Int. j. adv. multidisc. res. stud. 2026; 6(1):1292-1296

Received: 04-12-2025
Accepted: 14-01-2026

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Teacher Professional Growth: Towards Lesson Implementation in Zambia: A Case Study of Design and Technology

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Abstract

This research investigates a critically important deficit in Zambia's educational performance, specifically the persistent inability of secondary school learners studying Design and Technology (D&T) to develop functional, innovative, and problem-solving project outputs. Despite the existence of a robust national curriculum that explicitly promotes creativity, practical competence, and learner-centred inquiry, evidence continues to show that most learners struggle to translate theoretical knowledge into viable design solutions. This situation raises pressing concerns regarding the effectiveness of instructional delivery and the overall fidelity with which D&T education is being implemented in Zambian secondary schools. The study argues that the core challenge does not lie in the curriculum's structure, intent, or content; instead, it emerges from substantial implementation gaps at classroom level.

These gaps are principally shaped by teachers' persistent reliance on traditional, positivist pedagogical orientations that prioritise rote learning, teacher authority, and procedural reproduction of knowledge. Such approaches stand in direct contradiction to the mandated constructivist paradigm underpinning the Competence-Based Curriculum, which requires learners to actively construct meaning, engage in inquiry-driven tasks, and apply design thinking to real-world problems. By continuing to employ outdated instructional strategies, many teachers inadvertently limit learners' opportunities to explore, experiment, and iterate solutions—processes that are essential for developing technological literacy and practical innovation. Consequently, learners are often unable to produce holistic, functional projects that demonstrate transferable problem-solving capabilities. This research therefore, highlights the urgent need for pedagogical reform, targeted professional development, and strengthened curriculum implementation mechanisms to ensure that D&T education fulfils its intended role in nurturing creativity, critical thinking, and technical proficiency among Zambian secondary school learners.

Keywords: Education, Design, Technology, Workable Projects, Transferable Skills, Practical Activities, Constructivism Approach

1. Introduction

The contemporary global economy operates increasingly within knowledge-based frameworks, necessitating a workforce equipped with adaptive competencies including critical thinking, creativity, collaboration, and complex problem-solving rather than mere retention of factual information (World Bank, 2019) [12]. In recognition of these imperatives, Zambia's national development frameworks, Vision 2030 and the African Union's Agenda 2063, explicitly articulate the requirement for an education system that cultivates innovation, productivity, and lifelong learning capacities to advance the nation toward middle-income economic status (MOGE, 2013).

Nevertheless, the Zambian education system, bearing the institutional legacy of its colonial antecedents, has historically privileged academic and theoretical knowledge at the expense of practical and applied competencies. The 2013 curriculum framework represented an intentional paradigm shift designed to address this systemic imbalance. A foundational element of this reform initiative was the introduction of Design and Technology (D&T), which superseded the previously compartmentalized Industrial Arts program. The reconceptualised subject was envisioned as a holistic, integrative discipline intended to enable learners to identify, design, and implement tangible solutions to authentic problems, thereby operationalizing the competencies emphasized in national development policy.

Notwithstanding this ambitious policy vision, a persistent and substantial gap remains between stated intentions and observable

outcomes. As documented through national exhibitions and corroborated by officials from the Examinations Council of Zambia (ECZ), the projects produced by D&T learners at both Grade 9 and Grade 12 levels demonstrate consistent deficiencies in quality and functionality, serving no purpose beyond fulfillment of examination requirements before being discarded. This phenomenon constitutes a systemic failure of skills transfer, resulting in inefficient utilization of finite educational resources and, more critically, the unrealized potential of Zambian youth.

This paper contends that the fundamental cause of this failure resides not within the curriculum framework itself, but rather in the substantial pedagogical discontinuity that separates its constructivist philosophical foundations from the positivist, transmission-oriented practices that remain predominant in D&T classrooms. Consequently, this study undertakes a critical investigation of the pedagogical approaches employed by D&T teachers in Zambia, examining how these methodologies impede authentic skills acquisition and articulating requisite reforms to achieve alignment between pedagogical practice and policy objectives in service of national socio-economic development.

1.1 Statement of the Problem

Teachers of Design and Technology in Zambia have inadequate competencies in skills transfer to the learners. This has been observed that, since the introduction of Design and Technology in 2013. The situation is of great concern to the government and stakeholders at large. Currently, learners progress to higher grades without attaining the necessary competencies and skills. The situation is worrying as one does not apply the acquired skills competently in the future. The poor performance of the learners can be attributed to poor professional growth in the teachers. Transferred to 1`them from the teachers being seen in the type of products learners produce.

