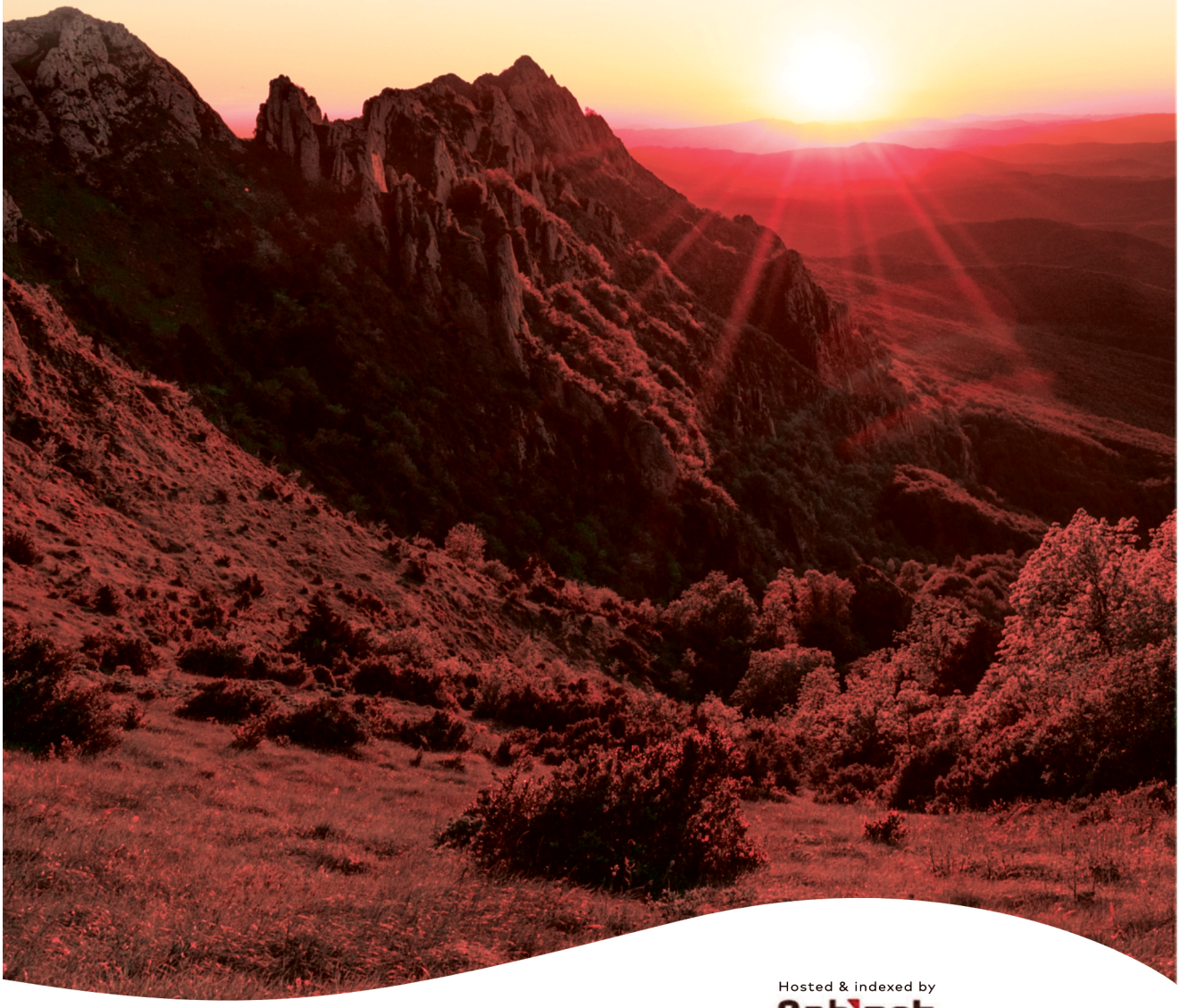
The Dyke

Volume 18 No.2

Education



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ISSN 1815-9036 (Print)
ISSN 2790-0940 (Online)

Textile technology for innovation in Zimbabwean teacher education

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Abstract

The textile technology curriculum in Zimbabwe's primary teacher education system emphasises technical outcomes with the potential to drive innovation and industrialisation. However, the limited application of signature pedagogies has constrained student teachers' opportunities to develop the innovative thinking and transversal competencies necessary to advance the goals of Education 5.0 and the national Vision 2030. Grounded in constructivist learning theory, which values contextual knowledge construction, active engagement, and social interaction, this qualitative narrative inquiry explored how immersion in a curriculum shaped by signature pedagogies could empower teacher educators and student teachers to lead transformative reforms in higher and tertiary education. Data were collected through interviews, focus group discussions, and document analysis from a purposive sample comprising 25 student teachers and five teacher educators. The findings indicate that, while the TT curriculum possesses inherent strengths for promoting innovation and industrialisation, prevailing theory-based assessment practices undermine the development of practical and creative competencies. The study highlights the urgent need to reorient teacher education through the adoption of innovative teaching strategies, competency-based assessment models, and stronger linkages with industry. It recommends a more integrated approach that balances technical proficiency with the cultivation of transversal skills and creative problem-solving. Additionally, the introduction of alternative certification for discrete skill sets is proposed to complement the teacher education diploma. Strengthening collaboration with industry is also deemed critical for improving access to modern resources and technologies, currently identified as key barriers to curriculum transformation.

Key words: curriculum, innovation and industrialisation, signature pedagogies, transversal skills, teacher education, Zimbabwe

The Dyke
www.thedyke.msu.ac.zw

18(2):342-366
ISSN 1815-9036 (Print)
ISSN 2790-0940 (Online)

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Introduction

The National Critical Skills Audit conducted in 2017 revealed that, despite Zimbabwe's commendable literacy rate of 95%, the availability of essential skills stood at a mere 38% (Tagwira, 2018). This disparity underscored the urgent need to restructure higher education to focus on the development of critical skills capable of empowering graduates to transform society through the production of innovative goods and services. In response, Zimbabwe transitioned from Education 3.0, centred on teaching, research, and community service, to Education 5.0, which incorporates two additional pillars: innovation and industrialisation.

