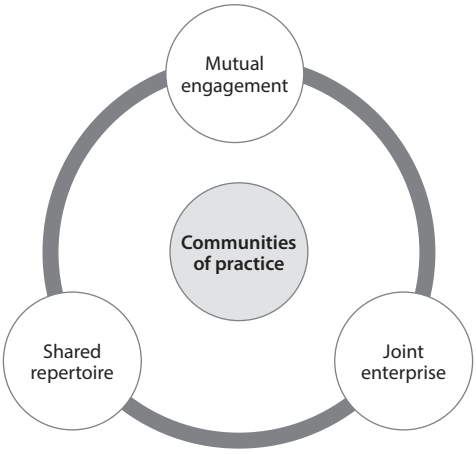
Theoretical framework

This study is informed by Wenger's (1998, 2000) CoP theory, which provides the conceptual basis for examining how TVET educators collectively interpreted ESD and translated it into pedagogical practice in the selected SST Change Projects. Wenger conceptualises learning as participation in social practice through which meaning, knowledge and practice are constructed collectively rather than acquired individually. This perspective is particularly appropriate because the study is concerned with educator collaboration around curriculum, pedagogy and sustainability, not with measuring programme outcomes or institutional performance. The interest therefore extends beyond identifying what educators did to understanding how collaborative professional activity contributed to the emergence of particular pedagogical responses to sustainability.

CoP theory offers an important departure from individualistic understandings of professional learning because it positions knowledge as something produced through participation in shared practice. Learning develops through interaction among people working around common concerns, where meanings are negotiated and practical responses evolve over time (Wenger, 1998). Such a perspective is especially relevant to sustainability education because ESD presents educators with complex educational questions that cannot be resolved through technical expertise alone. Sustainability introduces ecological, economic and social concerns that intersect with disciplinary knowledge, occupational practice and institutional priorities. Educators therefore engage in an interpretive process through which broad sustainability aspirations acquire pedagogical meaning in particular vocational contexts.

Wenger (1998) identifies mutual engagement, joint enterprise and shared repertoire as the defining dimensions through which CoP develop. These concepts provide a coherent explanation of collaborative professional learning and educator agency in the present study. Figure 1 shows the CoP framework.

Figure 1
Communities of practice theory



Mutual engagement directs attention to participation as the foundation of professional learning. Learning occurs through interaction among colleagues, students and other participants as educators exchange ideas, negotiate challenges and reflect on shared experiences. Sustainability learning is closely associated with interactions, particularly where educators collaborate around curriculum innovation, community engagement and practical sustainability problems. However, participation should not be interpreted as inherently harmonious. Contu and Willmott (2003) argue that CoP can obscure relations of power, exclusion and inequality, while Li et al. (2009) similarly caution against assuming that collaborative learning develops uniformly across organisational settings. These critiques are particularly relevant in southern African TVET, where institutional authority, resource constraints and unequal opportunities influence who participates and whose interpretations gain recognition. Mutual engagement therefore surfaces both the possibilities and limitations of collaborative professional learning.

Joint enterprise complements this perspective by explaining how educational purposes emerge through collective interpretation. Wenger (1998) argues that participants develop shared enterprises through negotiation rather than through simple acceptance of externally prescribed objectives. This insight is especially significant for ESD because sustainability does not enter vocational education as a fixed curriculum package. Although international frameworks such as SDG 4.7 articulate broad aspirations for sustainable development (UNESCO, 2017), educators remain responsible for interpreting what those aspirations mean in engineering, entrepreneurship, ICT, community-service learning or other vocational fields. Sustainability consequently acquires educational significance through disciplinary judgement and contextual interpretation. The CoP framework therefore explains how broad policy ambitions become meaningful through collective professional interpretation without assuming that identical understandings emerge across institutions.

The third dimension, shared repertoire, extends this argument by directing attention to the pedagogical resources that develop through collaborative practice. Wenger (1998) describes repertoire as the routines, concepts, tools, procedures and artefacts that communities create through participation. Sustainability-oriented professional learning becomes educationally significant when it produces practices that can organise teaching, curriculum or assessment. The Change Projects generated examples of such resources. These pedagogical products demonstrate how collaborative learning can acquire practical educational form. Their existence, however, should not be interpreted as evidence of institutionalisation or enduring organisational change. Contu and Willmott (2003) and Li et al. (2009) caution that communities may generate valuable practices without overcoming wider structural constraints. Questions of institutional authority, policy support, resource availability and organisational sustainability remain analytically distinct from the collaborative production of pedagogical knowledge.

The value of CoP in this study therefore extends beyond describing educator collaboration. It provides an explanation of how professional learning, negotiated educational purpose and pedagogical practice become interconnected. Mutual engagement explains participation as the social condition through which educators learn with colleagues and other participants. Joint enterprise explains how sustainability problems are interpreted and transformed into shared educational concerns. Shared repertoire explains how those negotiated understandings become embodied in curriculum, pedagogy, assessment and practical educational resources. Collectively, these concepts emphasise collaborative educator learning as a process through which sustainability is translated into vocational practice.

Meanwhile, Wenger's broader theory associates participation with identity formation. This insight remains theoretically important, but the present study adopts a deliberately bounded interpretation. The documentary evidence contains participant accounts of changed perspectives, greater awareness of sustainability and altered pedagogical thinking. These accounts provide evidence of reported professional learning and pedagogical reorientation. They do not establish enduring professional identity transformation because the available material does not document sustained changes in participation, professional recognition or self-understanding over time. This distinction preserves the explanatory value of Wenger's theory while aligning interpretation with the evidentiary limits of the study.

Within these boundaries, CoP theory offers a conceptual framework for understanding educator agency in sustainability-oriented TVET. It explains how collaborative participation, negotiated educational purpose and emerging pedagogical resources intersect in the social production of vocational knowledge. The framework therefore enables the study to explain how collaborative professional learning contributed to contextually meaningful enactments of ESD in the participating southern African TVET institutions.

Research design and methodology

This study employed a qualitative interpretive design based on secondary analysis of documentary evidence. The purpose was to examine how educator-led Change Projects represented and enacted ESD in TVET and to interpret the collaborative professional learning reflected in these documented practices. A qualitative approach was appropriate because the study sought to understand pedagogical meaning, educator learning and the interpretation of sustainability in particular institutional contexts instead of measuring programme outcomes or testing predetermined relationships (Creswell & Guetterman, 2025).

The study draws on documentary material contained in *Stories of leadership in education for sustainability: Communities of practice generating change for the common good in tertiary education institutions in eleven countries in southern Africa* (UNESCO & Rhodes University, 2023), an evaluative synthesis of the SST programme. Consequently, the research is best characterised as qualitative secondary document analysis. Document analysis views documents as socially produced sources that provide insight into practices, meanings and institutional processes while recognising that they are themselves products of particular purposes and contexts (Bowen, 2009; Morgan, 2022). The SST report combines project descriptions, participant reflections, interview extracts, institutional information and evaluative commentary. These materials constitute a single documentary corpus that had already been selected, edited and contextualised during programme evaluation. The study therefore analyses documentary representations of educator practice, not raw field data.

The SST programme was implemented through a partnership between UNESCO's Regional Office for Southern Africa and Rhodes University's Environmental Learning Research Centre across 11 Southern African countries. Change Projects formed the principal mechanism through which educators identified sustainability challenges in their own institutions and developed responses involving curriculum, pedagogy, assessment, institutional practice or engagement beyond the institution. For this reason, the Change Project, rather than the individual educator, constitutes the primary unit of analysis. Individual quotations are interpreted as educators' reported understandings in particular projects and are analysed alongside project descriptions. They are not used as independent participant cases from which broader claims about educator populations can be inferred.

The documentary corpus contains 138 initiated Change Projects, of which 134 recorded progress. This study examines seven purposively selected TVET cases from Botswana, Namibia and Zimbabwe. These cases were chosen because they met three criteria. First, each project had an explicit TVET or vocational orientation. Second, the documentary evidence provided sufficient detail to identify the sustainability problem being addressed together with the associated pedagogical, curricular or practice-based response. Third, the selected cases represented contrasting forms of ESD enactment, including entrepreneurship education, community-service learning, engineering redesign, repair-based circular economy practices, ICT-supported teaching, industrial attachment and water-management

engineering. Botswana, Namibia and Zimbabwe were selected because they belonged to earlier SST cohorts for which relatively mature documentary accounts were available, although they do not represent the only countries in the programme that undertook TVET-related work. The study therefore constitutes a purposively bounded comparative analysis designed to explore conceptual variation across cases rather than to provide a regional survey or representative sample.

The selected cases also provide sufficient diversity to examine how sustainability acquired different educational forms across vocational settings. The Botswana cases focused on entrepreneurship education, community-service learning and engineering responses to greenhouse gas emissions. Namibia contributed a repair-café initiative centred on circular-economy principles, waste streams and practical fabrication. Zimbabwe included ICT-supported formative assessment, industrial attachment linked to beekeeping, and engineering responses to water loss. These cases illustrate variation in vocational fields, sustainability concerns and pedagogical approaches while maintaining a coherent focus on educator-led ESD practice.

Ten educator quotations reproduced in the SST report were available across the seven Change Projects. These educators were not independently sampled for the present study. Their reflections were included because they formed part of the documentary source and were directly associated with the selected projects. Where the report provided detailed participant reflections, the analysis explored educator learning and pedagogical interpretation more fully. Where quotations were limited or absent, interpretation relied primarily on project descriptions. This distinction ensured that claims remained proportionate to the available evidence.

The documentary source also required careful consideration of evidentiary status. The report was compiled from multiple programme documents, including formative and final evaluation reports, annual reports, policy dialogue material, field visit documentation and Change Project records. It should therefore be understood as an authored synthesis. Project narratives provide evidence of reported activities, participant quotations provide insight into educators' interpretations and evaluative commentary supplies institutional context. Meanwhile, decisions regarding which projects, quotations and outcomes were included reflected the purposes of programme evaluation. The analysis therefore recognises that the available evidence is necessarily selective and cannot be assumed to represent every participant's experience or every dimension of each Change Project.

The analytical process combined thematic analysis with theoretically informed interpretation. Braun and Clarke's (2006) approach guided the identification and refinement of recurring patterns across the seven cases, while reflexive interpretation (Alvesson & Sköldberg, 2017) informed movement between documentary evidence, theoretical concepts and the wider TVET and sustainability literature. The first stage examined each Change Project individually to identify the sustainability problem addressed, the vocational context, the pedagogical response, educator and stakeholder participation, reported professional learning and

documented constraints. Cross-case comparison then identified three recurring pedagogical orientations: participatory and community-engaged learning, curriculum innovation for sustainability, and experiential and practice-based learning.

Wenger's (1998) CoP framework informed the second stage of interpretation. Instead of determining the empirical categories in advance, the framework was used to explain the collaborative learning processes associated with the three pedagogical orientations identified during thematic analysis. Mutual engagement provided a lens for understanding participation and collaborative learning, joint enterprise illuminated how sustainability problems acquired shared educational meaning and shared repertoire explained how collaborative activity generated pedagogical practices, curriculum adaptations and assessment resources. The framework therefore functioned as an interpretive rather than classificatory device, connecting observed pedagogical patterns with broader processes of social learning.

Throughout the analysis, participant quotations were interpreted together with the Change Projects to which they referred. Individual quotations were not used as independent proof of project outcomes or institutional change. Instead, they were considered alongside project descriptions, institutional context and patterns emerging across other cases. Greater analytical weight was assigned to cases supported by multiple participant reflections, while projects documented primarily through descriptive accounts were interpreted more cautiously. Table 1 shows the analytical scope of the study.

Table 1
Analytical scope of the study

Country	Institution code	Focus of Change Project	Quoted educator code(s) available in the source report
Botswana	A	Entrepreneurship/business education	A1, A2
	B	Community-service learning	B3, B4
	C	Engine redesign/reduction of greenhouse-gas emissions	C5
Namibia	D	Local green-skills repair cafés	D6, D7
Zimbabwe	E	ICT-supported teaching and formative assessment	E8
	F	ESD in industrial attachment, including beekeeping	F9
	G	Leak detection and water management/engineering	G10*

** Where a direct quotation relevant to the specific project activity is absent or limited in the source report, the analysis relies on the project description and does not attribute claims to participant testimony.*

The study also required explicit reflexivity because of my prior involvement in the SST programme. Participation in programme implementation provided contextual familiarity that informed interpretation but also created the possibility of reproducing programme assumptions or preferring favourable accounts. Reflexivity therefore became an ongoing analytical practice. Interpretations were checked against the documentary evidence, distinctions were maintained between participant testimony and evaluative description, and attention was given to reported constraints, uneven participation and institutional limitations alongside successful examples (Berger, 2015; Greene, 2014). Nevertheless, complete analytical distance cannot be claimed and this proximity remains part of the conditions under which the study was produced.

Ethically, the study relied exclusively on documentary material generated through the SST programme and did not involve new interviews or additional participant recruitment. Institution and participant codes were used to avoid unnecessary identification of individuals and quotations were reproduced only as they appeared in the source report. Individual reflections are interpreted as situated accounts of educator experience and are not presented as evidence of institution-wide attitudes, regional patterns or professional change (Locke et al., 2013).

Several limitations define the scope of interpretation. The study draws on a programme-generated documentary source in which project narratives and participant quotations had already been selected for evaluative purposes. The analysis therefore cannot recover omitted experiences or provide independent corroboration of reported activities. The documentary corpus offers uneven levels of evidence across cases, limiting equivalent comparison and preventing strong claims about long-term professional learning, institutional embedding or programme impact. As a purposively selected sample, the seven Change Projects are not representative of TVET institutions or SST initiatives across southern Africa. Their value lies in the conceptual insights they provide into educator learning, collaborative practice and the pedagogical enactment of ESD in particular institutional settings.

Research findings

The findings are drawn from secondary analysis of seven educator-led Change Projects undertaken in TVET institutions in Botswana, Namibia and Zimbabwe. Cross-case comparison identified three pedagogical orientations through which ESD was enacted: participatory and community-engaged learning, curriculum innovation for sustainability, and experiential and practice-based learning. These orientations emerged from the documentary evidence across the seven Change Projects. Participant quotations illustrate educators' reported experiences, while project descriptions provide documentary evidence of pedagogical, curricular and assessment practices. Because the documentary evidence varies across the cases, stronger claims are made only where the source report provides sufficient support.

Participatory and community-engaged learning

Participation formed a prominent feature of the documented Change Projects. Across the selected cases, educators organised learning through collaboration with students, colleagues and, in several instances, community partners. Participation therefore extended beyond classroom interaction to include shared planning, community engagement, professional learning and collaborative implementation of sustainability-related activities.