Purpose of the Research

The purpose of the study is to shed light on lesson implementation in design and technology in Zambia and how the gaps affect learning attainments. The study will significantly inform policymakers, School leaders, teachers of design and technology, and other concerned stakeholders on the practices of lesson implementation in design and technology. This is with the consideration of what is happening in the teaching of design and technology education.

1.2 Research Objectives

The objectives of the research were:

1. To observe the current state of lesson implementation in design and technology.
2. To determine the teaching practices of teachers of design and technology in the learning environment at the secondary school level.
3. To assess the lesson delivery in Design and Technology Education.

1.3 Research Questions

The research was guided by these questions:

The study will ask the following questions;

1. How is lesson implementation in design and technology done?
2. What are the teaching practices of teachers of Design and Technology?
3. Why is lesson implementation important in teaching design and technology education?

2. Literature Review

2.1 The Evolving Purpose of Education

Education is universally recognized as a fundamental human right and a critical determinant of socio-economic development trajectories (UNESCO, 2015) [11]. Its purpose has evolved from the acquisition of discrete knowledge elements to encompass the development of competencies, values, and dispositions that enable individuals to navigate and contribute effectively within complex, rapidly evolving environments (Schleicher, 2018) [8]. The Zambian policy document *Educating Our Future* (1996) articulates this educational philosophy, defining the sector's objective as facilitating "the provision of education for all Zambians so that they can pursue knowledge and skills, manifest excellence in performance and moral uprightness."

2.2 The Constructivist Imperative in Skills-Based Education

Constructivism, grounded in the theoretical frameworks developed by Piaget and Vygotsky, posits that learners actively construct understanding and knowledge through experiential engagement and reflective practice (Hinchey, 2010) [5]. Within this epistemological paradigm, the educator functions not as the primary transmitter of knowledge but rather as a facilitator who designs learning environments characterized by authentic problems and appropriate resources. This pedagogical orientation assumes particular significance within subjects such as D&T, wherein core activities, conceptual design, prototyping, and iterative refinement, constitute inherently constructive processes. This approach demonstrates substantive alignment with the competency requirements of 21st-century contexts, as it necessitates critical thinking in the evaluation of design alternatives, creativity in the generation of innovative solutions, and collaborative capacity in team-based problem-solving.

2.3 The Persistence of Positivist Pedagogy

Conversely, positivist pedagogy conceptualizes knowledge as an external, objective entity to be transmitted from educator to learner. This teacher-centered instructional model, prevalent across numerous post-colonial educational systems (Tabulawa 2003) [10], prioritizes comprehensive syllabus coverage, memorization of content, and demonstrated proficiency on standardized assessments. While potentially efficient for the dissemination of factual information, this approach demonstrates fundamental inadequacy for fostering the deep, applied learning competencies required within D&T contexts. When educators default to this pedagogical model, they effectively reduce a dynamic, process-oriented discipline to a compilation of definitions and prescribed procedures, thereby eliminating its essential creative and problem-solving dimensions.

2.4 The Zambian Context: From Industrial Arts to Design and Technology

The transition from Industrial Arts (encompassing Woodwork, Metalwork, and Technical Drawing) to D&T represented more than nomenclatural modification; it

constituted a philosophical reorientation from vocational training in discrete trades toward the education of adaptive problem-solvers. However, as Fullan (2007) [4] observes, educational transformation presents substantial challenges, with implementation fidelity representing the primary point of systemic failure. The Zambian context presents additional complexity, as many current D&T educators received their own professional preparation within positivist Industrial Arts traditions, thereby creating intergenerational pedagogical discontinuity. In the absence of substantial and sustained professional development interventions, these educators demonstrate strong tendencies toward teaching the reconceptualised subject utilizing previously established methodologies, a phenomenon characterized in cognitive psychology as assimilation rather than accommodation of new conceptual frameworks.

3. Methodology

3.1 Research Paradigm and Design

This investigation operates within a constructivist-interpretivist paradigm, which prioritizes understanding of subjective meanings and experiences of individuals within their specific contextual environments (Creswell & Poth, 2018) [3]. An instrumental case study design was employed, as this methodological approach facilitates in-depth exploration of a bounded system, specifically, a single D&T department, to generate insights applicable to broader phenomena, namely the nationwide implementation of D&T pedagogy (Stake, 1995) [9].