At the core of Education 5.0 is the imperative to cultivate competencies aligned with an industrial, technologically driven, and entrepreneurial society, skills that are vital for achieving Zimbabwe's Vision 2030 goal of becoming an upper-middle-income economy. Institutions of higher learning are thus tasked with producing graduates equipped not only with academic knowledge but also with the capacity to innovate and industrialise. As Rocha et al. (2022) assert, the promotion of generic competencies that provide competitive advantage and foster innovation must not be underestimated.

To align teacher education with Education 5.0, particularly within technical fields, the curriculum must be restructured to create a more realistic and economically relevant learning environment. Technical education is viewed as a gateway to economic empowerment and social transformation (Pendergast, 2009). It should be comprehensive, multidisciplinary, and application-oriented. Pendergast et al. (2005, p. 20) argue that while technical education encompasses multiple disciplines, it

> ***…does not teach a skill for the sake of that skill; it teaches it for application... for informed decision-making in endless scenarios... [and] empowers individuals no matter what context.***

Accordingly, students specialising in technical subjects such as Textile Technology (TT) are expected to graduate with the capacity to respond to technological, social, and economic challenges beyond the classroom. However, this transformation can only be realised if both teacher educators and student teachers embrace signature pedagogies, innovative approaches that bridge the theory–practice divide, encourage student agency, and prioritise the application of knowledge over rote acquisition (McLain, 2022).

Reforming the curriculum for innovation and industrialisation also necessitates a shift in the roles of both students and educators. Teacher educators must move from authoritative figures to facilitators who nurture creativity and autonomy, while student teachers must be empowered to become active participants in their learning processes. As Darling-Hammond et al. (2020) suggest, meaningful learning occurs when students are not passive recipients but rather co-constructors of knowledge. Within the current TT curriculum, however, opportunities for such engagement are limited. Student teachers are often denied the space to interact, explore, and reflect on the full lifecycle of artefact production, a key dimension of applied innovation and industrial development.

This study, grounded in constructivist learning theory, examines how the TT curriculum in teacher education can be restructured to support Zimbabwe's Education 5.0 agenda and Vision 2030 objectives. Constructivism emphasises learning through active participation, context-specific experiences, and social interaction (Shah, 2019). In this context, the TT curriculum is envisioned as a means of developing technologically literate student teachers with analytical and evaluative capabilities to address sector-specific challenges. Beyond technical knowledge, the curriculum also aims to instil entrepreneurial competencies relevant to Zimbabwe's evolving textile and design industries.

According to the European Commission (2018), entrepreneurship involves the identification and pursuit of opportunities to create value through innovation and the mobilisation of resources. Embedding this mindset within the TT curriculum can facilitate the creation of uniquely Zimbabwean textile products with enhanced global competitiveness (Moungar, 2018). Such reform is particularly urgent given Zimbabwe's declining textile industry, which has struggled to compete with imported second-hand clothing since the liberalisation of trade and collapse of domestic manufacturing in the 1990s (Ndiweni & Chikozho, 2020). This influx has stifled local innovation and disrupted economic sustainability.

In this regard, the TT curriculum is not only a tool for skills development but also a strategic vehicle for national industrial revitalisation. By integrating sustainable design practices and market-responsive training into the curriculum, student teachers can be empowered to become agents of economic regeneration. This paper critically explores the curriculum's potential and limitations in driving innovation, industrialisation, and value creation in Zimbabwe. It argues that,

when effectively implemented, the TT curriculum can produce creative, adaptable, and entrepreneurial graduates capable of leveraging indigenous knowledge and design to generate income, contribute to economic productivity, and revitalise Zimbabwe's textile sector.

Background

Although several studies in Zimbabwe have explored how the TT curriculum can be designed and delivered to promote self-reliance, entrepreneurship, and sustainability (Chirapa & Mberengwa, 2021; Chuma, 2022), a notable gap remains concerning its potential to foster and sustain innovation and industrialisation within the context of primary teacher education. This lacuna in the literature forms the basis of the current study. Previous research (Frazier & Cheek, 2016; Wilson & Zamberlan, 2017) has highlighted that while effective collaboration is vital for success and innovation in the textile and clothing industry, curricula often lack integrated opportunities for students to develop a comprehensive understanding of how design, merchandising, and retailing interconnect through collaborative processes.

Given the imperative of Education 5.0 to produce educators who not only possess pedagogical content knowledge but are also capable of generating goods and services, there is a critical need to align the TT curriculum with this broader developmental agenda. Investigating how the curriculum can be repositioned to achieve this aim contributes meaningfully to the current body of scholarship. Accordingly, this study sought to identify the key factors necessary for implementing and sustaining a TT curriculum that effectively fosters innovation and industrialisation. By recognising and embedding these factors into curriculum design and delivery, both student teachers and teacher educators may develop a deeper appreciation of the curriculum's transformative potential in advancing clothing innovation and industrial development in Zimbabwe.

Literature Review

Globally, TT has evolved beyond conventional fabric production to include smart textiles, sustainable materials, and digital design tools, which are increasingly integrated into industrial practices (Dejene et al., 2024). In developed countries, institutions of higher learning particularly those offering technical and vocational education and training are increasingly aligning their curricula with Industry 4.0 standards (UNESCO-UNEVOC, 2021). Developed

countries invest significantly in research and development to ensure that their textile sectors remain competitive and innovation-driven (OECD, 2023).