At Institution A in Botswana, the entrepreneurship Change Project initially concentrated on developing collaboration among members of the educator group before extending activities to students through entrepreneurship, office administration and accounting workshops. The project report indicates that the collaborative organisation of the educator group preceded wider student engagement. Reflecting on this experience, the project leader stated: 'It has made me know that[,] for the implementation of my change project, I need to engage students. Also[,] I should start with a group that I will be able to influence.' (A1) A second educator described the personal significance of participating in the project: 'It has changed my mindset, [that is,] the perspective [from] which I have been looking at things.' (A2) The documentary account also records that collaborative reflection generated what participants described as 'out-of-the-box' thinking and supported the development of new ideas during the project.

Participation extended beyond institutional boundaries in the community-service learning project at Institution B. The project integrated community engagement into a course module by organising students into four vocational groups representing accounting, hairdressing, tourism and agricultural economics. Each group undertook a needs analysis with community organisations relevant to its field. The accounting students worked with a primary school fundraising committee, the hairdressing students collaborated with salon entrepreneurs on health and safety, tourism students engaged a village development committee around a recreational park and agricultural economics students explored waste-related income opportunities with community stakeholders, including city council employees. An educator reflected that the initiative complemented curriculum developments already taking place in the institution: '[The institution] was in the process of infusing community-service learning as part of the teaching approaches; this [SST] training has come at the right time.' (B3). Another participant reported changes in classroom practice: 'I now teach with an open mind, including ecological aspects … to be included in my teaching.' (B4)

Institution D in Namibia also organised participation around collaborative activity through local repair cafés that involved trainers and students in repairing and repurposing discarded materials. The project documentation records activities involving wood, metal, rubber, batteries, oil and paper together with the fabrication of instructional aids from recycled materials. The initiative also established professional networks among TVET practitioners. The documentary evidence, however, indicates that participation was uneven. One participant observed: 'We are aware that a small change can have a large impact[;] however, there is a need to get buy-in from colleagues and students to make a lasting impact. Not everyone will

be on board and this is OK. The focus is on those who are willing to make a change and hope that others will follow.' (D7)

The Zimbabwean ICT project similarly organised participation across multiple groups, including lecturers, trainee teachers, mentors and school students. Staff-development workshops introduced participants to e-learning, mobile learning and electronic assessment, while one educator commented: 'The Programme equipped me to … effectively capacitate fellow workers on ESD practices; and (I) was equipped with the skills and knowledge to implement a change project.' (E8)

Participation also characterised the engineering project at Institution G, where educators and students worked together through lectures, experiments, fieldwork and research addressing water loss caused by damaged infrastructure.

Collectively, these cases demonstrate that participation was organised through collaboration among educators, students, colleagues and community stakeholders, although the nature and extent of participation differed across institutional settings.

Curriculum innovation for sustainability

The second pedagogical orientation concerned efforts to incorporate sustainability into curriculum, teaching and assessment. The documentary evidence records curriculum development at several institutions, although the extent of change differed across cases.

Institution A reported one example of curriculum-related uptake through the development of a minute-taking template produced during the entrepreneurship project. According to the documentary source, this template was subsequently adopted by the institution's Curriculum Committee for use across the college.

Curriculum innovation became more explicit at Institution B, where community-service learning was incorporated into a course module. The project also generated several curriculum resources, including a needs analysis instrument, a student self-evaluation tool and an assessment instrument linked to students' portfolios of evidence. The report records that the assessment tool was later adapted and standardised for departmental use.

Engineering education formed the focus of curriculum development at Institution C. The Change Project addressed greenhouse-gas emissions associated with older vehicles while encouraging students to investigate alternative engineering responses. The documentary evidence records attempts to revise engineering curriculum and assessment criteria to include ESD principles. Participant C5 described this experience as follows:

> The process of developing a Change Project has helped me to develop an in-depth understanding of the significance of sustainability. I have gained insights

> into how to develop an inclusive[,] working Change Project ideal for transforming community activities that contribute to greenhouse gas emissions. I can look within the current curriculum for workable ESD opportunities and further improve or influence policy and decision-making towards ESD. (C5)

The ICT project at Institution E also focused on curriculum development through the use of electronic learning and assessment technologies. The documentary source records staff-development workshops that introduced educators to e-learning, mobile learning and electronic assessment, while programme reports refer to renewed departmental collaboration around curriculum transformation and increased capacity to use ICT in teaching and assessment.

Institution F incorporated ESD into the Industrial Attachment Programme through curriculum revision linked to beekeeping and honey production. The report records that a departmental community worked on curriculum innovation, developed a new Industrial Attachment assessment tool and submitted the revised curriculum for institutional approval. Participant F9 reflected on the learning experience: 'All the presentations and excursions were new and a rare lifetime experience[;] therefore I will cherish the workshop very much.' (F9)

Institution G similarly incorporated ESD into engineering course outlines, coursework and examination assessment. The project documentation reports staff-development workshops involving colleagues from other departments and sister organisations, together with revisions to engineering teaching and assessment that addressed sustainability knowledge within the departmental curriculum.

Across these cases, sustainability entered existing vocational curricula through revised course modules, assessment instruments, curriculum resources, course outlines and teaching practices. The documentary evidence also records instances of departmental adoption and curriculum approval processes in several institutions.

Experiential and practice-based learning

The third pedagogical orientation centred on practical engagement with sustainability through vocational activities. Instead of introducing sustainability as abstract content, the projects connected it with authentic occupational practices.

Engineering projects provided several examples. Institution C involved students in designing a model vehicle emission device while shifting attention from repairing older engines towards engineering approaches that addressed greenhouse-gas emissions. Institution G addressed water loss through leak-detection activities involving lectures, experiments, fieldwork and engineering research. Students investigated damaged pipe systems and participated in practical activities linked to engineering solutions for water management.

Institution D approached sustainability through repair cafés that focused on repairing, repurposing and reusing discarded materials. Trainers and students worked with waste streams including wood, metal, rubber, batteries, oil and paper while fabricating instructional aids from recycled materials. The documentary source also records candidate assessment, monitoring and evaluation activities associated with the project.

Practical learning also characterised Institution F, where industrial attachment incorporated beekeeping and honey production as examples of sustainable livelihoods. The project connected workplace learning with sustainable production and generated an assessment tool to support the revised Industrial Attachment Programme.

Community-service learning at Institution B also involved practical investigation of local issues. Students undertook needs analyses in their respective vocational fields before developing responses linked to fundraising, health and safety, tourism development and waste-related income generation. Practical engagement therefore formed part of the learning process rather than serving as an additional activity outside the curriculum.

The ICT project at Institution E likewise emphasised practical application. Staff-development workshops demonstrated e-learning, mobile learning and electronic assessment, enabling educators to experiment with digital approaches intended to reduce paper-based assessment and improve access to teaching resources under conditions of limited infrastructure. This shows that 'TVET is key in implementing ESD' (D6).

Across the seven Change Projects, experiential learning was expressed through engineering design, community investigation, repair work, ICT application, industrial attachment, entrepreneurship and environmental problem-solving. The documentary evidence also records the production of practical educational resources, including assessment instruments, needs-analysis tools, curriculum adaptations, instructional aids, engineering models and ICT-supported teaching practices. These resources formed part of the reported project outputs across the selected institutions.

Discussion

This study examined how educator-led Change Projects enacted ESD in selected TVET institutions in Botswana, Namibia and Zimbabwe. Across the seven cases, three pedagogical orientations emerged: participatory and community-engaged learning, curriculum innovation for sustainability, and experiential and practice-based learning. These findings suggest that sustainability did not enter vocational education as a predefined body of knowledge to be implemented uniformly. Instead, educators interpreted broad sustainability aspirations in relation to the occupational, institutional and community contexts in which they worked. The findings therefore position educator agency as an interpretive and collaborative process through which ESD acquires pedagogical meaning. Wenger's (1998) CoP framework provides a useful explanation of how this process unfolds through participation, negotiated educational purpose and the development of shared pedagogical practices.

The first pedagogical orientation demonstrates that participation was central to the enactment of ESD. Across the cases, educators worked with colleagues, students and community partners to identify sustainability challenges, design learning activities and implement pedagogical responses. These collaborative relationships extended learning beyond conventional classroom boundaries and situated vocational education in wider social and environmental contexts. Wenger's (1998) concept of mutual engagement explains this finding by locating professional learning within participation in shared practice rather than individual acquisition of knowledge. From this perspective, educators developed new pedagogical understandings because they engaged collectively with practical educational problems. This interpretation is consistent with Fullan's (2016) view that educational change depends on the professional capacity to exercise judgement in institutional contexts rather than simply implementing externally prescribed reforms. Similarly, Priestley et al. (2015) conceptualise teacher agency as emerging through interactions between professional capabilities and the ecological conditions within which educators work. The Change Projects illustrate this relational understanding of agency. Educators did not act independently of curriculum structures, institutional expectations or resource constraints. Instead, they exercised professional judgement by determining how sustainability could be addressed in their vocational disciplines and institutional settings.

The findings also demonstrate that collaborative participation should not be understood as uniformly inclusive or harmonious. The Namibian repair-café project, where educators acknowledged the difficulty of securing commitment from colleagues and students, indicates that participation remained uneven and negotiated. This finding strengthens, rather than weakens, the explanatory value of Wenger's framework because it resonates with critiques that CoP can understate issues of power, exclusion and differential participation. Contu and Willmott (2003) argue that participation is shaped by organisational relationships and competing interests, while Li et al. (2009) similarly caution against assuming that collaboration develops naturally in organisational settings. The present findings support these critiques by showing that collaborative learning depended upon institutional support, professional commitment and opportunities for participation. They also support Monk et al.'s (2023) argument that sustainability-oriented vocational learning develops through relationships connecting educational institutions, communities and local livelihoods.

The second pedagogical orientation demonstrates that sustainability became meaningful through curriculum interpretation rather than curriculum addition. Instead of introducing ESD as a separate topic, educators re-examined existing vocational curricula in the light of locally significant sustainability challenges. Engineering educators addressed vehicle emissions and water management, entrepreneurship educators connected business education with sustainability, community-service learning linked vocational programmes to local development priorities, while ICT projects reconsidered assessment practices under conditions of resource scarcity. These findings indicate that educators interpreted sustainability through the knowledge structures and occupational concerns of their respective disciplines. Wenger's (1998) concept of joint enterprise provides a useful explanation because it

emphasises that shared educational purposes are negotiated through collective activity rather than prescribed in advance. The Change Projects reveal that sustainability acquired educational meaning through collaborative interpretation of vocational problems instead of direct implementation of policy aspirations.

This finding contributes to debates concerning sustainability in TVET. Moso-Díez et al. (2025) argue that sustainability in vocational education encompasses interconnected environmental, social and economic dimensions but is fragmented across educational practice. The present findings suggest that these dimensions become integrated when educators reinterpret vocational knowledge through authentic occupational problems. Vehicle emissions connected engineering competence with environmental responsibility; community-service learning linked vocational education with community development; repair cafés combined circular-economy principles with practical skills; and industrial attachment connected sustainable livelihoods with workplace learning. Sustainability therefore became embedded in vocational knowledge itself rather than being positioned alongside it. This interpretation aligns with Tikly's (2019) argument that educational reform in African contexts must be understood in relation to local institutional and socio-economic conditions. Likewise, Lotz-Sisitka (2016) argues that transformative sustainability learning emerges through engagement with situated socio-ecological issues rather than through abstract policy commitments. The findings therefore indicate that global sustainability agendas acquire educational substance only when educators negotiate what they mean in particular vocational fields.

These curriculum developments also broaden prevailing understandings of vocational competence. Traditional conceptions of TVET have prioritised employability, productivity and economic development (Allais, 2022; McGrath, 2012). More recent discourse argues for broader educational purposes that incorporate sustainability, human development and social responsibility (McGrath & Powell, 2016; Ramsarup et al., 2024). Majola (2026a, 2026b) similarly advocates TVET pedagogies that emphasise participation, agency and critical engagement with social and environmental issues. The present findings demonstrate how educators translated these broader educational purposes into curriculum and assessment practices. Sustainability did not replace occupational competence. Instead, it expanded the criteria through which competent vocational practice was understood.

The third pedagogical orientation demonstrates that sustainability became pedagogically meaningful through practical engagement with vocational work. Engineering redesign, repair cafés, industrial attachment, community-service learning, entrepreneurship and ICT-supported assessment all connected sustainability with authentic occupational activities. These practical interventions generated assessment instruments, curriculum resources, instructional materials, engineering tasks, needs-analysis tools and revised teaching practices that supported sustainability-oriented learning. Wenger's (1998) concept of shared repertoire explains this pattern by highlighting how collaborative learning produces tangible resources that shape subsequent professional practice. The significance of these resources lies not

simply in their existence but in their capacity to make sustainability teachable through concrete pedagogical practices.

Meanwhile, the findings distinguish between pedagogical production and institutionalisation. Several projects generated assessment tools, curriculum revisions and teaching resources, while some documented departmental adoption or curriculum approval processes. However, the evidence does not establish that these practices became permanently embedded across institutions or diffused throughout the wider TVET system. Li et al. (2009) caution against assuming that practices emerging in CoP automatically become enduring organisational routines and the present findings support this caution. The documentary evidence demonstrates local pedagogical enactment and, in several cases, documented institutional uptake. It does not support broader claims concerning sustained institutional transformation or system-wide change. This distinction recognises that pedagogical innovation and institutional embedding represent different stages of educational change.

The participant reflections further validate this interpretation. Educators described changed perspectives, greater attention to ecological dimensions of teaching and deeper understanding of sustainability. These accounts indicate professional learning associated with participation in the Change Projects. Wenger (1998) conceptualises learning as changing participation in shared practice, while Mezirow and Taylor (2009) and Cranton and Taylor (2011) emphasise the role of critical reflection in reshaping professional perspectives. The findings are consistent with these theoretical positions but do not justify claims of enduring professional-identity transformation. The documentary evidence captures educators' reported reflections at particular moments and documents associated pedagogical developments, but it does not trace long-term changes in professional identity or practice. The stronger conclusion is therefore that collaborative professional learning informed pedagogical judgement and supported local curriculum and assessment innovation.

