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The feasibility of a learner-centered approach in a civil technology classroom

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Abstract

Learner-centered approach in Civil Technology remains a critical method to achieve learner outcomes amidst the persistence of polycrisis, such as learner overcrowding. It remains unclear how Civil Technology teachers enact this approach in the face of overcrowding and insufficient hands-on skills learning resources. The purpose of this study is to explore the feasibility of adopting a learner-centered approach within Civil Technology classrooms. Purposive sampling was used to identify seven (7) Civil Technology teachers of different subject specializations to participate in this study. A qualitative research approach and single case study design were adopted. The data collected through semi-structured interviews and open-ended questionnaires were analyzed thematically. The findings revealed that Civil Technology teachers faced challenges in employing a learner-centered approach and preferred group work when conducting practical lessons. Teachers demonstrated cognitive dissonance regarding the use of this approach in large classes, stating it was impossible to attend to each learner's needs during practical lessons. In fact, the practical lessons (simulations) had been structured such that learners should always work in groups. As a result, this hindered the promotion of a learner-centered approach in Civil Technology classrooms. Therefore, this study recommended that, since teachers have the autonomy to design their own practical lessons, they should consider structuring simulations that can be done individually to foster learner-centeredness. This aligns with the Civil Technology Practical Assessment Task policy, which stresses the need for skilling learners both individually and in groups to achieve satisfactory learner outcomes.

Keywords: Civil technology, Learner-centered approach, Learning outcomes, Practical skills, Technology and vocational education.

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Contents

Contribution of this paper to the literature

This study contributes to the existing literature concerning the challenges faced by Technology and Vocational Education schools in integrating theory with practical skills. In fact, some of the strategies that can be used to achieve effective teaching and learning are presented in this study.

1. Introduction and Background

Throughout these decades, we have come to learn about the impasse confronting Technology and Vocational Education (TVE), which, among other issues, includes the production of unskilled learners due to excessively theoretical subjects. Even though the Department of Basic Education (2020) stipulates that more focus is to be given to hands-on activities, (Maeko & Makgato, 2014) posit that Civil Technology teachers are still leaning on theory than practical. A study by Msimango (2024) highlighted the persistent gaps that are demonstrated by Civil Technology teachers, which include instructional knowledge where various didactical approaches are used. According to this author, Civil Technology teachers tend to focus on content-focused methods, thereby neglecting other interactive and participative methods that are effective in achieving learner outcomes. One such recommended method is the Learner-Centered Approach, where a teacher prioritizes the learner's needs, interests, and learning styles. In this study, we thus examine how feasible this method is in a Civil Technology classroom.

The golden reason for this study is that there is a paucity of such studies in the Civil Technology environment and that Mtshali and Singh-Pillay (2023), ordered that there be studies looking into pedagogical practices held by teachers as they struggle to enact their pedagogical capital. In fact, the field of Technology and Vocational Education (TVE) is constantly evolving, demanding professionals who possess not only artisanship proficiency but also critical thinking, problem-solving, and collaborative skills. According to Okanya (2023), TVE is a multifaceted field that combines technical skills training with the application of modern technology to prepare individuals for specific occupations. Furthermore, it is designed to equip learners with hands-on skills and knowledge for a specific trade: Mechanical, Electrical, and Civil Technology at a high school level, often seen as an alternative to traditional academic routes. In the Department of Basic Education (DBE), the schooling program from the Republic of South Africa, Civil Technology education is considered a practical and skills-oriented subject that aims to give learners craftsmanship and knowledge in three areas: construction, woodworking, and civil services.