The integration of entrepreneurship and sustainability into textile education has become essential for driving innovation. Vocational institutions in countries such as Finland and Singapore emphasize entrepreneurial training and practical, hands-on experiences to equip students with the skills needed to launch start-ups or enhance existing industrial processes (OECD, 2023; UNESCO-UNEVOC, 2024).These systems encourage problem-solving and creativity, essential components of innovation.

Across sub-Saharan Africa, the development of textile education exhibits significant variation, reflecting both progress and persistent challenges. Countries such as Ethiopia and Kenya have made notable strides toward aligning textile education with broader industrialisation objectives by establishing specialised textile training centres and fostering partnerships with industry stakeholders. These initiatives aim to equip students with the practical skills needed to meet the demands of evolving textile sectors. However, substantial implementation gaps remain, largely due to inadequate infrastructure, limited funding, and insufficient policy support. Such challenges hinder the capacity of vocational and technical institutions to deliver high-quality, industry-relevant education. These constraints underscore the need for concerted efforts to strengthen institutional frameworks and enhance resource allocation to ensure that textile education can effectively contribute to industrial growth and economic development in the region (UNESCO-UNEVOC, 2021; African Development Bank, 2020; World Bank, 2020).

The regional landscape shows that innovation in TT education requires a deliberate strategy to harmonise curricula, provide industrial attachment opportunities, and promote knowledge exchange. The African Union's Agenda 2063 articulates a long-term vision for the continent's development, emphasizing the importance of education and skills development as drivers of socio-economic transformation. Specifically, the agenda highlights the need to reform technical and vocational oriented curricula to better equip the students with relevant skills, including those in TT, thereby empowering communities and fostering inclusive growth (African Union, n.d.). This regional policy framework underlines education's central role in achieving sustainable economic empowerment and social development across Africa.

In Zimbabwe, TT remains marginalised within the broader teacher education framework, despite its potential to contribute significantly to innovation and industrialisation (Chirapa & Mberengwa, 2021). Chuma (2022) conducted a study examining textiles and clothing-related programs in Zimbabwe's higher education sector. The research identified significant gaps in the curriculum, including a lack of emphasis on emerging areas such as disruptive technologies, brand innovation, supply chain management, data science, and sustainable design and manufacturing. These omissions suggest that the current curriculum may emphasise traditional methods of textile production with limited scope for experimentation and engagement with emerging trends. The study advocates for curriculum reforms to align with the objectives of Education 5.0, which emphasise innovation and industrialisation.

Methodology

This study on the efficacy of the TT curriculum in promoting innovation and industrialisation was guided by the constructivist paradigm, which posits that knowledge is actively constructed through experience and interaction. Based on this perspective, a qualitative narrative inquiry was adopted to explore how teacher educators and student teachers interpret and experience the TT curriculum (Alele & Malau Aduli, 2023).

Narrative inquiry enabled participants to reflect freely on their experiences without undue researcher influence. A single case study design (Yin, 2018) provided contextual depth, with potential for broader relevance given similarities in teaching and learning practices (Shareia, 2015).

Purposive sampling was used to select 25 student teachers and 5 teacher educators with direct experience in TT. Student teachers were included if they had completed at least one year of study, while educators required a minimum of five years' teaching experience and involvement in curriculum implementation (Creswell & Poth, 2014).

Data were collected through semi-structured interviews, focus group discussions (FGDs), and document analysis (Creswell & Poth, 2018). Interviews explored participants' views on curriculum strengths, challenges, and opportunities for enhancing innovation. FGDs encouraged dialogue among student teachers on how the curriculum prepares them for Vision 2030. Document analysis involved reviewing TT curriculum guides and student innovation projects, using Braun and Clarke's (2021) thematic coding approach.

Findings were presented narratively, supported by verbatim quotes to reflect participants' voices and enhance credibility (Eldh et al., 2020). Ethical approval was obtained from the case study institution, and informed consent was secured. Participants retained the right to withhold or withdraw sensitive information (NIH, 2025; Eaton, 2020).

While rich data were obtained, the focus on one institution may limit generalisability. Social desirability bias in interviews and FGDs is also acknowledged. These factors were considered in interpreting results.

The next section presents the study's findings, organised thematically.

Findings & Discussion

How Student Teachers and Teacher Educators Conceptualise Innovation and Industrialisation

To enable student teachers and teacher educators to play an active role in fostering innovation and industrialisation, it was necessary to first assess their understanding of these concepts. Participants were asked: *"What do innovation and industrialisation in TT mean to you?"* The responses provided insight into their perceptions and roles in advancing the objectives of Education 5.0.

Participants generally defined 'innovation' as the modification or enhancement of existing designs. As one student in FGD 1 stated:

> *Innovation in TT is giving a new look to a design that already exists, while industrialisation is creating industries for producing similar designs on a large scale.* — ***[FGD 1, Participant 4]***

Another echoed:

> *Innovation is introducing new style features to change the outlook of a design. These can then be produced in industries* — ***[FGD 2, Participant 1].***

Teacher educators provided more elaborated views. One explained:

> *Innovation is inproving a style to give it a new look, while industrialisation is creating industries to commercialise designs.* — ***[Interviewee 2].***

Another stated:

> *Innovation in TT is originating new designs to address gaps in fashion, while industrialisation involves setting up industries—apparel, fabric, accessories. The list is endless.* — ***[Interviewee 3].***

These responses suggest a sound understanding of innovation as the introduction of new or improved ideas, consistent with the OECD (2019), which defines innovation as the development of enhanced products, services, or processes. The clarity in participants' responses indicates few conceptual barriers to engaging in innovation-driven learning. This aligns with constructivist learning theory, which holds that knowledge is constructed through experience and interaction (Shah, 2019).

Similarly, industrialisation was commonly described as the establishment of industries and the mass production of goods, reflecting definitions in literature that link it to economic transformation from manual labour to mechanised production (Kwandayi, 2021). Within the Education 5.0 framework, which promotes industrialisation alongside teaching, research, and innovation, such understanding is critical. A culture of innovation and entrepreneurship must be cultivated to empower teacher educators and student teachers to generate practical, market-driven solutions.