The study addresses a conceptual gap concerning how educators participate in making sustainability teachable in TVET. Studies have substantially advanced understanding of sustainability in TVET through research on green skills, curriculum reform, institutional sustainability and transformative pedagogies (Majola, 2026a, 2026b; McGrath & Powell, 2016; Monk et al., 2023; Moso-Díez et al., 2025; Ramsarup et al., 2024). Less attention has been given to the collaborative processes through which educators interpret sustainability and translate broad policy aspirations into pedagogical practice. The present study positions educators as active interpreters of sustainability whose professional judgement shapes curriculum, assessment and vocational learning in specific institutional contexts. Wenger's (1998) CoP framework provides a coherent explanation of this process by showing how mutual engagement supports collaborative learning, joint enterprise enables educators to negotiate educational purpose and shared repertoire gives those interpretations practical pedagogical form. These findings suggest that educator agency in sustainability-oriented TVET is best understood as a collaborative and interpretive process through which sustainability becomes meaningful in vocational education.

Limitations of the study

The findings should be read within the boundaries of the documentary evidence and the purposively selected seven Change Projects. The SST report provides uneven levels of detail across cases and represents participants' experiences through an already curated evaluative account. Consequently, the study cannot establish the durability of reported pedagogical changes, completed professional-identity formation or the extent to which local curricular innovations became embedded beyond the settings documented. The analysis therefore offers theoretically informed insight into situated educator learning and ESD enactment, with transferability dependent on the contextual comparability of other TVET settings. Evidence of institutional or system-level change would require further research drawing on independent evidence from educators, students, institutional leaders and curriculum or policy processes.

Conclusion

This study responds to a specific gap in an expanding body of TVET and sustainability research: insufficient understanding of how TVET educators collectively interpret ESD and translate it into contextually meaningful pedagogical practice. Analysis of seven Change Projects from Botswana, Namibia and Zimbabwe shows that sustainability acquired vocational meaning through educators' engagement with concrete curricular, occupational and community problems. The evidence identifies three interconnected pedagogical orientations: participatory and community-engaged learning, curriculum innovation for sustainability, and experiential and practice-based learning. Wenger's CoP framework theorises these orientations by showing how mutual engagement, joint enterprise and shared repertoire demonstrate the collaborative processes through which these pedagogical responses developed. The study therefore positions TVET educators as interpreters and producers of situated pedagogical knowledge, while understanding reported changes in perspective as professional learning and pedagogical reorientation, not evidence of completed professional-identity transformation. The study has therefore theorised sustainability-oriented TVET as a socially situated process in which collaborative educator learning connects policy aspirations with vocational knowledge and practice.

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Restrictive practices influencing workplace-based experience implementation at TVET colleges

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ABSTRACT

In the National Certificate (Vocational) (NC(V)) qualification, work-integrated learning (WIL) is referred to as workplace-based experience (WBE), which is a key part of the vocational college curriculum. There are well-known barriers to WBE, such as poor connections between the college and industry and the lack of resources for its implementation. A more nascent concept in existing literature is the constraints to WBE emerging from restrictive practices at the technical and vocational education and training (TVET) colleges themselves, which is the topic explored in this article. This article aims to address the question: What are the micro-level restrictive practices affecting WBE from TVET college lecturers' perspective? To do this, TVET college lecturers were interviewed about their understandings of WBE and perceived barriers to its implementation. Data were analysed by using cultural historical activity theory (CHAT) to examine the historical tensions between different components of the TVET college WBE activity system. Among other difficulties, the researchers identified tensions between the roles played by lecturers, WIL officers and college management as leading to restrictive practices. The research concludes that different professional groups should be encouraged to collaborate in order to share perspectives and co-develop new models for addressing the various WBE tensions at TVET colleges.

Keywords: Workplace-based experience (WBE), work-integrated learning (WIL), National Certificate (Vocational) (NC(V)), tourism, technical and vocational education and training (TVET), activity theory

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Introduction

Technical and vocational education and training (TVET) colleges in South Africa provide practical, vocational and occupational training to equip students with employability skills (DHET, 2013, p. 11). TVET colleges became more relevant in the education landscape through the introduction in 2007 of the National Certificate (Vocational) (NC(V)) in the TVET sector as an alternative to secondary schooling in order to meet the changing needs of workplaces (UMALUSI, 2013, p. 15). The NC(V) was meant to replace apprenticeships and occupationally focused programmes, for example the National Accredited Technical Education Diploma (NATED) occupational courses. The NC(V) is offered over three years, commencing with NC(V) Level 2 in 2007, NC(V) Level 3 in 2008 and NC(V) Level 4 in 2009. For the sake of context, NC(V) Level 4 is equivalent to a Grade 12 certificate, that is, a school-leaving certificate, but with specialised vocational skills. The standard entry requirement to enrol for NC(V) includes a Grade 9 pass or equivalent.

There are about 19 different NC(V) programmes (related to specialised fields) offered at TVET colleges. However, for the purpose of this article, the NC(V) tourism programme is the focus, as this is the area of expertise of the lead author. The theoretical content of the NC(V) programme consists of three fundamental subjects (English, Mathematics/ Mathematical Literacy and Life Orientation) and four vocational subjects specific to the discipline of tourism. Regardless of the programme, the theoretical content in the NC(V) curriculum is generally taught in terms of practical examples explained in class. Furthermore, curriculum documents suggest that this be accompanied by at least some sort of workplace exposure, for example job shadowing, excursions and workplace-based experience (WBE). WBE is a form of work-integrated learning (WIL) used at TVET colleges in South Africa. Even though WBE is not formally mandated by the Department of Higher Education and Training (DHET), subsequent published policy statements have made it clear that it is an essential part of the curriculum, as the following excerpt from the White Paper indicates:

> Workplace training and work-integrated learning (WIL) must be a central part of our training system. This is an understanding that the DHET and other stakeholders (including employers, the labour movement and community organizations) are coming to share. It is demonstrated by the National Skills Accord, signed in July 2011 by all the partners in the National Economic Development and Labour Council (NEDLAC) (DHET, 2013, p. 16).

In a 2010 report by Papier (DHET, 2010, p. 32), it was stated that TVET colleges currently lack resources necessary to assist students in locating WBE experiences and that they have little motivation to do so because the NC(V) does not mandate it (DHET, 2010, p. 31). In essence, TVET college students should be granted access to the workplace and all signatories should, as agreed, promote expanded access to training opportunities in both educational institutions and workplaces (DHET, 2013, p. 8).

Notwithstanding the above, the problem in South Africa is that individual TVET colleges do not provide any WBE opportunities at all for their NC(V) tourism programme students. Research suggests that there has been a 'lack of WIL' for NC(V) programmes since 2010 (DHET, 2010; DHET, 2013; SSACI, 2013). The Swiss–South African Cooperation Initiative (SSACI) stated the following as regards the importance of WIL for TVET programmes:

> Work-integrated learning (WIL) should be a central component of the college programmes… . The extent to which students are able to get placements in the workplace will be used as an important indicator for assessing the performance of the management of institutions. The DHET will place a high priority on the colleges achieving regularly increasing levels of workplace placements for students and will expect colleges that have problems in this regard to seek assistance from both the Department and the SETAs [sector education and training authorities]. This will serve to ensure that work-integrated learning is taken very seriously (SSACI, 2013, p. 6).

For context, the SSACI, in cooperation with DHET, initiated a Swiss-funded Internal Continuous Assessment project in 2008 to structure WBE in such a way that it supported applicable NC(V) curricula. The project succeeded in ensuring that WBE contributed to the weighting of TVET college students' year mark, especially for the NC(V) tourism programme in 2014 and 2015 (Taylor, 2013). However, owing to the differing capacities of TVET colleges to place students in workplaces and to administer such placement, the project was terminated in 2016. Thereafter, WBE was no longer compulsory and it was up to the individual colleges to determine how they were going to introduce their students to the workplace. This stance is supported by research conducted by Taylor (2013) and Coetzee (2012), who found that, historically, TVET colleges have been poorly staffed and resourced and that lecturers have been minimally involved in WBE. Following the stoppage of the initiative, only a handful of TVET colleges continued with WBE; for the majority, the lack of an assessed, weighted component was one of the major issues limiting WBE.

Fundamentally, research suggests that TVET colleges face challenges that prevent them from providing much-needed WBE exposure for students, particularly in NC(V) programmes. In essence, these constraints most likely stem from macro- (e.g. funding, policy), meso- (e.g. college capacity and resources) and micro-level restrictive practices.

Although attention has been given to challenges at the macro and meso levels (e.g. Taylor, 2013), less attention has been paid to challenges at the micro level.

In this study, therefore, the primary research objective was to determine, through the lens of TVET college lecturers, the influence that restrictive practices at a micro level have on the implementation of WBE at selected TVET colleges in the NC(V) tourism programme.

The present article investigates how internal college relationships and divisions of labour restrict WBE, even when funding and other macro-level restrictions may have been dealt with. To better understand the data, a theory was required that viewed WBE as a system whose interacting parts may be in a state of tension with one another. One such theory is cultural historical activity theory (CHAT) and its analytical tool, the activity system. By employing CHAT as an analytical tool, the researchers were able to determine the tensions that were leading to the observed restrictions in the WBE system.

Ultimately, this article can assist TVET colleges to understand what their NC(V) staff value about WBE and where they see internal restrictive practices occurring in the WBE activity system.

The importance of lecturer involvement in WBE

Various literature sources comment on the benefits of WIL (Billett, 2003, 2009; Govender & Wait, 2017; Konkola, 2007; McRae, 2015) and state that the best way to learn is to engage in real-life processes of change. Furthermore, they point to the academic, personal, career and work ethic benefits of WIL. WIL seeks to draw on the social as well as the cognitive experience, where, according to Govender and Wait (2017, p. 52), students view WIL as the most significant influence on their future careers. According to Billett (2009, p. 837), there are strengths (e.g. access to real job activities, observation and listening to peers, real-world practice and access to more experienced co-workers) as well as limitations (e.g. lost class time and short duration of practical exposure) when it comes to WIL.

Govender and Wait (2017, pp. 51–52) are of the view that WIL benefits various stakeholders, as:

- Students generally contribute economically and socially during WIL by working hard and engaging in practical activities;
- Lecturers are able to evaluate real-world scenarios, thereby preparing students for the workforce and enhancing their abilities; and
- Students are given an opportunity to develop important skills and attributes that are necessary for the workplace (e.g. those relating to communication, interpersonal relationships, writing, technology, teamwork, leadership, observing theory in action, applying theory, workplace culture, meeting expectations and coping with our rapidly changing world), which may lead to significant personal growth for them.

Notwithstanding the above, Govender and Wait (2017, p. 50) state that there is limited empirical research as to what the benefits of WIL projects are. Although WIL is deemed significant for vocational students, its implementation at TVET colleges in South Africa is inconsistent. This view is supported by DHET (2010), which noted that WIL is to be observed much more in technical disciplines like plumbing than in business-oriented fields such as hospitality.

Taylor (2013) confirms this observation by indicating that TVET colleges are, for the most part, understaffed and underfunded, with little engagement on the part of lecturers and little industry participation in placements, thereby hampering effective WIL through WBE. Taylor also notes that the absence of a weighting for WBE in year marks reduces its significance for both students and colleges. In addition to the lack of weighting, lack of funding to support students during work experience is an often-cited reason for the poor implementation of WIL (Njengele et al., 2024). The latter is also commonly linked to the lack of involvement of industry in TVET college course design and pedagogy, thus creating a barrier to WIL implementation (Wedekind et al., 2024).

Molele et al. (2024) assert that there is inadequate management of WBE activities, beginning with the planning of WBE and then the placement of NC(V) students. They also posit that lecturers have no guidelines in terms of what their roles in WBE are. The study by these authors in the Limpopo province of South Africa highlighted that WIL officers operate independently, concentrating only on college-related activities and ignoring industry developments. This, Molele et al. (2024) state, negatively affects the placement of students. Additionally, Maseko (2018) highlights how crucial academic leadership is in effectively managing WIL and indicates that it takes dedication on the part of academics (including lecturers) and professional partners with a range of specialties to create effective WIL programmes. Molele et al. (2024) further state that, according to WIL officers, there are still gaps at the college level, which lead to problems with students' WIL placements.

According to Maseko (2018), even though there are clear institutional guidelines and resources for WIL, lecturers should be aware of new opportunities and enhance their teaching techniques based on newly emerging ideas. This, however, will be possible only if they are part of the WBE process. According to Paterson et al. (2017), implementation of WBE must be ensured by management, for the integration of WBE cannot be realised without efficient management. In a study undertaken by Ngubane et al. (2021), it was found that there is minimal enforcement by campus managers. Consequently, it is mainly the duty of the WBE champions to enforce integration and the responsibility of TVET management to ensure that all participants (including staff and students) understand the purpose of WBE.

Even where the above challenges are acknowledged to be an issue, much of the current focus on the improvement of quality in colleges has been on developing lecturer qualifications in pedagogy and on knowledge of the fields concerned (Rudman & Meiring, 2018). Other authors (e.g. Van der Bijl & Oosthuizen, 2019) have also commented on the lack of theoretical, disciplinary and workplace knowledge on the part of lecturers at TVET colleges as well as on their not having official teaching qualifications. This focus on lecturers' abilities may have led to a sense of inadequacy and even alienation among teaching staff (Wedekind, 2010). Furthermore, such sense of inadequacy may be made worse by lecturers having to contend with larger classes in larger college structures and widening discontinuity between the community and the classroom.

In advocating for quality teaching in the TVET sector, and in support of current lecturers' abilities, Rudman and Meiring (2018) argue that the focus should be on what lecturers do in their interactions with students rather than on development of qualifications. Wedekind and Russon (2024), like Rudman and Meiring (2018), suggest that lecturers should be more involved with organising WBE that supports their regular teaching roles. Though not explicitly stated, it may be inferred that this is because of lecturers' knowledge of the field of study and of their students. Improvements in quality should then involve the role of lecturers in improving engagement between colleges and industry.