3.2 Sampling and Participants

Purposive sampling methodology was employed to select four participants from a secondary school in Lusaka. The sample encompassed both classroom practitioners and departmental leadership personnel, thereby ensuring representation of perspectives from multiple levels of instructional governance. Participant selection was predicated upon direct involvement and substantive experience with D&T instruction, providing information-rich cases appropriate for intensive analysis.

3.3 Data Collection and Triangulation

To ensure credibility and methodological rigor, data triangulation was implemented through multiple collection sources:

a) Semi-structured Interviews

Conducted to elicit teachers' comprehension of D&T curriculum frameworks, their pedagogical beliefs regarding teaching and learning processes, and their perceived implementation challenges.

b) Systematic Observation

Classroom sessions were observed to document actual instructional practices, student-teacher interaction patterns, and the characteristics of classroom activities.

c) Document Analysis

Critical analysis was conducted of lesson plans, student workbooks, and photographic documentation of completed student projects. This provided material evidence of pedagogical alignment or misalignment with curriculum objectives.

3.4 Data Analysis

Data underwent systematic thematic analysis following methodological procedures articulated by Braun and Clarke (2006) [2]. This process involved: (1) comprehensive familiarization with data; (2) generation of initial codes; (3) identification of potential themes; (4) review and refinement of themes; (5) definition and nomenclature of themes; and (6) production of the analytical report. Emergent themes included "Examination-Oriented Instruction," "Risk Aversion in Practical Pedagogy," "Curriculum Misinterpretation," and "Resource Constraints as Pedagogical Justification."

3.5 Ethical Considerations

Before data collection, informed consent was obtained from all participants following comprehensive explanation of research purposes and procedures. Participants received assurance of anonymity and confidentiality protections. The study adhered to established ethical principles including respect for persons, beneficence, and justice.

4. Results and Discussion

4.1 The Dominance of Positivist Orientations

The data comprehensively confirmed the prevalence of what Bourdieu (1977) [1] characterizes as a "positivist habitus" among participating educators. Interview data revealed that participants' primary success metric consisted of student performance on theoretical components of national examinations. One educator articulated, "We must ensure they can define the types of wood and their properties for the paper," thereby demonstrating prioritization of declarative knowledge over procedural or conditional knowledge forms. Observational documentation consistently recorded classroom dynamics characterized by teacher-directed lecture formats and student note transcription, with minimal questioning or experiential engagement.

4.2 A Comparative Analysis of Contrasting Pedagogical Approaches

Documentary evidence provided the most substantive illustration of the pedagogical discontinuity under examination.

a) The Positivist Instructional Model

The analyzed lesson plan addressing "Manufacturing Materials" exemplifies transmission-oriented pedagogy. The articulated learning outcomes “List names," "Identify properties," "Classify types" occupy lower taxonomic levels within Bloom's framework, emphasizing remembering and understanding cognitive processes. The methodological approach consists predominantly of group discussion and teacher-directed questioning, with the designated "practical exercise" constituting merely a custodial activity involving timber organization. The instructional design establishes no connection to authentic problems or design challenges, thereby treating D&T as a body of information to be assimilated rather than a process requiring experiential engagement.

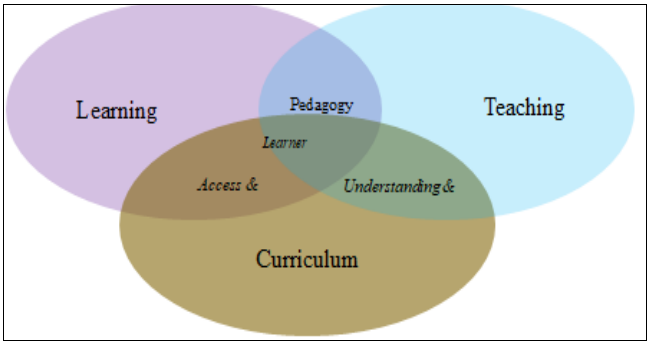
b) The Constructivist Pedagogical Exemplar

In substantive contrast, the professional development exemplar addressing "Graphic Design" employs a "Situations, Key Questions, and Solutions" framework. The lesson commences by anchoring instruction within an authentic, contextually relevant scenario involving advertisement design for a family agricultural enterprise. The focal question "What principles can be employed.?" immediately frames learning as problem-resolution. The lesson structure, hypothesis formation, presentation,

additional problem engagement, reflects design thinking methodology encompassing empathy, problem definition, ideation, prototyping, and evaluation phases. This pedagogical approach positions knowledge of design principles as instrumental tools for problem resolution rather than terminal learning objectives.