Zimbabwe's Ministry of Higher and Tertiary Education is championing this shift through innovation hubs and industrial parks at tertiary institutions (see Figure. 1). These platforms provide space for transforming ideas into products, from design to production, using locally available resources. This approach mirrors successful models in countries like Japan, Germany, and China, which have built strong economies by leveraging indigenous innovation systems. Through this model, Zimbabwe aims to position education as a catalyst for industrial growth and national development.

Figure 1: Student teachers working in the institution's Textile Industrial Park

Source: Photograph by the author, 2024.

The hands-on activities conducted within the textile industrial park offer student teachers authentic learning experiences that effectively bridge the gap between theory and practice, an essential pillar of constructivist pedagogy. At this industrial park, emphasis has been placed on the production of tangible items such as protective clothing, academic regalia, and graduation gowns, illustrating the practical application of skills and knowledge. These outputs provide concrete evidence of the TT curriculum's potential to foster innovation and industrialisation within Zimbabwe's teacher education framework.

Alignment of the TT Curriculum with Emerging Innovations

To further evaluate the TT curriculum's effectiveness in advancing innovation and industrialisation, the study conducted a document analysis to determine how the curriculum addresses emerging trends and technologies in the textile sector. The TT syllabus served as the primary source for this analysis, which involved systematic skimming, close reading, interpretation, and thematic categorisation of relevant content (Nowell et al., 2017; Saldana, 2021).

Focus was placed on identifying content that reflected themes of innovation, technological advancement, and industry relevance, including how frequently such themes appeared. The frequency and depth of inclusion were used as indicators of the curriculum's responsiveness to industrial transformation and its alignment with national development goals. The findings of this analysis are summarised in Table 1.

Table 1: Themes of emerging trends and technologies in the TT curriculum

Theme	Emerging trends / technologies	Frequency in the TT curriculum
1	Fibres and fabrics	8
2	Use of software in design	2
3	Advanced manufacturing techniques	2
4	Sustainability issues	5
5	Entrepreneurship	3

Table 1 reveals five themes specifically tailored to support innovation and industrialisation within the TT curriculum. Notably, Theme 1 has the highest frequency, indicating a strong emphasis on that area. This paper argues that

the greater the focus placed on emerging trends and technologies, the more significant their role in fostering innovation within the curriculum.

A strong understanding of fibres and fabrics is fundamental to fostering innovation and supporting industrialisation in textile-related fields. This knowledge enables informed decision-making regarding the selection of materials for specific designs, ensuring both functionality and desired performance outcomes. For student teachers specialising in TT, a solid grounding in this area provides the versatility needed to adapt and apply theoretical knowledge in practical, real-world contexts. By embedding this knowledge in the curriculum, institutions empower future educators to contribute meaningfully to Zimbabwe's industrialisation agenda through contextually relevant and globally informed textile innovation.

Another general approach to fostering innovation in TT involves adapting alongside technological advancements and utilising advanced manufacturing machinery. However, the relatively low frequency of Theme 2 in the curriculum raises concerns about the corresponding level of competence among student teachers. During interviews, teacher educators emphasised that student teachers specialising in TT have had limited opportunities to engage with the machinery and software essential for clothing innovations. This gap was largely attributed to insufficient infrastructural development.

> *Textile technology often involves students designing, creating and producing. However, students fail to reach their potential because of* ***the*** *infrastructure that has become outdated in the era of Education 5.0 and the resources that are depleted in this discipline of specialisation. This is a gap that requires immediate attention to improve on students' capabilities* ***[Interviewee 3].***

In focus group discussion 1, one student also observed:

> *I have seen that there is a lot of talent among TT students. However, limited access to necessary machinery has resulted in us producing substandard work which makes the clothing innovations less attractive in the eyes of buyers. For example, t-shirt hemlines should be made by flossing machines so as to produce neat work but we do not have access to such machinery* ***[FDG 1, Participant 3].***

Advancements in the field of textiles, particularly the adoption of Computer-Aided Design (CAD), underscore the need for a curriculum that intentionally incorporates and promotes the use of such software in clothing innovations. The clothing industry has embraced several technological developments, including tension-free stitching with minimal machinist intervention, improved fabric feeding mechanisms, and machines operating with varying degrees of automation. Integrating cutting-edge technology like CAD into the TT

curriculum provides student teachers with meaningful experiences that enable them to construct knowledge through hands-on interaction and problem-solving underpinning the constructivist perspective that informs this study.

Transforming the current status quo requires a collaborative effort between educational practitioners and industry partners to ensure that student teachers remain updated on the latest sector developments. This partnership not only enhances the curriculum's relevance but also prepares future educators to be conscious of and responsive to emerging trends in the textile industry.

Sustainability, with a frequency of '5', plays a significant role in advancing Sustainable Development Goal (SDG) 12, which promotes responsible production and consumption. SDG 12 aims to ensure that goods and resources are produced in ways that minimise waste, reduce environmental impact, and enhance resource efficiency. The textile industry is a major contributor to environmental pollution due to its use of chemicals, high waste generation, and resource consumption.

The curriculum's inclusion of textile repurposing and the repair of clothes using creative techniques reflected by a frequency of '3' highlights its potential to promote sustainable fashion practices alongside entrepreneurial skills (Theme 5).

To validate this finding, the researcher further analysed student teachers' artefacts to assess the innovative and entrepreneurial skills demonstrated. The entrepreneurial capacity appeared strong, as evidenced by the upcycling of vintage bed linen (see Figure 2), showcasing the practical knowledge and skills acquired by student teachers.