Theoretical framework

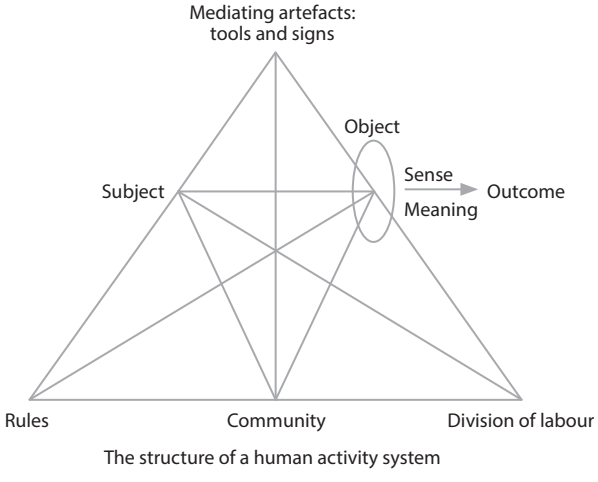
Cultural historical activity theory (CHAT) (Cole & Engeström, 1993; Engeström, 2015), also known as 'activity theory', states that human thought and behaviour are connected in activity systems that are organised by groups and mediated by artefacts. Engeström (1999, 2001, p. 133) and Downes (2022, pp. 63–64) suggest five principles that can be used to summarise activity theory:

1. A collective, artefact-mediated and object-oriented activity system, seen in its network relations to other activity systems, is taken as the prime unit of analysis;
2. Multi-voicedness characterises activity systems, which exist as a community of multiple points of view, traditions and interests;
3. Historicity shapes activity systems, which get transformed and take shape over lengthy periods of time;
4. Contradictions play a central role as sources of change and development; and
5. Expansive transformations become possible in activity systems over a period of time.

With this foundation in place, CHAT, or activity theory, was identified as a suitable analytical tool. By employing an analytical lens, CHAT gives researchers a way to look into and understand what is happening in organisations. The theory makes it easier to study how people and groups change and grow by interacting with one another and through mediation. CHAT is an appropriate tool for this study because it can investigate how people interact and learn at both the micro and macro levels (Spinuzzi, 2023) and it will help to determine how people in a college's activity system understand and implement WBE.

The unit of analysis in activity theory is the activity system shown in Figure 1. In the top half of Figure 1, the trio of 'subject', 'object' and 'mediating artefact' is a frequent way of conveying the concept of cultural mediation of activities. The sub-triangle depicts the link between the tools (cultural and historical beliefs, artefacts, theories), the subject (which is driving the system) and the object/outcome (issue to be resolved) (Engeström, 2001, p. 134). This sub-triangle represents the first generation of activity theory, with a focus on individual learning (Engeström & Sannino, 2021).

Figure 1
Second-generation activity theory model



Source: Engeström (2015).

In second-generation activity theory, the social and collective parts of an activity system are added to the first-generation 'subject', 'mediating artefacts' and 'object' system (Engeström 2001; Engeström & Sannino, 2021). These are the community (i.e. who else is involved with work on the object), rules (overt rules, policies and hidden rules that subjects and other stakeholders comply with) and division of labour (i.e. who does what on what authority). In using second-generation activity theory, it is important to examine how the components interact with one another (Downes, 2022, p. 61).

In third-generation activity theory, there is recognition that a targeted activity system often interacts with and is influenced by other neighbouring activity systems. Thus, the unit of analysis in the third generation is a minimum of two interacting activity systems (Engeström 2001) rather than a single system typical of second-generation analysis.

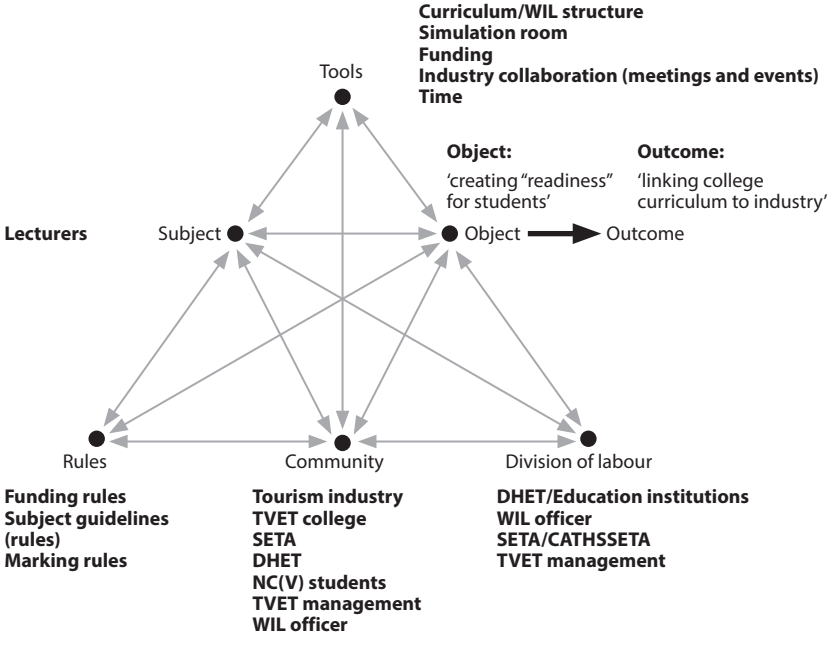
More recently, there is recognition that working with complex societal problems may involve an even larger and heterogeneous grouping of interacting activity systems, known as fourth-generation activity theory. For example, in examining the problem of homelessness, a researcher would need to include the interaction of homeless communities and non-governmental organisations (NGOs) with local and national government (Engeström & Sannino, 2021).

In the context of the present research, second-generation activity theory is utilised in which WBE is examined as an activity system. Based on the researchers' knowledge of the NC(V) programmes, the 'object' of the system is understood as 'creating "realness" for students', and the 'outcome' is that of 'linking [the] college curriculum to industry'.

In this WBE activity system, the lecturers are the 'subject', as they were asked for their opinions and the 'tools' are the NC(V) curriculum, the simulation room, funding, industry meetings and events, and time.

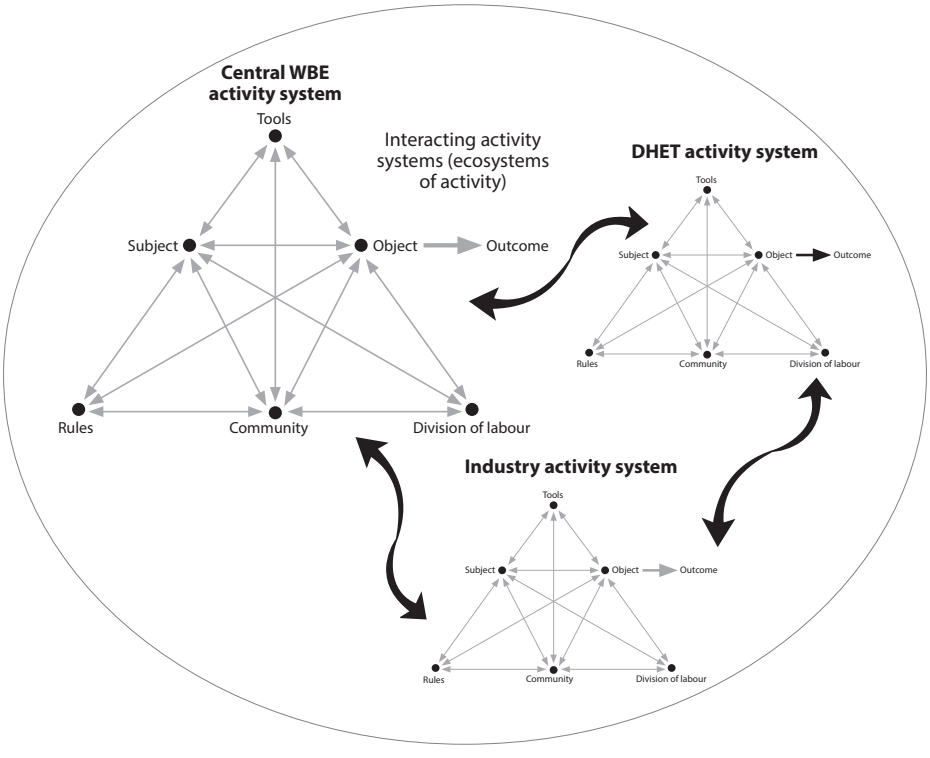
The 'rules' are related to policy documents from TVET management as well as from DHET. The 'community' includes students, lecturers, industry and other stakeholders; and the 'division of labour' refers to how their work on the object is allocated. Figure 2 represents the second-generation activity analysis of the TVET college WBE activity system and provides a picture of the various tools, the rules, the community and the division of labour in the WBE college system and how they interact with one another.

Figure 2
WBE activity system



The WBE system is influenced by neighbouring activity systems. For example, the implementation of WBE is influenced by the policies of DHET and, furthermore, needs to be responsive to the needs of industry, as illustrated in Figure 3.

Figure 3
Interactive activity systems



With reference to Figure 3, WBE implementation can be examined by way of a third-generation activity theory methodology, but not for the purpose of this article. The macro-level restrictive practices have been commented on in the literature (Coetzee, 2012; DHET, 2010, 2013; Njengele et al., 2024; Taylor, 2013; UMALUSI, 2013). However, what are less known are the micro-level restrictive practices hindering the implementation of WBE – which is what this present article focuses on.

Understanding these micro-level restrictions is important, since even if the 'rules' in DHET and other activity systems change so as to benefit WBE, there may still be internal micro tensions that hinder the progress of WBE.

This research therefore concentrates on the internal micro relations of the WBE system. In doing so, it uses a second-generation activity theory approach. According to Engeström (2015), it is crucial to examine activity systems in order to comprehend how people and groups cooperate to accomplish common objectives and how tensions and conflicts inside these systems can drive progress. Tensions can occur in a variety of ways, such as through disagreements over the division of labour, as a result of conflicts between opposing goals, and because of inconsistencies in the rules. Tensions are viewed as generative and productive, rather than simply as issues to be resolved.

Within particular contexts or communities, activity systems are networks with connected activities, roles and divisions of labour (Engestrom & Sannino, 2015). These tensions underpinning the micro-level restrictive practices can be regarded both as dual sources of dysfunction and engines of change and further explain why activity theory is being used not just to map the system but to understand the challenges.

Research methodology

Qualitative in-person group interviews as detailed in Table 1 were held with NC(V) tourism lecturers at five TVET colleges, with one WIL officer from the Western Cape being present. The WIL officer was part of the group interview only for TVET1; no other WIL officers were present during the group interviews for TVET2, TVET3, TVET4 and TVET5. The sole purpose of including the WIL officer was because the person was a lecturer at the applicable TVET college and had significant insight into WBE practices at TVET1.

Data collection

Table 1
Group-interview locations and duration

TVET	WHO	WHERE	TIME	GROUP INTERVIEW
TVET1	6 NC(V) lecturers 1 WIL officer	Bellville	2 hours	Group
TVET2	6 NC(V) lecturers	Cape Town	Group – 1.3 hours	Group – lecturers
TVET3	3 NC(V) lecturers	Muizenberg	Group – 1.3 hours	Group – lecturers
TVET4	4 NC(V) lecturers	Mossel Bay	Group – 1.3 hours	Group – lecturers
TVET5	4 NC(V) lecturers	Vredenburg	Group – 1.3 hours	Group – lecturers

Total: N = 24 participants; total hours = 7.2

Justification for site selection was that the roll-out of the SSACI WBE Internal Continuous Assessment (ICASS) Project was undertaken in the Western Cape at all five of the TVET colleges listed in Table 1. Furthermore, participants were selected because all of them were NC(V) lecturers. The lecturers who took part in the research taught a variety of fundamental subjects (i.e. Mathematical Literacy or English as a first additional language or Life Orientation) or one or more of the four vocational subjects offered at their various TVET colleges within the NC(V) tourism programmes. Most participants had between one and five years' experience of working with NC(V) students, with the remainder having taught NC(V) subjects for more than ten years. The long years of service in teaching NC(V) subjects had given the participants a unique perspective of the restrictive practices in driving WBE since the first ICASS WBE initiative in 2014. All group interviews were recorded and then transcribed verbatim.

Data analysis

Since the issue of interest in the present research was restrictive practices related to lecturers' roles in WBE and how this might affect the object of WBE, the researchers first considered what lecturers understood the 'object' of the activity system to be. Thereafter, attention shifted to restrictive practices related to lecturer roles that emerged in the interviews. However, other restrictive practices were also raised, for example a lack of financial support for WBE, a lack of weighting and the absence of practical guidance in the subject guidelines. Though these were important restrictions, as illustrated in Figure 2, they are not explored further in this article. As mentioned, they have already been discussed in previous research.

All the restrictive practices raised by the lecturers were first highlighted in each of the transcripts and their relationship to one or other of the activity system elements (tools, rules, etc.) was recorded using colour-coding. This relationship assisted the researchers in analysing the data at a later stage. The next step was to scrutinise those restrictive practices related to lecturer involvement and identify which were reported by more than one TVET college lecturer. These were then identified as the most pressing issues and were further thematised into three main categories: exclusion from industry meetings; exclusion from/lack of communication with WIL officers; and lack of commitment on the part of college management regarding WBE. Table 2 illustrates how the data was organised for further analysis.

Table 2
Example of how data analysis was organised

WIL ACTIVITY SYSTEM ELEMENTS:	ALL RESTRICTIVE PRACTICES FOR WBE:	RESTRICTIVE PRACTICES WBE THEMES:
Subject and community: NC(V) lecturers		
Tools: Curriculum	• No realness for NC(V) tourism students • Lack of practical skills in curriculum • Outdated NC(V) tourism curriculum	
Collaborative meetings, events and functions	• NC(V) lecturers not invited to CATHSSETA or industrial meetings, functions or conferences	• Lecturers not invited to industry meetings, events and functions anymore
Division of labour: TVET management	• Management out of touch with NC(V) student's need for WIL • Management not creating relationship/understanding between the college and industry	• TVET management not supporting WBE for NC(V)
WIL officer	• WIL officers not placing NC(V) students • No funding for NC(V) WIL placements	• WIL officer not including lecturers in WBE process and implementation

Each of the categories was then described in more detail and illustrated with supporting quotes from the interviews.

In activity theory, the researcher does not simply seek to identify difficulties but also to gain a deeper understanding of their origins and nature. To this end, a systematic analysis was conducted using the activity theory triangle (see Figure 2) of the main tensions that underpinned these identified restrictive practices. These tensions were then shown as being between the different elements of the activity system and were indicated with red arrows on the activity triangle (see, for example, Figures 4 and 5).

Ethical considerations

To comply with the principles of ethical research, DHET was approached for permission to conduct the research. DHET noted that consent to conduct this research must first be obtained from the five TVET colleges and comply with DHET policy (DHET, 2016). Using the DHET Request to Conduct Research Application form, permission was obtained from each of the five TVET colleges in the Western Cape (that offer the NC(V) tourism programme). By following the appropriate university protocol, ethical clearance was also obtained from the Ethics Committee of the Education Faculty of the researchers' university.

All interviewees gave informed consent by completing a form in which it was stipulated that no individual identifiers would be collected from any respondent so as to ensure anonymity. This was done prior to collecting any data. Moreover, it was stated that the research results would be used for the present study only and would not be shared with any third party. Ethical requirements such as confidentiality, non-coercion and the right to withdraw from the study at any time were stated explicitly in the informed-consent form.