4.3 Observable Consequences: Deficiencies in Project Quality

The ultimate manifestation of this pedagogical misalignment becomes evident in the material outputs produced by students. Photographic documentation of Grade 12 projects demonstrates rudimentary, frequently unstable artifacts bearing minimal resemblance to functional or marketable products. Structurally deficient wooden furniture and inadequately soldered electronic assemblies cannot address societal needs or challenges.



This empirical evidence substantiates concerns articulated by ECZ leadership regarding institutional production of prototypes solely for assessment purposes. This cyclical pattern demoralizes learners, results in inefficient utilization of materials including timber, metal, and electronic components, and most significantly, represents unrealized learner potential and creative capacity. It reinforces prevailing stereotypes characterizing technical education as a secondary educational pathway for academically less capable students, rather than as a vital mechanism for national innovation capacity development.

5. Conclusion and Recommendations

This investigation conclusively demonstrates that the crisis in Zambian D&T education constitutes fundamentally a crisis of pedagogy. The documented inability of learners to produce functional projects represents a direct manifestation of instructional methodologies that remain fundamentally incompatible with the subject's philosophical foundations. The persistent employment of positivist, teacher-centered pedagogical approaches systematically suppress the creativity, critical thinking capacities, and practical competencies that the curriculum framework is designed to cultivate. To address this systemic discontinuity, a comprehensive and sustained emphasis on teacher professional development represents an essential prerequisite. Curricular revision alone proves insufficient; fundamental transformation of instructional methodology constitutes the necessary intervention. Based upon research findings, the following recommendations are advanced:

For Educators and School Administrators

1. Comprehensive Curriculum Engagement

Educators must transcend superficial syllabus interpretation to engage in sustained professional learning communities focused on deconstructing curriculum frameworks, with particular emphasis on underlying conceptual foundations and intended competency development. This interpretive work constitutes the foundational prerequisite for meaningful implementation fidelity.

2. Adoption of Concept-Based Planning Frameworks

Lesson preparation must transition from topic-centered to concept-centered planning methodologies, utilizing analytical tools including concept mapping.Planning processes should commence with authentic problems or essential questions, employing the "Situations" framework to structure all instructional activities.

3. Transition to Facilitative Pedagogical Roles

Educators require professional preparation and ongoing support to transition from functioning as primary knowledge sources to operating as designers of learning experiences. This necessitates skills in structuring learning environments, providing appropriate resources, formulating probing questions, and guiding iterative design processes without prescribing predetermined solutions.

For Policymakers and Teacher Education Institutions

1. Comprehensive Reform of Teacher Preparation

Pre-service teacher education programs at tertiary institutions must fully integrate constructivist pedagogical frameworks, with prospective teachers assessed on demonstrated capacity to design and implement problem-based instructional plans specific to D&T contexts.

2. Implementation of Sustained In-Service Professional Development

The Ministry of Education, in partnership with organizations including the Zambia Association of Technology Education (ZATE), should mandate and provide high-quality, practice-oriented in-service professional development focused specifically on constructivist methodologies for D&T instruction, progressing beyond isolated workshop interventions toward sustained coaching and mentoring frameworks.

3. Systematic Review of Assessment Practices

The Examinations Council of Zambia should examine mechanisms through which national assessments can more effectively evaluate design processes and practical competencies rather than exclusively theoretical knowledge, thereby creating systemic incentives for desired pedagogical transformation at the classroom implementation level.

The future economic prosperity and innovative capacity of Zambia depend fundamentally upon its capacity to educate a generation equipped with adaptive problem-solving competencies. The transformation of pedagogical practices among Design and Technology educators transcends educational policy objectives to constitute a national development imperative.

6. Acknowledgment

The author expresses sincere appreciation to the participating educators and school administrators in Lusaka

who generously contributed their time, professional insights, and facilitated classroom access for this investigation. Their professional openness proved essential to understanding the implementation realities of curriculum reform at the institutional level.

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