Figure 2: ***Upcycling old bed linen using natural dyes***

Source: Photograph by the author, 2024

The artefacts demonstrate how active, constructivist learning experiences enable students to integrate theory and practice effectively, reinforcing their readiness to innovate and adapt in real-world settings. This approach fosters the development of a diverse and applicable skill set, equipping students with competencies that extend beyond the classroom into entrepreneurial and income-generating ventures. By transforming waste into value-added products, students are not only engaged in creative problem-solving but are also empowered to contribute to environmental preservation and economic resilience. Such practices cultivate a mindset of innovation, resourcefulness, and self-reliance, aligning with global sustainability imperatives and circular economy principles (Chatzopoulos et al., 2023).

Theme 3: Place-based learning as a means of enhancing innovation and industrialisation

In the context of enacting the TT curriculum, place-based learning (PBL) has emerged as a critical signature pedagogy for fostering innovation and industrialisation. PBL is grounded in the local context, drawing on community resources and involving local community members as facilitators (Smith & Sobel, 2014). This pedagogical approach not only promotes experiential and contextual learning but also fosters innovation by encouraging student teachers to creatively use local materials to solve real-world problems. By leveraging locally available resources, PBL ensures equal access to learning in TT a subject that is typically resource-intensive while simultaneously nurturing creativity, innovation, and problem-solving skills essential for addressing industry-related challenges.

This collaborative approach during PBL proved instrumental in developing transversal competences as defined Belchior-Rocha et al., (2022). The opportunity to work directly with peers and community members stimulated innovative thinking and also cultivated a positive attitude toward learning, as students found meaning and ownership in their experiences. This transformation is evident in one student's reflection during FGD 2:

> *At first, I was just confused of what is expected of us in this assignment, but through the members of the group and our community members now I see our purpose and our learning, and I have improved in solving problems* ***[FDG 2, Participant 2].***

In 21st-century learning and work environments, transversal competencies are increasingly prioritised due to their significant influence on business performance, effectiveness in diverse teams, and their role in driving innovation

(García-Álvarez et al., 2022). Within the context of Education 5.0, Zimbabwe's transformative framework aimed at fostering teaching, research, innovation, industrialisation, and community engagement, such competencies are essential. From a constructivist perspective, these skills are most effectively developed when students are actively engaged in collaborative, real-world tasks that encourage exploration, problem-solving, and reflection. Through PBL, student teachers participated in collective undertakings that mirrored authentic community and industry challenges.

A critical enabler in the development of transversal competences is the availability and strategic use of resources. Within the framework of Education 5.0, there is growing recognition of the significance of leveraging locally available resources to support contextualised and sustainable learning. The implementation of PBL in this study offered student teachers a valuable opportunity to engage with heritage-based ideologies, enabling them to apply theoretical knowledge in authentic, community-relevant contexts. This approach was clearly demonstrated in their creation of fabric designs using natural dyes derived from the local environment (see Figure 3).

Figure 3: Student engaged in fabric design using natural dyes
Source: Photograph by the author, 2024

Such activities not only reinforced technical skills but also highlighted how resource-conscious, context-sensitive pedagogies can drive both innovation and the development of transversal skills, including creativity, adaptability, and environmental responsibility. Grounding learning in the local context, enabled student teachers gain a deeper appreciation for indigenous knowledge systems

and sustainable practices, thereby aligning education with national goals for industrialisation and community engagement.

To maximise the benefits of PBL, the learning process was anchored in the design thinking approach, which is widely recognised for fostering innovative and user-centred problem-solving (Pusca & Northwood, 2018). Design thinking is inherently iterative, encouraging continuous refinement of ideas in response to feedback and emerging insights. Figure 4 showcases a clothing innovation created using the material developed in Figure 3. This outcome illustrates how the application of the design thinking process through iterative exploration can result in meaningful and contextually relevant designs.

***Figure 4**: Clothing innovation developed through the design thinking approach*
Source: Photograph by the author, 2024

It became evident that to make the design process more distinctive to innovation and central to industrialisation, it could be enhanced by incorporating two additional components: narration and reflection at each stage. When student teachers were required to maintain structured documentation, recording their activities, achievements, and lessons learned, and reflective insights throughout the design process, they engaged in deeper information processing. This practice fostered greater conceptual understanding and enabled them to transfer their learning more effectively to new contexts. One student teacher expressed this transformative experience during FGD 2:

> *This chance [design process approach] has opened my eyes to realise that as a textile designer I can do a lot with materials that I used to think [are] a waste. It has changed my life for the better* ***[FGD 2, Participant 3].***

This reflection illustrates the **empowering potential of reflective practice** in design-based learning. By critically engaging with each step of the process, student teachers not only improved their technical and creative skills but also developed a more sustainable and innovative mindset aligned with the goals of Education 5.0. It is essential for teacher educators to refrain from imposing ideas on student teachers. Instead, they should attentively consider students' input and offer thoughtful guidance that nurtures critical engagement and student autonomy.

While PBL offers numerous pedagogical benefits, its implementation in **resource-constrained settings** is often hindered by **limited community engagement**. In such contexts, financial and infrastructural limitations may restrict opportunities for sustained partnerships and collaborative activities with local stakeholders (Boon, 2021). However, these challenges can be mitigated through the **strategic use of cost-effective technologies,** such as mobile devices and online platforms, which provide accessible alternatives for communication, participation, and knowledge sharing (Ramirez & Inga, 2022). These tools enable both students and community members to engage meaningfully in the learning process, thus **enhancing the PBL experience** and fostering deeper connections between educational institutions and the communities they serve (Paniagua & Istance, 2018).