Ethically, the researchers sought to create a positive and secure environment where lecturers could voice their concerns and frustrations and comment about the WBE system at their TVET colleges without feeling exposed or that their comments could be held against them; hence the guarantee of the anonymity of all the participants in the group interviews.

Research findings and data analysis

In analysing the data, the researchers first identified how the lecturers understood the purpose and benefit of WBE for learning ('object' and 'outcome' – see Figure 2). Thereafter, the focus shifted to restrictive practices inhibiting the 'object' of WBE using the three identified restrictive themes (see Table 2).

Lecturers' understanding of the 'object'

The lecturers' understanding of the 'object' of WBE is that it gives students access to the real world by allowing them to access industry. This will assist students to relate what is happening in practice in the industry to what they are being taught at college. Therefore they strive to work on the 'object' and 'outcome' of the WBE activity system. This understanding, as indicated in the following quotes, was similar to what was initially proposed by the researchers.

> If students have practical industry exposure, they can relate what they experience in the industry to what is taught in class, and this practical experience during WBE will also better equip students to work in industry. … For example, we only focus on the theory, but if our kids can be exposed to these different sectors that is in industry [i.e. transport, accommodation] that can also assist the students to be more exposed in the practical side of what we teach in class.

And:

> What is good about this WBE is our students see what we are teaching them practically, within the workplace. And for them [the students] to actually go out and experience how to speak over the phone, how to communicate with the customers and try to help.

Now that we have discussed the 'object', the focus moves on to restrictive practices inhibiting WBE. This is done using the main themes identified in Table 2.

Restrictive practices at the TVET college that inhibit WBE

Theme 1: Lecturers excluded from industry events (community–tools–object)

One of the main restrictive practices is that, although the TVET colleges do hold internal meetings with industry role players which involve the WIL department and management, these meetings do not include the lecturers who are actually doing the teaching and who work with students daily. In addition, by networking and creating industry connections, lecturers can stay abreast of the latest developments and innovations in the tourism industry, can share these with their students and can provide industry-relevant examples. The quotes below from two different TVET college lecturers reinforce their argument that there is a lack of access to internal college forums comprising industry players:

> And we don't get invited to industry meetings, the WIL officer goes, and the lecturers are not included, which I think is very bad because we are firsthand dealing with the Level 2, 3 and 4 students; we know the dynamics, we know the personality, we know what their needs are and we know where they want to be in industry. But we are not included in any industry meetings with the Federated Hospitality Association of South Africa (FEDHASA), Southern African Tourism Services Association (SATSA), no.

And:

> The Association of Southern African Travel Agents and Travel Advisors (ASATA)/ National Department of Tourism (NDT)/Culture, Art, Tourism, Hospitality and Sport Sector Education Authority (CATHSSETA) meetings? – We're not going there; we used to, not any more. Before there was a WIL department, we were more involved.

Another quote from a lecturer at a different TVET college illustrates the importance of creating connections between lecturers and industry:

> WBE must be managed; it's about relationships … . Before there was a WIL department, we were more involved.

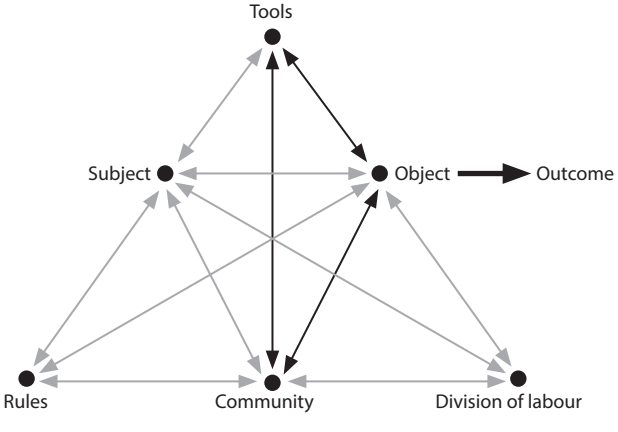
In the past, a few lecturers did attend some of the SATSA meetings, but, since the recent creation of WIL departments at TVET colleges, this no longer happens. It is now standard practice at TVET colleges for WIL department staff to now receive these invitations.

Here, the tension occurs between the 'community' (lecturers, industry role players, WIL department and TVET management) and the 'tools' (meetings, functions and events) which should enable the lecturers to collaborate with industry in order to drive WBE, to stay up to date as regards industry and to create relationships with industry that will lead to placement for WBE students.

This restrictive practice can be seen as originating from a systemic tension between the 'community' (lecturers and industry representatives) and the collaborative 'tools' (meetings, events and functions) that the key actors need in order to work towards the object of implementing WBE. Such tension could thus be attributed in practice to the lack of collaborative 'tools' (meetings, functions, events and career guidance) available to the college lecturers to connect them and the TVET college to the industry.

Figure 4 illustrates the tension taking place within the WBE activity system between the 'community' and the 'tools' which may affect the 'object' of the activity system.

Figure 4
Community–tool–object tension



Theme 2: WIL officers not supporting NC(V) (subject–division of labour–object)

Another internal tension from the lecturers' perspective is lack of support from the WIL department in placing NC(V) students for WBE, as well as lecturers not being involved in WBE. WIL officers at most of the colleges interviewed are not placing NC(V) students for WBE but rather only NATED N6 students entering industry for 18 months. The lecturers commented as follows on WIL officers not placing NC(V) tourism students at their colleges:

> WIL departments are responsible for the placement of the students, to facilitate the placement and help the student; that's why they are there, but that is not happening. … In terms of support for NC(V), it is very minimal, due to funding constraints, and the funding only becom[ing] periodically available now.

and

> …WIL officer not making the effort, concerted effort, to say: 'I'm not just here to support NATED; I'm here to support NC(V)'. We are missing that gap completely; everything is NATED, NATED, NATED.

Another frustration mentioned by lecturers is that WIL officers are placing students in various industries without having a basic understanding of the tourism industry, which would assist them in finding tourism companies to approach for placements. This is where lecturers could assist:

> WIL officer doesn't know the tourism companies – they place left, right and centre. Tick the box, it doesn't work like that.

A lecturer also commented on how lecturers could assist WIL officers:

> As a tourism practitioner I know places, hotels. So it's easy for me to match a personality because I know that student and the company.

Thus, the expertise of lecturers and their knowledge of both the field and their students are not always acknowledged by the colleges. Rudman and Meiring (2018) argue that, while improvement in quality at the college level is concentrated on enhancing lecturers' credentials, it should also value their expert knowledge of the field and of students (Wedekind, 2010).

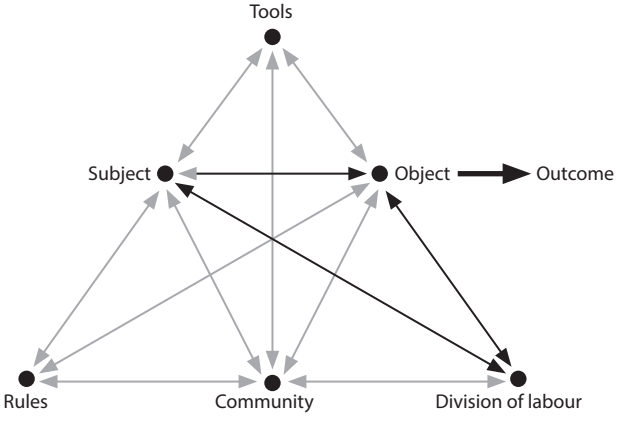
This tension is occurring between the 'subject', the lecturers who understand their professional field and their students and the other actors who play a role in WBE, in this case the WIL officers. The division of labour here is unequal, with the WIL officers taking the more dominant role. Such an unequal division of roles is, from the lecturers' perspective, constraining the lecturers' work on the object of the system.

In addition, lecturers believe that TVET management should do more to drive WBE and to create links with industry so as to improve the placements of NC(V) students. However, this role has been assigned to the relatively recently introduced WIL officers, who are not communicating with the lecturers who know their subject field and the capabilities of the students.

> The powers that be don't think about that, the mind-set of the student, because they're not on the ground level, they don't see what we [the lecturers] see.

Figure 5 below illustrates tensions between the 'subjects' (lecturers) and the 'division of labour' (WIL officers and TVET management), which restricts lecturers from achieving the 'object' or desired goal of the activity system.

Figure 5
Subject–division of labour–object tension



A further theme involving subject–division of labour–object is that of management's focus.

Theme 3: Management focus on 'bums on seats' vs WBE for quality

When it comes to TVET management, lecturers criticised TVET management's lack of partnerships and relationships as being a hindrance to student placement, for example:

> Management will always be obsessed with a role player or a stakeholder that will be funding or donating things. They'll be obsessed and build that relationship, but any other relationship will be like given to the WIL department to facilitate.

Lecturers were also frustrated by the lack of funding allocated to WBE for NC(V) students. College management appears not to be focusing on these students. It would seem as if TVET management has contradictory motives; on the one hand, it wants 'bums on seats' (for obtaining government funding), but, on the other, it does not want to use the funding

accrued from student subsidies for NC(V) WBE. These funds are supposed to support the entire curriculum, of which WBE is an important part.

> They're thinking about numbers [pass rates], not thinking of the mind-set of the student.
>
> They're not on-the-ground people because they don't interact with the students on the level that we do so they don't see the benefit it [WBE] would have for the student … .
>
> They are quick to say when you have a failure and what is your intervention. But they're just a bum on a seat, and the number that you have to meet.

The restrictive practices described above can be seen as arising from tensions between the 'subject' (lecturers) and the 'division of labour' (TVET management). This tension can be seen as constraining the lecturers' work on the 'object' of 'creating a real-world experience' for students as illustrated in Figure 5.

Summary of the results

The NC(V) lecturers believe that successful WBE is being inhibited by certain restrictive practices at the micro level within the TVET activity system. They argue that they should be included when it comes to industry events and meetings in order, first, to advocate for NC(V) and what NC(V) graduates are able to do in the industry, and, second, to help the industry understand the NC(V) tourism qualification. Other internal restrictive practices relate to the WIL department not placing NC(V) students for WBE but only NATED students. The final restrictive theme is that TVET management is not prioritising WBE for NC(V) and that there is a lack of connection between TVET college and industry, thus hindering placements for students.

These restrictions can be understood by analysing them as tensions in the activity system community and in the division of labour as lecturers attempt to work towards the object of WBE.

Discussion

The researchers agree with Billett (2003, 2009), Konkola (2007), McRae (2015) and Govender and Wait (2017) that WBE gives students a chance to learn about real-life processes, which may lead to access to real job opportunities. However, the implementation of WBE for vocational students has, at best, been patchy (Papier, 2010). The macro-level restrictive practices mentioned in the literature which have led to this can be attributed to a lack of funding for WBE (Njengele et al., 2024), to policy documents not assigning a weighting to WBE (Taylor, 2013) and to a poor relationship between industry and colleges (Wedekind et al., 2024). However, what has not been discussed to any great extent is the important role lecturers can play in supporting WBE.

This research focuses specifically on the micro-level restrictive practices that may hinder lecturer involvement, such as their exclusion from engagement in WBE (see Table 2, Figures 4 and 5). However, it is argued that addressing macro-level restrictive practices alone is insufficient; internal micro-level barriers would continue to impede effective WBE implementation.

In agreement with this argument, Maseko (2018), Paterson et al. (2017) and Wedekind (2010) suggest that academics need to be involved in implementing WBE and that management needs to ensure the integration of WBE into the curriculum. However, these authors are less clear on how this could be done in colleges.

As Engeström & Sannino (2015b, PowerPoint presentation, slide no. 2) argues, the activity system analysis drawn from activity theory at the very least allows researchers to 'clarify, elucidate, and essentialize' what is actually happening in an organisation. Using activity theory for our analysis has helped to understand what underpins the restrictive practices and the implications of the identified activity theory tensions (the lack of collaborative tools, divisions of labour) in working on the object of implementing WBE. Activity theory has therefore given us a systemic understanding (Engeström, 2001) of the challenges experienced by staff. In other words, it is not simply a matter of interpersonal difficulty; rather, it is a difficulty that resides within the TVET college system itself. Applying this theory allows us to pinpoint tensions (as highlighted in Figures 4 and 5) between components of the activity system that underpin the restrictive practices observed and, consequently, to determine what aspects of the system need to be addressed in order to improve WBE. In activity terms, the tensions are key and are points for future discussion and development. These disruptions need to be made visible if the patchy implementation of WBE for the benefit of students and the college is to be addressed.

Two avenues of further exploration that draw on activity system analysis can be proposed. First, college staff (management, WIL officers and lecturers) themselves could be presented with the 'Engeström triangle' so that systemic tensions in WBE can be exposed. This may lead to a discussion focused on what new practices could be initiated to resolve some of the current problematic issues with WBE. What would need to be exposed would be tensions arising from thinking in silos so that a more collaborative and mutually beneficial approach could be adopted. Implementation of this activity theory approach to understanding and attempting to resolve organisational WBE issues and tensions at the university level has been attempted with some success by Spante et al. (2025). In their research, university lecturers at one institution involved with implementing and monitoring WBE highlighted difficulties with their WBE work. Thereafter, they worked collaboratively on understanding these difficulties as systemic and historically rooted tensions within the WBE activity system. This provided a stimulus for future work on improving the system so as to include more collaborative engagements. Such a systems analysis approach could be further augmented if industry representatives could, as part of the WBE 'community', also be involved and their interests in and issues with WBE highlighted.

Conclusion

The aim of this article has been to highlight internal restrictive practices at the micro level that may be inhibiting WBE. Using activity theory analysis assisted in arriving at a systemic and clearer understanding of the restrictions. As indicated by UMALUSI (2013), more research is needed into all stakeholders working together to drive practical training (colleges working in partnership with industry), an issue to which this article has attempted to contribute. Furthermore, by focusing on lecturers' experiences of WBE at the micro level, the article addresses a gap in the current research.

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Bridging the skills gap: Strategies to increase TVET enrolment in South Africa

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ABSTRACT

South Africa's technical and vocational education and training (TVET) sector remains under-enrolled, with preliminary 2025/26 headcount enrolment of 432 505 falling below the National Development Plan (NDP) 2030 target of 2 500 000. This article argues that the binding constraint on enrolment is supply-side and institutional – enrolment capping driven by funding limitations and lecturer vacancies – rather than demand-side failure. Drawing on credentialism, social cognitive career, human capital and systems theories operating at distinct analytical levels, the article develops a conceptual model spanning demand-side perceptions, supply-side and institutional constraints, and the labour market interface. Department of Higher Education and Training (DHET) data reveal that 24.9% of TVET lecturer posts were vacant in 2024, R580 million was returned to the National Treasury over two years due to underspending and per capita National Student Financial Aid Scheme (NSFAS) allocation to TVET students was about one-third the university level. The article proposes strategies such as lifting enrolment caps, expanding NSFAS capacity, professionalising the TVET lecturer workforce and realigning the Quality Council for Trades and Occupations (QCTO) qualification transition to address the supply-side bottlenecks that constrain the sector's capacity to absorb latent demand, which South African scholarship shows is socially produced and structurally mediated.