Overcoming barriers to the successful implementation and sustainability of the TT curriculum

While there is strong conviction that the proposed practices and models outlined previously foster innovation and industrialisation, the education system remains entrenched in a culture of performativity (Harris, 2021). In such a performance-driven culture, students are pressured to produce work that is 'visible and measurable', work that can be externalised and quantified to enable comparison and accountability (Mandouit & Hattie, 2023). These traditional metrics and assessment orthodoxies continue to dominate judgments of student teachers' performance, consequently limiting opportunities to cultivate and recognise innovative skills. One interviewee commented:

> *Competencies intended to result in the production of goods and services cannot be tested using a pen and a paper, in a three-hour theory examination. This is a method that falls short of students demonstrating their capabilities* ***[Interviewee 5].***

The interviewee's critique highlights a fundamental misalignment between **assessment methods** and the nature of competencies targeted by the TT

curriculum. Competencies designed to produce tangible goods and services, skills inherently practical, applied, and process-oriented, cannot be adequately measured through traditional pen-and-paper examinations. Assessment practices in many technical education settings continue to prioritise theoretical knowledge recall and cognitive understanding, often at the expense of practical proficiency, creativity, and problem-solving capabilities (UNESCO, 2023). This finding also echoes longstanding concerns within educational research about the limitations of **summative, time-bound, and decontextualised testing** methods in capturing complex, real-world skills (Gauthier & Blignaut, 2021). When assessment tools fail to authentically measure students' capabilities, they risk distorting teaching and learning priorities, reinforcing surface-level learning, and undermining the development of transversal and innovative competences essential for industrialisation (OECD, 2023; Yildiz et al., 2022).

In the context of TT education, this creates a tension between curriculum goals, such as fostering innovation and entrepreneurship and assessment practices that constrain these aims. This study therefore recommends that teacher educators adopt assessment models that prioritise competencies and practical skills, including the possibility of awarding certificates for specific skill sets alongside the teacher education diploma. This approach calls for greater emphasis on skill and knowledge development validated through portfolio-based assessment.

While portfolios are not a novel tool in TT education, their traditional use has often been limited to serving as mere repositories of artefacts, lacking cohesion and insufficiently linking evidence to learning outcomes or competencies (Oraibi, 2022). Adopting a well-structured portfolio model within TT education could provide comprehensive evidence of the integration of theory and practice. Such portfolios would incorporate detailed narratives and reflective observations that demonstrate critical thinking, analytical skills, professional growth, and ongoing reflectivity. There is ample evidence supporting the effectiveness of portfolios as a competence assessment method in fields such as professional health education and research. Key benefits include encouraging self-reflection and enabling students to take ownership and accountability for their learning (Oraibi, 2022). However, to date, there has been no empirical research exploring the validity and utility of portfolios as an assessment method within TT teacher education. Further investigation into their application in this context is therefore warranted to better understand their potential and optimise their use.

Self-assessment and mentor feedback emerged in this study as valuable mechanisms for evaluating transversal skills and monitoring the ongoing

intellectual development of student teachers. This approach to assessment enhanced students' ability to evaluate their progress and performance more critically, as noted by Eaton (2016). One student teacher in Focus Group Discussion 2 reflected on this experience, stating:

> *Reflecting on my journal has helped, largely because as I was writing I was able to realise my strengths and weaknesses. I realised that at first, I used to doubt my capabilities and lacked confidence in myself but by writing and reflecting I managed to turn my weaknesses into strengths and I was able to realise how much I had improved … every time I was writing on my praxis, I was inspired and motivated* ***[FGD 2, Participant 2].***

When students engage in re-evaluating their capabilities and limitations, they become more aware of their learning needs and are better positioned to make informed adjustments that enhance their development. This model of reflective engagement aligns with the signature pedagogies and PBL strategies promoted in this study.

While the findings of this study indicate that the TT curriculum holds significant potential to drive innovation and industrialisation, it is important to acknowledge a valid counterargument. Many institutions of learning operate under severe resource constraints, making the acquisition of cutting-edge technologies financially unfeasible. However, this limitation does not render innovation unattainable. Rather, it highlights the need for context-responsive, low-cost strategies that can still deliver meaningful educational outcomes.

To address this challenge, institutions can adopt a variety of innovative yet affordable approaches. These include leveraging open-source technologies, forming collaborative partnerships with local industry, and integrating the use of widely accessible mobile devices into teaching and learning processes. Such measures not only reduce dependency on high-end infrastructure but also enhance access, engagement, and relevance particularly in resource-constrained settings. By reimagining how technology is integrated into the curriculum, educational institutions can still promote creativity, problem-solving, and practical competence, all of which are central to the goals of Education 5.0.

Implications for policy and practice

The findings of this study carry important implications for both policy formulation and educational practice in Zimbabwe, particularly in the areas of curriculum design and teacher education. The following recommendations are proposed to enhance the effectiveness and sustainability of the TT curriculum.

Teacher education programmes should be enhanced to equip educators with the competencies required to deliver the revised TT curriculum effectively. This includes providing continuous professional development, structured mentorship programmes, and access to relevant teaching resources and technologies. Strengthening the capacity of teacher educators will ensure they are able to facilitate innovative, skills-based learning aligned with the demands of Education 5.0.

Educational institutions should actively pursue strategic partnerships with industry to provide student teachers with authentic, hands-on learning experiences. Such collaborations can offer exposure to emerging technologies and industrial practices, helping to bridge the gap between education and the labour market. This alignment ensures that graduates are equipped with the practical skills and industry-relevant knowledge necessary for employability and entrepreneurship.

To support the implementation of a modernised curriculum, both government and educational institutions must prioritise investment in technological infrastructure. This includes the provision of computers, software, internet access, and other digital learning tools, as well as the establishment of well-equipped workshops and laboratories that reflect real-world industry environments.

Implementing these recommendations will enable policymakers and educators to ensure that the TT curriculum remains relevant, future-focused, and responsive to economic and industrial priorities. Ultimately, these efforts will contribute to the development of a highly skilled, innovative workforce capable of driving Zimbabwe's industrialisation agenda and sustainable economic growth.