Keywords: NEET youth, funding asymmetry, QCTO transition, conceptual model, post-school education, occupational qualifications

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Introduction

South Africa faces a persistent and deepening skills mismatch that constrains economic growth, exacerbates unemployment and perpetuates inequality. Despite the National Development Plan (NDP) target of producing 30 000 artisans annually and enrolling 2 500 000 students in technical and vocational education and training (TVET) colleges by 2030, the sector remains chronically under-enrolled (NPC, 2012). Preliminary headcount enrolment for 2025/26 stands at 432 505, a figure still subject to validation across all 50 colleges according to the parliamentary response of the minister of higher education and training (Manamela, 2026). This is in contrast to a funded target of 480 547 (DHET, 2025). The 2025/26 enrolment thus represents a shortfall of approximately 83% relative to the NDP target, which raises fundamental questions about whether the constraint lies primarily on the demand side, as is commonly assumed, or on the supply side.

The prevailing policy narrative frames TVET under-enrolment as a demand-side problem rooted in societal stigma, poor perceptions of vocational education and a cultural preference for university qualifications (Makola et al., 2023; Tlapana & Myeki, 2020). While these perceptions are real and documented, this article argues that they constitute a necessary but insufficient explanation. The evidence suggests that the binding constraint is in fact supply-side: enrolment capping driven by funding limitations, lecturer vacancies and institutional capacity deficits that prevent the TVET system from absorbing the latent demand that demonstrably exists. Approximately 3.5 million young South Africans aged 15 to 24 are not in employment, education or training (NEET), according to Statistics South Africa's (Stats SA's) Quarterly Labour Force Survey for Q1 2022 (Stats SA, 2022), which is a substantial pool of potential TVET candidates whose access is structurally constrained rather than voluntarily withheld.

This article acknowledges that the demand–supply distinction, while analytically useful, does not capture the full complexity of the TVET enrolment challenge. Supply-side deficiencies – including lecturer shortages, poor infrastructure and weak graduate outcomes – simultaneously shape perceptions of TVET and therefore influence demand, creating feedback loops that the conceptual model is designed to capture. The article develops an integrated analytical framework drawing on credentialism theory, social cognitive career theory (SCCT), human capital theory and systems theory to map the interconnected factors influencing TVET enrolment. The resulting conceptual model (Figure 1) identifies three domains: demand-side perceptions, supply-side and institutional constraints, and the labour market interface, all situated within a broader macro-context. The analysis suggests that, while demand-side interventions are necessary, they are unlikely to succeed without first addressing the supply-side bottlenecks that cap enrolment and undermine programme quality. The article concludes with evidence-informed strategies prioritising the lifting of enrolment caps, expansion of National Student Financial Aid Scheme (NSFAS) capacity, professionalisation of the TVET lecturer workforce and realignment of the Quality Council for Trades and Occupations (QCTO) qualification transition.

Literature review and theoretical framework

The TVET enrolment paradox: Demand versus supply

A substantial body of literature attributes TVET under-enrolment to demand-side factors, particularly societal stigma and the cultural premium attached to university education. Tlapana and Myeki (2020) document the pervasive perception that TVET qualifications are inferior to university degrees, while Makola et al. (2023) identify parental influence, peer pressure and limited career guidance as key deterrents. These findings are consistent with international evidence from sub-Saharan Africa, where vocational education is widely perceived as a second-chance option for academic underperformers (Atchoarena & Delluc, 2001; Oketch, 2007). The demand-side narrative is reinforced by South Africa's credentialism dynamic, in which employers and society alike privilege formal academic credentials over occupational competence (Collins, 1979; Kraak, 2008). However, as McGrath (2012) has argued, vocational education and training (VET) policy in developing countries is frequently grounded in outmoded development models that assume skills supply will automatically meet demand, thus neglecting the structural constraints that limit the system's capacity to deliver.

South African scholarship on student demand for TVET

A growing body of South African scholarship has demonstrated that student demand for TVET is considerably more complex than the stigma narrative suggests. Powell and McGrath (2014), drawing on interviews with further education and training (FET) college students, argue that enrolment decisions are embedded in 'life projects' that extend beyond narrow employability to include community contribution, self-esteem and family responsibility. The work of these authors therefore challenges deficit-based accounts that frame TVET entrants as academic failures. The major Department of Higher Education and Training (DHET)-commissioned study by Powell et al. (2024) provides the most direct empirical engagement with student demand to date, documenting enormous unmet demand and finding that large proportions of applicants who meet entrance requirements are nevertheless rejected because of supply-side capacity limits. Sibiya et al. (2021) extend this picture by examining TVET engineering students' perceptions of their qualifications and employment prospects, finding divergent and ambivalent views shaped by labour market conditions as much as by intrinsic interest in the trade. Collectively, this literature shows that student demand itself is socially produced, aspirationally mediated and shaped by broader structural and institutional factors, including the very supply-side deficiencies this article centres on. The present analysis builds on these findings by foregrounding the feedback loops through which supply-side constraints depress, distort and reshape student demand. Maluleke (2021), although focusing on lecturer rather than student career development, underscores the same point through his application of careership theory to TVET colleges: decisions to enter and remain within the TVET system are structurally and biographically co-produced.

However, demand-side explanations cannot account for the structural reality that hundreds of thousands of qualifying applicants are turned away from TVET colleges annually because of enrolment caps. DHET data indicate that the TVET sector has never exceeded the 702 383 headcount enrolment achieved in 2014 and has since contracted significantly (DHET, 2025). The funded enrolment target for 2023/24 was 557 035, while actual enrolment was 564 089, suggesting that demand marginally exceeded funded capacity even at these depressed levels. This pattern is inconsistent with a purely demand-side diagnosis: if students were unwilling to enrol, funded targets would not be met or exceeded. The evidence points instead to a supply-side constraint that rations access below the level of latent demand.

Credentialism theory and TVET stigmatisation

Credentialism theory, as articulated by Collins (1979), suggests that educational qualifications function primarily as status markers rather than as accurate signals of productive competence. In the South African context, Kraak (2008) argues that credentialism drives a qualitative hierarchy of qualifications in which university degrees are positioned at the apex and TVET certificates at the base, irrespective of labour market demand. This hierarchy is reinforced by historical patterns of racialised access to education under apartheid, where university education was reserved for white South Africans and vocational training was imposed on black communities as a mechanism of labour control (Allais, 2012). The legacy of this history continues to shape perceptions: TVET colleges are widely seen as institutions of last resort rather than as pathways to skilled employment. Wheelahan (2007) extends this analysis by demonstrating how competency-based training frameworks structurally deny vocational students access to theoretical knowledge, reproducing class-based hierarchies between academic and vocational pathways and undermining genuine parity of esteem.

The implications for enrolment are significant but nuanced. Credentialism explains why TVET qualifications are culturally devalued and why students with the option to pursue university education overwhelmingly do so. However, it does not explain why the millions of young people who do not qualify for university admission, and who are currently NEET, are not enrolling in TVET programmes. The gap between the 3.5 million NEET youth and the approximately 432 505 enrolled in TVET colleges suggests that the barrier is not solely attitudinal; it is also structural. Enrolment caps, funding constraints and institutional capacity deficits prevent the TVET system from absorbing the demand that exists, even after accounting for the credentialism discount. Allais (2024) has recently shown how globally borrowed VET policy tools have further undermined local institutional capacity in South Africa, deepening rather than resolving this structural gap.

Social cognitive career theory and occupational choice

Social cognitive career theory (SCCT), developed by Lent et al. (1994), provides a framework for understanding how self-efficacy beliefs, outcome expectations and contextual barriers shape career choices. In the TVET context, SCCT suggests that students' decisions to pursue vocational education are influenced by their confidence in their ability to succeed in technical programmes (self-efficacy), their expectations about the employment outcomes of TVET qualifications (outcome expectations) and the structural barriers they encounter (contextual factors). Research by Makola et al. (2023) confirms that South African students perceive significant barriers to TVET participation, including inadequate career guidance, limited programme information and concerns about programme quality.

SCCT is particularly useful for understanding the interaction between demand-side perceptions and supply-side constraints. Students who encounter poor facilities, high lecturer vacancy rates and inadequate equipment at TVET colleges receive negative efficacy signals that reinforce their pre-existing doubts about the value of vocational education. Supply-side deficiencies do not merely limit access; they actively undermine demand by creating a negative feedback loop. The 24.9% lecturer vacancy rate in 2024 (DHET, 2023; Taylor & Sadeck, 2024) is not simply a capacity constraint; it is also a perceptual barrier that discourages potential applicants, who interpret staff shortages as evidence of institutional dysfunction. Similarly, the return of R580 million to the National Treasury over two financial years owing to underspending (PMG, 2024) signals administrative incapacity that damages the sector's reputation. This feedback dynamic challenges any rigid distinction between supply and demand: the two are causally intertwined.

Human capital theory and the skills gap

Human capital theory (Becker, 1964; Schultz, 1961) provides the foundational economic rationale for public investment in TVET. The theory holds that education and training increase individual productivity and earnings, generating returns both for the individual and for society. In the South African context, the skills gap is conventionally understood as a mismatch between the skills produced by the education system and those demanded by the labour market (DHET, 2024a). The 2024 National List of Occupations in High Demand (N-OIHD), published in Government Gazette No. 50510, identifies critical-shortage occupations that TVET colleges are well positioned to address, including occupations such as electrician, welder, plumber and information and communications technology (ICT) technician (DHET, 2024c).

However, human capital theory's assumption of rational investment decisions by individuals breaks down when structural constraints prevent access to education. The theory predicts that individuals will invest in education when the expected returns exceed the costs. However, this calculation is irrelevant when enrolment slots are unavailable. The current situation, in which TVET colleges are capped well below the level of demand, represents a market failure that

human capital theory alone cannot resolve. Public intervention is required to expand supply capacity. Wheelahan (2015) has further argued that an exclusive focus on skills in VET policy – without attention to the knowledge architecture that underpins occupational competence – limits the transformative potential of vocational education.

Systems theory and the TVET ecosystem

Systems theory (Von Bertalanffy, 1968) provides the integrative framework for understanding TVET enrolment as an emergent property of multiple interacting subsystems. The TVET ecosystem comprises interdependent components, including government policy, institutional capacity, labour market dynamics, societal values and individual decision-making processes. Changes in any one component propagate through the system, generating feedback loops that can amplify or dampen enrolment trends. For example, underfunding of TVET colleges reduces programme quality, which depresses enrolment, which reduces political support for TVET funding, which further reduces programme quality, all in a self-reinforcing cycle of decline.

The systems perspective is essential for understanding why isolated interventions have consistently failed to increase TVET enrolment. Efforts to improve the sector's image through marketing campaigns cannot succeed if the underlying institutional capacity is insufficient to absorb additional students. Similarly, increasing NSFAS bursary amounts is futile if there are no lecturers to teach the additional students that the bursaries would attract. The conceptual model presented in this article (Figure 1) reflects this systemic understanding by situating the three domains of demand, supply and labour market interface within a macro-contextual envelope and by specifying the feedback mechanisms that connect them.

Theoretical integration: Rationale for the multi-theoretical framework

The four theories are not merely listed in sequence; they are integrated through a layered analytical architecture in which each theory operates at a distinct explanatory level and the conceptual model specifies the causal pathways that connect them. Credentialism theory (Collins, 1979; Kraak, 2008) operates at the macro-social level, explaining the cultural devaluation of vocational qualifications; SCCT (Lent et al., 1994) operates at the micro-individual level, specifying the mechanisms such as self-efficacy, outcome expectations and contextual barriers through which macro-cultural devaluation is translated into individual occupational choices; human capital theory (Becker, 1964) operates at the meso-economic level, linking individual choices to labour market outcomes; and systems theory (Von Bertalanffy, 1968) operates at the integrative meta-level, specifying the feedback loops through which outcomes at one level propagate to and reshape conditions at the other levels. Integration is achieved not by collapsing these theories into a single framework but by assigning each a specified analytical role within the conceptual model (Figure 1): Credentialism and SCCT jointly illuminate the demand-side domain; human capital theory illuminates the labour market interface; and systems theory binds all three domains through bidirectional causal arrows. This layered architecture resolves the theoretical pluralism concern by ensuring

that each theory is invoked only for the analytical question it is best equipped to answer, while the model specifies the inter-theoretic bridges that constitute the article's explanatory contribution.

Methodology

This article adopts a conceptual policy analysis approach, situated within the interpretive policy analysis tradition (Yanow, 2000) and combining a structured review of theoretical literature with analysis of publicly available secondary data from DHET annual reports and statistical publications (DHET, 2024a; DHET, 2025), DHET policy documents, including the N-OIHD (DHET, 2024c), Parliamentary Monitoring Group (PMG) records (PMG, 2024) and published academic research on TVET enrolment, demand and institutional capacity. The approach is consistent with the conceptual policy analysis genre recognised in the VET research literature (McGrath & Yamada, 2023) and serves the purpose of reframing policy debates by bringing new analytical lenses to bear on existing evidence. The analysis is subject to the usual limitations of secondary data, including reporting lags and inconsistencies between sources, which are discussed in the 'Limitations' section.