Conclusions

The study reveals that while the potential for the TT curriculum to drive innovation in Zimbabwean teacher education is significant, it remains largely untapped. A review of global and regional practices shows that integrating digital tools, indigenous knowledge, and entrepreneurship into TT curricula can yield powerful outcomes. Zimbabwe's current approach is limited by outdated pedagogies, poor infrastructure, and weak alignment with national development goals. To meet the aspirations of Vision 2030 and Education 5.0, a paradigm shift is required in how TT is conceptualised, delivered, and resourced in teacher education.

Recommendations

- Assessment methods should shift from traditional examinations to portfolio-based and reflective assessment that values creativity, innovation, and problem-solving.
- Institutions of higher learning should invest in technological infrastructure and prioritise the provision of modern TT equipment such as CAD software, and advanced sewing machines to support design and production learning.
- Industry-academia partnerships should be strengthened to ensure the relevance of training to current market demands.
- Professional development programs should be introduced for teacher educators to update their pedagogical and technical skills in TT.
- Teacher education institutions should align TT curriculum policies with the Education 5.0 agenda by mandating innovation and entrepreneurship outcomes in programme reviews and accreditation frameworks.

References

African Development Bank. (2020). *Skills development for industrialization in Africa*. African Development Bank Group. https://www.afdb.org/en/documents/skills-development-industrialization-africa

African Union. (n.d.). *Agenda 2063: The Africa We Want*. African Union. Retrieved from https://au.int/en/agenda2063/overview

African Union. (n.d.). *Agenda 2063: The Africa we want*. https://au.int/en/agenda2063/overview

Alele, F., & MalauAduli, B. (2023). *An introduction to research methods for undergraduate health profession students* [ebook]. Townsville, QLD: James Cook University. https://doi.org/10.25120/fh2z-yva8

Belchior-Rocha, H., Casquilho-Martins, I., & Simões, E. (2022). Transversal competencies for employability: From higher education to the labour market. *Education Sciences, 12*(4), 255. https://doi.org/10.3390/educsci12040255

Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability*, 21(1), 5–31. https://doi.org/10.1007/s11092-008-9068-5

Boon, H. J. (2021). Barriers and enablers to place-based education in rural, regional and remote schools. *Australian and International Journal of Rural Education*, 31(1), 39–56.

Braun, V., & Clarke, V. (2021). One size fits all? What counts as quality practice in (reflexive) thematic analysis. *Qualitative Research in Psychology, 18*(3), 328–352. https://doi.org/10.1080/14780887.2020.1769238

Chatzopoulos, A., Tzerachoglou, A., Priniotakis, G., Papoutsidakis, M., Drosos, C., & Symeonaki, E. (2023). Using STEM to educate engineers about sustainability: A case study in mechatronics teaching and building a mobile robot using upcycled and recycled materials. *Sustainability, 15*(21), Article 15187. https://doi.org/10.3390/su152115187

Chirapa, A., & Mberengwa, L. R. (2021). A-level textile technology and design curriculum compatibility with industry requirements in Harare, Zimbabwe. *East African Journal of Education and Social Sciences*, 2(2), 243-251.

Chuma, C. (2022). Curriculum review and Education 5.0 in higher education in Zimbabwe: A review of textiles and clothing-related programs. *Chitrolekha Journal on Art and Design, 6*(1), 1–9. https://doi.org/10.21659/cjad.61.v6n103

Creswell J. W. (2014) *Research Design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Sage.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage Publications.

Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2020). Implications for educational practice of the science of learning and development. *Applied Developmental Science, 24*(2), 97–140. https://doi.org/10.1080/10888691.2018.1537791

Dejene, B. K., Abtew, M. A., Birlie, A. A., & Woldeab, M. E. (2024). Three-dimensional (3D) knitted spacer textile materials for advanced healthcare solutions: A comprehensive review. *Journal of Industrial Textiles, 54*, Article 15280837241290169. https://doi.org/10.1177/15280837241290169

Eaton, C. (2016). "I don't get it" – The challenge of teaching reflective practice to health and care practitioners: Reflective practice. *Educational Researcher*, 32(4), 3-12. 10.1080/14623943.2016.1145582

Eaton, S. E. (2020). Ethical considerations for research conducted with human participants in languages other than English. *British Educational Research Journal*, 46(4), 848-858.

Eldh, A. C., Årestedt, L., & Berterö, C. (2020). Quotations in qualitative studies: Reflections on constituents, custom, and purpose. *International Journal of Qualitative Methods, 19*, 1–7. https://doi.org/10.1177/1609406920969268

European Commission, Directorate-General for Employment, Social Affairs and Inclusion. (2018). *EntreComp: The European entrepreneurship competence framework*. Publications Office of the European Union. https://doi.org/10.2767/405164

Frazier, B. J., & Cheek, W. K. (2016). An industry view of competencies for entry-level merchandising jobs: Application of the ITAA meta-goals. *Clothing and Textiles Research Journal*, 34(2), 79-93.

García-Álvarez, J., Vázquez-Rodríguez, A., Quiroga-Carrillo, A., & Priegue Caamaño, D. (2022). Transversal competencies for employability in university graduates: A systematic review from the employers' perspective. *Education Sciences*, 12(3), 204.

Gauthier, D., & Blignaut, S. (2021). *Redesigning assessment for 21st-century skills in TVET*. *Journal of Vocational Education & Training, 73*(4), 567–584. https://doi.org/10.1080/13636820.2021.1889204

Gulikers, J. T. M., Bastiaens, T. J., & Kirschner, P. A. (2004). A five-dimensional framework for authentic assessment. *Educational Technology Research and Development*, 52(3), 67–86. https://doi.org/10.1007/BF02504676

Harris, R. (2021). Risk aversion in a performativity culture – What can we learn from teachers' curriculum decision making in history? *Journal of Curriculum Studies, 53*(5), 659–674. https://doi.org/10.1080/00220272.2021.1914776

Hughes, C., Bell, D., & Wooff. (2010). Sustaining the essence of design and technology: the case for textile technology, the Design and Technology Association Education and International Conference, Keele University, UK

Kwandayi, H. (2021). Enhancing industrialisation and modernisation in universities in Zimbabwe. *The Fountain: Journal of Interdisciplinary Studies, 5*(1), 104–117.

Majoni, C. (2014). Challenges facing university education in Zimbabwe. *Greener Journal of Education and Training Studies, 2*(1), 20–24.

Mandouit, L., & Hattie, J. (2023). Revisiting "The power of feedback" from the perspective of the learner. *Learning and Instruction, 84*, Article 101718. https://doi.org/10.1016/j.learninstruc.2022.101718

McLain, M. (2022). Towards a signature pedagogy for design and technology education: a literature review. *International Journal of Technology and Design Education*, 32(3), 1629-1648.

Ministry of Higher and Tertiary Education, Innovation, Science and Technology Development. (2019). *Education 5.0: Reconfiguring higher and tertiary education for industrialisation and modernisation*. Harare: Government of Zimbabwe.

Moungar, V. (2018) Textile and clothing industries can drive Africa's industrialization, benefit women. News and Events. African Development Bank Group, 22 Aug 2018 https://www.afdb.org/en/news-and-events

Mulder, M., Weigel, T., & Collins, K. (2007). The concept of competence in the development of vocational education and training in selected EU member states: A critical analysis. *Journal of Vocational Education & Training, 59*(1), 67–88. https://doi.org/10.1080/13636820601145630

Ndiweni, E., & Chikozho, L. (2020). The impact of second-hand clothing on Zimbabwe's textile industry and employment creation. *African Journal of Economic and Sustainable Development, 8*(2), 143–157.

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods, 16*, 1–13. https://doi.org/10.1177/1609406917733847

Organisation for Economic Co-operation and Development (OECD). (2019). *OECD Science, Technology and Innovation Outlook 2018: Adapting to technological and societal disruption*. OECD Publishing. https://doi.org/10.1787/sti_in_outlook-2018-en

OECD. (2023). *Research and development spending across sectors: Trends in advanced manufacturing and textiles*. Organisation for Economic Co-operation and Development. https://textile-future.com/archives/87561

OECD. (2023). *Skills Outlook 2023: Enabling effective and equitable digital transformation*. OECD Publishing. https://doi.org/10.1787/dc1bcda2-en

Oraibi, L. A., Shahbal, S., Noshili, A. I., Hudays, A. Y., Haqawi, A. J. M., Hakami, A. A. Y., ... & Alshiak, A. H. (2022). Nursing professional trends and role of technical and permanent education in the context of New Saudi Medical Era Rooted in Arab Regions, A bibliographic Research. *Journal of Positive Psychology and Wellbeing*, *6*(2), 2043-2057.

Paniagua, A., & Istance, D. (2018). *Teachers as designers of learning environments: The importance of innovative pedagogies*. Paris: OECD Publishing. https://doi.org/10.1787/9789264085374-en

Pendergast, D. (2009). Generational theory and home economics 1: future proofing the profession. *Family and Consumer Sciences Research Journal*, 37(4), 504-522.

Pusca, D., & Northwood, D. O**.** (2018). Design thinking and its application to problem solving. *Global Journal of Engineering Education*, 20(1), 48-53. https://www.researchgate.net/publication/323277797

Ramirez, A., & Inga, E. (2022). Educational innovation in adult learning considering digital transformation for social inclusion. *Education Sciences, 12*(12), Article 882. https://doi.org/10.3390/educsci12120882

Rocha Estrada, F. J., Ruiz-Ramírez, J. A., George-Reyes, C. E., & Glasserman-Morales, L. D. (2022). Evaluation of a virtual campus adapted to web-based virtual reality spaces: assessments of teachers and students. *Frontiers in Education*, 7, 918125.

Saldana, J. (2021). *The coding manual for qualitative researchers* (4th ed.). Sage Publications.

Shah, R. K. (2019). Effective social constructivist approach to learning for social studies classroom. *Journal of Pedagogical Research*, 3(2), 38-51.

Shareia, B. (2015). The qualitative case study research in accounting: Challenges and prospects—The Libyan case study. *International Journal of Social, Management, Economics, and Business Engineering*, *9*(12), 3873–3877.

Smith, G.A., & Sobel, D. (2014). *Place-and Community-based Education in Schools*. Routledge.

Sobel, D. (2002). *Childrens Special Places: Exploring the role of forts, dens, and bush houses in middle childhood*. Wayne State University Press. https://books.google.co.zw/books?id=D3x1FHpwrlsC&dq=Sobel,+D.+(2002)&lr=&source=gbs_navlinks_s

Tagwira, F. (2018). Rethinking education in the "New Dispensation" in Zimbabwe. Keynote address to the 2018 Student Academic Freedom Regional Advocacy Meeting at Africa University, Mutare.

UNESCO. (2023). *Transforming technical and vocational education and training for successful and just transitions*. Paris: UNESCO.

UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training. (2021). *New qualifications and competencies for future-oriented TVET: Volume 3: TVET delivery – Providing innovative solutions*. UNESCO-UNEVOC. https://unevoc.unesco.org/home/TVET+Qualifications+and+Competencies

UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training. (2021). *TVET country profiles*. UNESCO-UNEVOC. https://unevoc.unesco.org/home

Wilson, S. E., & Zamberlan, L. (2017). Design pedagogy for an unknown future: a view from the expanding field of design scholarship and professional practice. *International Journal of Art & Design Education*, 36(1), 106-117.

World Bank. (2020). *Skills for manufacturing and industrialization in Africa*. World Bank Group. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/345093584561749234/skills-for-manufacturing-and-

Yildiz, A., Kaya, B., & Erdem, M. (2022). *Authentic assessment practices in vocational education: A pathway to workplace readiness*. *International Journal of Educational Research Open, 3*, 100157. https://doi.org/10.1016/j.ijedro.2022.100157

Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). Sage Publications.