Conceptual model

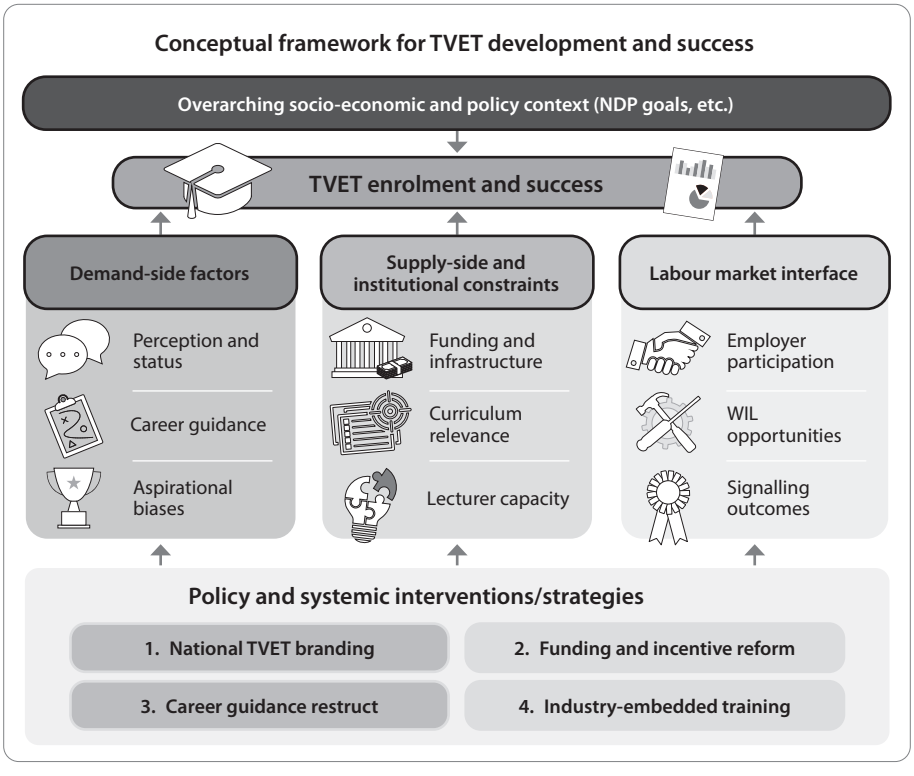
Figure 1 presents the conceptual model developed through the integration of the four theoretical perspectives discussed above. The model identifies three primary domains that influence TVET enrolment: demand-side perceptions, supply-side and institutional constraints, and the labour market interface. These domains are situated within a broader macro-context encompassing policy frameworks, societal values and economic conditions. Bidirectional arrows between the central node and each domain indicate mutual causation, while dashed feedback loops illustrate the systemic interactions that amplify or dampen enrolment dynamics.

The model designates supply-side and institutional constraints as the primary binding constraint, visually indicated by the heavier border around this node (Figure 1 note). This designation is based on the empirical evidence presented below: latent demand for TVET places exceeds funded supply, enrolment caps are the direct mechanism by which demand is rationed and institutional capacity deficits – particularly lecturer vacancies and infrastructure backlogs – are the proximate cause of enrolment capping. The model captures the mutual constitution of supply and demand: supply-side deficiencies shape demand-side perceptions, meaning that the distinction between supply and demand is analytical rather than ontological.

The macro-context node acknowledges that all three domains operate within a broader environment shaped by national policy (including the QCTO qualification transition), societal values (including credentialism and the cultural premium on university education) and economic conditions. Feedback from the macro-context to the supply side reflects the policy-funding nexus, while feedback from the supply side to the macro-context reflects the

reality that institutional failures undermine political confidence in the TVET system. The bidirectional relationship between demand-side perceptions and the labour market interface captures the dynamic whereby employment outcomes shape perceptions of TVET value and perceptions, in turn, influence the supply of labour to vocational occupations.

Figure 1
Conceptual model of factors influencing TVET enrolment in South Africa



Note: The supply-side and institutional constraints node is visually emphasised (heavier border) to indicate its designation as the primary binding constraint, based on the evidence presented in this article.

Demand-side perceptions of TVET

Societal stigma and the cultural premium on university education

The demand-side literature consistently identifies societal stigma as the primary perceptual barrier to TVET enrolment. In South Africa, TVET colleges are widely perceived as inferior alternatives to universities, a perception rooted in both the colonial and apartheid legacies of racialised education and the contemporary dynamics of credentialism (Allais 2012; Kraak, 2008). Tlapana and Myeki (2020) found that parents, teachers and career guidance counsellors

actively dissuade students from considering TVET pathways, characterising vocational education as suitable only for those who fail to meet university admission requirements. As McGrath et al. (2004) document, the apartheid-era legacy of technical education as a mechanism of labour control for black workers continues to shape contemporary attitudes and post-1994 reforms have not succeeded in overcoming this historical imprint.

The cultural premium on university education is reflected in application patterns. Despite the NDP's emphasis on expanding TVET enrolment, the vast majority of school leavers who qualify for university admission apply to universities first, with TVET colleges considered only as a fallback. The South African Qualifications Authority (SAQA) has noted that the National Qualifications Framework (NQF) has not succeeded in establishing parity of esteem between vocational and academic qualifications (SAQA, 2023). Wheelahan (2015) argues that genuine parity of esteem requires substantive access to theoretical knowledge within vocational programmes, a condition that is far from being met in South Africa. The challenge is compounded by employer behaviour: many employers continue to require university degrees for positions that could be performed by TVET graduates, thereby perpetuating the credentialist bias in hiring practices.

The NEET population and latent demand

The scale of the NEET population provides the strongest evidence that demand for post-school education and training substantially exceeds current TVET capacity. Statistics South Africa's Quarterly Labour Force Survey for Q1 2022 reported approximately 3.5 million young people aged 15 to 24 who were not in employment, education or training (Stats SA, 2022). Subsequent data suggest that this figure has continued to rise, reaching approximately 3.82 million by Q1 2025 (Stats SA, 2025; UCT Children's Institute, 2024). The NEET population represents a vast reservoir of latent demand for TVET programmes that is not being captured because of structural supply-side constraints and not because of insufficient interest in vocational education.

Critically, the NEET population is not composed exclusively of individuals who have rejected TVET education. Many NEET youth have attempted to enrol in TVET colleges but have been turned away because of enrolment caps, programme closures or the unavailability of their desired programme at a nearby college. Others are deterred by the poor conditions they observe during the application process: overcrowded facilities, insufficient equipment and evidence of staff shortages. These observations are consistent with SCCT, which predicts that contextual barriers reduce self-efficacy and lower outcome expectations, thereby depressing enrolment intentions even among individuals who would otherwise be motivated to pursue vocational education. This dynamic illustrates the difficulty of maintaining a rigid demand–supply distinction: what appears as insufficient demand is, in part, a demand-side effect of supply-side deficiencies.

Supply-side and institutional constraints

Enrolment capping as the binding constraint

The most direct mechanism by which supply-side factors constrain TVET enrolment is the system of enrolment capping imposed by DHET. Colleges are assigned annual, funded enrolment targets based on the available budget and colleges that exceed these targets do not receive additional funding for the excess students. The practical effect is that colleges are financially incentivised to limit enrolment to the funded target, regardless of the level of demand. Table 1 summarises the funded and actual enrolment figures for recent years, demonstrating that actual enrolment has consistently remained close to or slightly above the funded target, suggesting that the cap, rather than demand, is the operative constraint.

Table 1
TVET college-funded targets and actual headcount enrolment, 2014–2025/26

Year	Funded target	Actual headcount	Variance
2014	610 000 (estimated)	702 383	+92 383
2019	~603 000	~603 000	Approximately at target
2021/22	568 569	589 083	+20 514 (+3.6%)
2022	582 048	518 584	–63 464 (–10.9%)
2023	557 035	564 089	+7 054
2025/26	480 547	432 505 (prelim.)	–48 042

Sources: DHET (2025); PMG (2024); Manamela (2026). The 2019 funded target is approximate and should be confirmed from DHET annual reports. The 2025/26 actual headcount is preliminary and subject to validation across all 50 colleges.

The data in Table 1 reveal several patterns. First, the 2014 peak of 702 383 was achieved during a period of relatively generous funding. However, subsequent budget constraints led to a sharp contraction in funded targets and actual enrolment. Second, the 2021/22 figure of 589 083, confirmed by parliamentary data (Manamela, 2026), represents a recovery that interrupts the narrative of uninterrupted decline. Nevertheless, this recovery was short-lived, as enrolment fell to 518 584 in 2022 before recovering to 564 089 in 2023. Third, the preliminary 2025/26 figure of 432 505 represents a sharp decline even from the reduced funded target of 480 547, suggesting that the system is now underperforming relative to its own diminished capacity targets. The gap between the NDP target of 2 500 000 and actual enrolment of 432 505 in 2025/26 is 82.7%, indicating that the NDP goal appears increasingly unachievable without a fundamental restructuring of TVET funding and capacity.

Lecturer vacancies and teaching capacity

The second major supply-side constraint is the acute shortage of qualified lecturers. DHET data indicate that 24.9% of TVET lecturer posts were vacant in 2024, representing a significant erosion of teaching capacity (DHET, 2023; Taylor & Sadeck, 2024). This vacancy rate means that, even where physical infrastructure and funding exist to enrol additional students, the absence of qualified lecturers prevents colleges from offering the necessary instructional hours. The vacancy rate is particularly acute in technical and engineering subjects, where the gap between TVET lecturer remuneration and private-sector salaries is widest.

Table 2
TVET lecturer workforce and institutional capacity indicators

Indicator	Value	Source
Lecturer vacancy rate (2024)	24.9%	DHET, 2023; Taylor & Sadeck, 2024
Eastern Cape: Acting principals	7 out of 8 colleges	PMG, 2024
Lecturers without required qualifications	Estimated as >30%	DHET, 2024b
Average lecturer-to-student ratio (target)	1:30	DHET norm
Average lecturer-to-student ratio (actual)	1:35–1:40 (estimated)	Calculated from DHET data

Sources: DHET (2023, 2024b); Taylor & Sadeck (2024); PMG (2024). The lecturer-to-student ratio is estimated from headcount enrolment and filled posts and may vary by programme.

The institutional capacity crisis is further illustrated by the situation in the Eastern Cape, where seven of the province's eight TVET colleges were operating with acting principals as of 2024 (PMG, 2024). This level of leadership instability undermines strategic planning, financial management and academic governance, creating a vicious cycle in which poor management leads to underperformance, which further erodes political and financial support. The return of R580 million to the National Treasury over two financial years owing to underspending is symptomatic of this dysfunction: colleges with acting principals and vacant lecturer posts are unable to spend their allocated budgets effectively, creating the perverse situation in which the sector is both underfunded and underspending simultaneously.

Funding asymmetries: TVET sector versus university sector

The funding disparity between the TVET and university sectors is stark and provides compelling evidence of the supply-side constraint. Table 3 presents comparative DHET and NSFAS allocation data, revealing that per capita DHET spending on TVET students is less than 60% of the university level, while the average NSFAS bursary for TVET students is approximately one-third of that received by university students. This disparity persists

despite the NDP's explicit commitment to expanding TVET as a proportion of post-school education and training. The table also includes the approximate distribution of enrolment across the major post-school subsystems to contextualise the TVET sector's relative size.

Table 3
Comparative funding allocations and post-school enrolment distribution, 2023/24

Category	Universities	TVET colleges	Other/notes
DHET allocation 2023/24 (R billion)	R44.63	R12.8	DHET, 2024a
NSFAS total allocation 2023/24 (R billion, estimated)	R48.6	R13.70	NSFAS Annual Report
NSFAS-funded students 2023/24	~480 000	~450 000	Estimated
Average NSFAS bursary per student	~R101 000	~R30 400	Ratio approximately 3.3:1
Per capita DHET allocation	~R40 600	~R23 000	Ratio approximately 1.8:1
Headcount enrolment (approximate)	~1 100 000	564 089 (2023)	Council on Higher Education (CHE), 2022; DHET, 2025
Share of post-school enrolment	50%	26%	Approximate
Private higher education institutions (HEIs) and colleges			~150 000 (7%)
Programmes funded by sector education and training authorities (SETAs)			~300 000 (14%)
Community education and training (CET) colleges			~80 000 (4%)

Sources: DHET (2024a, 2025); CHE (2022); NSFAS Annual Report 2023/24; SETA annual reports. Figures are approximate and drawn from different reporting periods. NSFAS figures are estimated from the most recently available annual reports.

The funding asymmetry has direct implications for enrolment capacity. Universities receive substantially more per student than TVET colleges, enabling them to offer better facilities, smaller classes and more attractive working conditions. The disparity is compounded by the NSFAS allocation pattern, where university students receive significantly higher bursary values than their TVET counterparts, despite the fact that TVET students are overwhelmingly from lower-income households. The per capita funding gap is a structural barrier that prevents the TVET sector from expanding its capacity to absorb latent demand. At approximately

R30 400 per annum for TVET students, the NSFAS allocation is insufficient to cover the full cost of education, including accommodation, transport and learning materials, thereby contributing to high dropout rates.

Infrastructure and equipment backlogs

Infrastructure deficiencies constitute a further supply-side constraint that limits both enrolment capacity and programme quality. Many TVET colleges operate in ageing buildings with outdated or broken equipment, particularly in workshop-based programmes such as engineering, construction and hospitality. DHET's own assessments have identified significant infrastructure backlogs across the TVET college system, with some colleges unable to offer certain high-demand programmes because they lack the necessary workshops, laboratories or specialist equipment (DHET, 2024b). These backlogs are both a capacity constraint, limiting the number of students who can be accommodated, and a quality constraint, undermining the learning outcomes and employability of those who are enrolled.

The infrastructure problem is compounded by the QCTO qualification transition, which requires colleges to adapt their facilities and equipment to meet the requirements of the new occupational qualifications. Government Gazette No. 51771 (December 2024) provides the regulatory framework, but the costs of compliance – including retooling workshops, updating curricula and retraining lecturers – impose additional burdens on an already resource-constrained system. The risk is that the QCTO transition, while theoretically sound in its aim of aligning qualifications with occupational standards, could in practice further reduce enrolment capacity if colleges are unable to meet the new requirements within existing budget constraints.

Programme-level complexities: NC(V), NATED and NSFAS dynamics

The analysis thus far has treated TVET enrolment as a single aggregate, but the sector comprises distinct programme types with different enrolment dynamics, completion rates and funding implications. The two principal programme types are the National Certificate (Vocational), known as NC(V), introduced from 2007 as the preferred curriculum for TVET colleges, and the NATED (National Accredited Technical Education Diploma) (Report 191) programmes, which are legacy qualifications dating from the apartheid-era technical college system that consist of stand-alone, trimester-based subjects. Enrolment dynamics differ significantly: NC(V) enrolment has generally declined as colleges have struggled to implement the curriculum effectively, while NATED enrolment has proved more resilient, partly because the modular structure allows students to combine study with employment (Akoojee, 2008; Garraway, 2022).

Throughput rates at TVET colleges are low: a significant proportion of students who enrol do not complete within the minimum time and many do not complete at all. Garraway (2015) has documented the difficulties students face in transitioning between college and workplace

practicums, which contribute to extended programme durations and high attrition rates. Low completion rates mean that the effective output of the TVET system is substantially lower than headcount enrolment figures suggest. NSFAS dynamics further complicate the picture: NSFAS bursary administration has been characterised by delays and errors that disrupt registration. Moreover, the relatively low TVET bursary value (approximately R30 400 per annum as against R101 000 for university students) means that even funded students may be unable to cover living costs, thus contributing to dropout. These dynamics illustrate that the boundary between supply-side and demand-side constraints is blurred: NSFAS is a supply-side funding mechanism, but its inadequacy generates demand-side effects by depressing enrolment and retention.

Labour market interface

Occupations in high demand

The labour market provides both the demand signal for TVET programmes and the outcome measure by which TVET success is judged. The 2024 N-OIHD, published in Government Gazette No. 50510, identifies the occupational categories where labour market demand significantly exceeds supply (DHET, 2024c). Table 4 presents selected high-demand occupations relevant to TVET programme offerings, based on the official N-OIHD rankings.

Table 4
Selected occupations in high demand aligned with TVET programme offerings

Occupation	OFO code	Demand category
Electrician	6711	High demand
Welder	7212	High demand
Plumber	6426	High demand
ICT technician	3514	High demand
Diesel mechanic	6533	High demand
Chef	5120	High demand
Automotive motor mechanic	6531	High demand
Boilermaker	6513	High demand
Fitter and turner	6523	High demand

Sources: DHET (2024c); N-OIHD, Government Gazette No. 50510. 'OFO codes' refers to the four-digit Organising Framework for Occupations (OFO) groups used in the South African classification system. Occupations marked with an asterisk (*) in the gazette also have a comparatively large number of unemployed individuals on the Employment Services of South Africa (ESSA) database.

The alignment between high-demand occupations and TVET programme offerings suggests that the TVET system is theoretically well positioned to address labour market shortages. However, the supply-side constraints identified above prevent the system from producing sufficient graduates to meet demand. The consequence is a paradox in which the labour market signals a clear need for TVET graduates while the education system is unable to respond because of funding and capacity limitations. This paradox reinforces the present article's central argument: the binding constraint appears to be on the supply side, though this constraint generates demand-side effects through the feedback mechanisms identified in the conceptual model.

Employer perceptions and graduate outcomes

Employer perceptions of TVET graduates are a critical component of the labour market interface. Research consistently finds that South African employers rate TVET graduates as inadequately prepared for the workplace, citing deficits in practical skills, workplace readiness and problem-solving ability (DHET, 2017; DHET, 2024a). These perceptions, whether fully justified or not, feed back into the demand side by reinforcing the stigma against TVET qualifications: students who observe that TVET graduates struggle to find employment are less likely to view TVET as a worthwhile investment. This feedback loop is captured in the conceptual model (Figure 1) through the bidirectional arrows between the labour market interface and demand-side perceptions.

Graduate outcome data, though limited by poor tracking systems, support the concern about TVET graduate employability. DHET's own research acknowledges that the transition from TVET college to employment is often prolonged and that many graduates end up in low-skilled jobs unrelated to their field of study (DHET, 2024a). This outcome is partly attributable to the quality constraints imposed by supply-side deficiencies: underqualified lecturers, outdated equipment and inadequate work-integrated learning (WIL) opportunities all contribute to graduate outcomes that fall short of labour market requirements. Once again, the demand–supply interaction is central: poor graduate outcomes (a supply-side quality issue) drive negative perceptions (a demand-side effect).

Enrolment trends and the NDP target

Table 5 presents the long-term enrolment trend data, including the shortfall relative to the NDP 2030 target. The addition of the 2021/22 data point (589 083) reveals that the decline in enrolment was not monotonic: the 2021/22 recovery to 589 083 exceeded the funded target of 568 569 by 3.6%, indicating that the system was capable of absorbing additional students when funded to do so. However, this recovery proved unsustainable and enrolment fell back to 518 584 in 2022 before partially recovering to 564 089 in 2023.

The trend data in Table 5 are consistent with the article's central argument. Enrolment peaked in 2014 at 702 383 and has since declined, with only the 2021/22 year showing a

meaningful recovery. The NDP 2030 target of 2 500 000 appears increasingly unattainable: at current rates of decline, enrolment would need to increase by a factor of approximately 5.8 times over the remaining five years to meet the target, a rate of growth that is unprecedented in the sector's history and infeasible without massive additional investment. The shortfall as a percentage of the NDP target has increased from 71.9% in 2014 to 82.7% in 2025/26, indicating that the gap is widening rather than narrowing.

Table 5
TVET college headcount enrolment trends and shortfall relative to NDP 2030 Target

Year	Actual headcount	Shortfall as % of NDP target
2014	702 383	71.9%
2019	~603 000	75.9%
2021/22	589 083	76.4%
2022	518 584	79.3%
2023	564 089	77.4%
2025/26	432 505 (preliminary)	82.7%

Sources: DHET (2025); PMG (2024). The 2019 figure is approximate and should be confirmed from DHET annual reports. The 2025/26 figure is preliminary and subject to validation. 'Shortfall as % of NDP target' is calculated as (2 500 000 minus actual) divided by 2 500 000, multiplied by 100.

Strategies to increase TVET enrolment

Lifting enrolment caps and expanding funded capacity

The most direct strategy for increasing TVET enrolment is to lift the enrolment caps that currently constrain the system. This requires a fundamental increase in the TVET sector's funded enrolment target, which has been progressively reduced from approximately 610 000 in 2014 to 480 547 in 2025/26. Restoring the funded target to at least its 2014 level would require an estimated additional R6 billion to R8 billion in annual DHET funding, based on current per capita allocation rates. While this is a significant sum, it represents a fraction of the R44.63 billion allocated to universities in 2023/24 and would be partly offset by reduced social grant expenditure and increased tax revenue from higher employment rates among TVET graduates.

Lifting enrolment caps must be accompanied by measures to ensure that colleges have the institutional capacity to absorb additional students. This includes filling the 24.9% of lecturer posts that are currently vacant, expanding physical infrastructure and providing the equipment and learning materials necessary to maintain programme quality at higher enrolment levels. The experience of the 2021/22 academic year, in which enrolment recovered to 589 083 against a funded target of 568 569, demonstrates that the system can absorb

additional students when resources are made available. The subsequent decline in 2022 and the sharp drop in 2025/26 reflect the consequences of failing to sustain that investment.

Expanding NSFAS capacity and equity in bursary allocation

Reform of the NSFAS is essential for both increasing enrolment and improving retention. The current disparity in average bursary per student – approximately R101 000 for university students versus R30 400 for TVET students – creates a perverse incentive structure in which financially needy students are incentivised to pursue university education, where the financial support is more generous, rather than TVET education, where the labour market demand is greater. Rebalancing NSFAS allocations to achieve greater parity between university and TVET bursary values would remove this distortion and enable more TVET students to complete their studies without financial hardship.

In addition to increasing the per-student bursary value, NSFAS capacity must be expanded to cover a larger number of TVET students. The current NSFAS allocation covers approximately 450 000 TVET students, but the sector's enrolment potential, if caps were lifted, is estimated at 700 000 or more. Expanding NSFAS coverage to this level would require a substantial increase in the TVET NSFAS budget, estimated at an additional R5 billion to R7 billion annually. This investment would generate returns through increased graduate output, higher employment rates and reduced dependency on social grants.

Professionalising the TVET lecturer workforce

Addressing the 24.9% lecturer vacancy rate requires both supply-side and demand-side interventions. On the supply side, DHET must invest in pre-service training programmes to develop a pipeline of qualified TVET lecturers, including establishing dedicated TVET lecturer training programmes at universities of technology and expanding learnership and apprenticeship pathways that enable experienced artisans to transition into teaching roles. On the demand side, TVET lecturer remuneration and conditions of service must be made more competitive relative to private-sector alternatives, particularly in high-demand technical fields where the salary gap between teaching and industry employment is widest.

Professional development for existing TVET lecturers is equally important. A significant proportion of current lecturers lack the pedagogical qualifications required for effective vocational teaching and many have not had access to ongoing professional development. Research by Akoojee (2008) and Gamble and Hewlett (2022) identifies the lack of systematic lecturer development as a key factor in poor programme quality. Garraway and Winberg (2020) argue that vocational teacher development must bridge the theory–practice gap through expansive learning approaches. DHET's TVET Lecturer Development Strategy must be fully funded and implemented, with mandatory continuing professional development linked to lecturer registration with the relevant professional body.

Realigning the QCTO qualification transition

The QCTO qualification transition represents both a risk and an opportunity for TVET enrolment. The transition from the legacy NATED (N1–N6) and NC(V) qualifications to the new occupational qualifications under the QCTO framework has the potential to improve the alignment between TVET programmes and labour market needs, but it also imposes significant costs on colleges that must retool workshops, retrain lecturers and develop new curricula. Government Gazette No. 51771 (December 2024) provides the regulatory framework, but the implementation timeline and resource requirements remain challenging.

To ensure that the QCTO transition does not further constrain enrolment, DHET must provide dedicated transition funding, including capital grants for workshop retooling, training allowances for lecturers and technical assistance for curriculum development. The transition must be phased in a manner that allows colleges to continue offering existing programmes while developing capacity for the new qualifications, avoiding a gap in provision. Akoojee (2016) has cautioned that the gap between developmental TVET rhetoric and implementation realities in South Africa is wide, and the QCTO transition risks replicating this pattern unless accompanied by adequate resourcing and institutional support.

Discussion

The analysis presented in this article challenges the prevailing narrative that TVET under-enrolment in South Africa is primarily a demand-side problem. While demand-side factors, particularly societal stigma and the cultural premium on university education, are real and significant, the evidence suggests that they are not the binding constraint. The binding constraint appears to be supply-side: enrolment capping driven by funding limitations, lecturer vacancies and institutional capacity deficits prevent the TVET system from absorbing the latent demand that demonstrably exists. The 3.5 million NEET youth represent a vast reservoir of potential TVET enrolment not being captured because the system lacks the capacity to enrol, teach and support them. As the South African scholarship discussed above makes clear (Powell et al., 2024; Powell & McGrath, 2014; Sibiya et al., 2021), this demand is itself socially produced and structurally mediated, so the demand–supply distinction is analytical rather than ontological, and the two dimensions are causally intertwined through the feedback mechanisms identified in the conceptual model.

The conceptual model (Figure 1) captures the systemic nature of the problem: poor institutional capacity produces low-quality graduates, which depresses employer demand for TVET qualifications, which reinforces societal stigma, which further reduces political support for TVET funding, which further erodes institutional capacity. Breaking this cycle requires a supply-side intervention as the first mover. The 2021/22 enrolment recovery to 589 083, against a funded target of 568 569, demonstrates that the system can respond positively when funding and policy conditions are supportive; the subsequent decline and the preliminary 2025/26 figure of 432 505 confirm that one-off gains are insufficient.

The analysis does not claim that supply-side constraints are the only barrier; rather, they constitute the binding constraint that, if lifted, would yield the largest marginal increase in enrolment. Demand-side interventions remain necessary but are unlikely to be effective while the system lacks the capacity to absorb the students they would attract.

Limitations

This article is a conceptual policy analysis and does not present primary empirical data. The analysis relies on publicly available DHET data, parliamentary records and published research, which are subject to the usual limitations of secondary data sources, including reporting lags, inconsistencies between sources and the possibility of revision. The conceptual model, while grounded in established theory, has not been empirically tested and should be understood as a heuristic framework for organising the available evidence rather than as a confirmed causal model. The article treats TVET enrolment as an aggregate, although the programme-level analysis reveals significant differences between NC(V) and NATED programmes that aggregate data obscure; future research should disaggregate enrolment trends by programme type and address regional variation. The claim that supply-side constraints are the binding constraint is based on circumstantial evidence rather than direct econometric testing. Finally, the multi-theoretical framework, while analytically useful, draws on theories from different intellectual traditions; the layered integration proposed in this article is conceptual rather than epistemologically unified and future empirical work should seek to operationalise and test the model's propositions using quantitative methods, including structural equation modelling and time-series analysis.

Conclusion

The present article has argued that the binding constraint on TVET enrolment in South Africa is primarily supply-side and institutional, not demand-side. The evidence suggests that the TVET system has never been funded or capacitated to enrol anywhere near the number of students that the NDP envisions and the current trajectory is moving further away from, rather than toward, the 2030 target. The 24.9% lecturer vacancy rate, the R580 million returned to the National Treasury owing to underspending and the persistent per capita funding gap between TVET and university students all point to a system that is structurally unable to respond to the demand that exists. However, this conclusion must be qualified: the demand–supply distinction is analytical rather than ontological and the two dimensions are causally intertwined. Supply-side constraints generate demand-side effects through the feedback mechanisms identified in the conceptual model, meaning that addressing supply alone is necessary but not sufficient.

The strategies proposed in this article, such as lifting enrolment caps, expanding NSFAS capacity, professionalising the TVET lecturer workforce and realigning the QCTO qualification transition, are interdependent and must be implemented in concert. Lifting caps without filling vacancies will merely dilute programme quality; expanding NSFAS

without lifting caps will leave funded students unable to find places; and professionalising the lecturer workforce without competitive remuneration will fail to attract the talent the sector needs. The systems perspective embedded in the conceptual model (Figure 1) highlights the necessity of a coordinated, multipronged approach rather than isolated interventions. South Africa's unemployment crisis, particularly among young people, cannot be addressed without a functional, high-quality TVET system that produces the skilled workers the economy needs. The choice is not between demand-side and supply-side interventions; it is about sequencing. Supply-side capacity must be built first so that demand-side interventions can succeed.

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EDITORIAL POLICY AND PROCEDURE

The *Journal of Vocational, Adult and Continuing Education and Training* (JOVACET) recognises the need for critical engagement through studies in TVET and adult and continuing education and training, and for encouraging critical scrutiny of this expansive knowledge area on the African continent.

The voices and experiences of practitioners, reflecting on all aspects of teaching and learning within vocational education and adult education settings, should be heard through publication of empirical and robust research. While the journal clearly wishes to take forward academic scholarship, it also seeks to strengthen opportunities for reflective practice that makes a scholarly contribution to the field. New knowledge emerging out of complex developmental contexts has significant value and needs to be showcased beyond existing geographical and political boundaries. The journal is therefore committed to also supporting the development of emerging researchers by providing them with a space to present and defend their research among a network of global scholars. Within the field of vocational and continuing education there is substantive 'grey literature' that remains in project report form. The journal is potentially a vehicle for the translation of this important work into an academic contribution to a wider community of practice, thereby enhancing the value of such work.

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The article should not contain any identification of the author and should be anonymised as far as possible. The name and affiliation of the author, as well as the author's email address, should appear on a separate page.

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Joy Papier

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