Since educational paradigms focus on more than just a teacher-centered approach, this subject, then, provides an opportunity to examine the consequences of adopting various methodologies. Teacher-centered instructional strategies, even though they provide a baseline understanding, may not offer learners the opportunity to develop these crucial skills. This study assesses the utilization of Learner-Centered Approaches (LCAs) practiced by Civil Technology teachers during the practical sessions of their lessons and the subsequent outcomes of the learners. The Learner-Centered Approach, relative to the constructivist orientation of education, considers every student as a participant in all the processes involved in the learning system (Du Plessis, 2020). In addition, the approach encourages collaboration, which fosters the development of critical skills, self-discovery, and hands-on participation. The shift to LCAs in high school TVE is due to the fact that learners learn best when they are active participants and take responsibility for their learning, building the knowledge themselves (Bodnar, 2016).

In addition, the types of initiatives within the LCA Framework include project-based learning, problem-based learning, collaborative learning, and inquiry-based learning, which all emphasize active learning, self-directed learning, and real-world problem-solving integration to knowledge acquisition. As a result, this represents a shift from older models where the focus was on learning by passively listening to lectures and memorizing content (Abdel Meguid & Collins, 2017). In the case of Civil Technology, where learners are involved in doing hands-on projects, the Learner-Centered Approach seems to hypothetically promise better learner engagement and skill acquisition. The rationale for this research is the use of LCA to increase the quality of teaching and learning Civil Technology in schools. In doing so, motivation to learn increases, which in turn means that learners will understand the content better and be able to retain the knowledge longer. They will also be able to acquire important higher-order thinking skills such as critical thinking, problem solving, collaboration, and teamwork, which are important in Civil Technology. Most importantly, LCA can enhance learner motivation and engagement, which in turn leads to improved academic performance and better prospects for careers in civil engineering, carpentry, plumbing, and bricklaying.

For the purpose of this study, the qualitative approach to research was found to best align with the study's objectives. As mentioned by Lim (2024), the qualitative approach to research aims at simplifying complex social situations and human experiences. Hence, the explanation of the qualitative approach to research given by Lim (2024) is quite relevant in the case of this study. Thus, a learner-centered philosophy advocates for the active participation of learners in the learning process, with particular attention to their needs, interests, and experiences. In addition, the qualitative approach to research is most suited to this case in order to assess the complexities of this approach. It also provides researchers with avenues to explore learner-centered practices and the impacts of these practices on learner outcomes. In this research study, the authors utilized qualitative methods, employing semi-structured interviews and open-ended questionnaires as effective means of obtaining rich, detailed data concerning the experiences of both learners and teachers of Civil Technology.

Thus, the findings of this study will provide valuable insights for Civil Technology teachers, curriculum developers, and policymakers seeking to improve the effectiveness of Civil Technology hands-on practical lessons and prepare learners for the demands of the 21st-century workforce. Additionally, the findings from this study will also serve as a means to address polycrisis, such as learner overcrowding in Civil Technology classrooms or workshops.

- The Research Purpose

The purpose of this study is to explore the feasibility of adopting a learner-centered approach within civil technology classrooms.

- The Research Questions

I. What are the perceptions of Civil Technology teachers regarding the implementation of a learner-centered approach in their classrooms?

II. What are the challenges associated with implementing a Learner-Centered Approach in a Civil Technology classroom?

- The Objectives Research

I. To find the perceptions of Civil Technology teachers regarding the implementation of a learner-centered approach in their classrooms.

II. To investigate the challenges associated with implementing a Learner-Centered Approach in a Civil Technology classroom.

2. Literature Review

A sizable body of recent scholarly work, presented in a range of formats like articles, book chapters, dissertations, and so on, has produced the literature in the field of Technology and Vocational Education. This enables scholars and researchers to identify knowledge gaps that could support the advancement of the field of education. However, the literature review for this study will concentrate on these two areas, specifically;

I. Learner-centered Education

II. Challenges in Implementing a Learner-centered Approach

2.1. Learner-centered Education

Learner-centered education (LCE) prioritizes the needs, experiences, and active participation of learners in the instructional process. According to Weimer (2013), it promotes autonomy and responsibility, shifting the power balance from teacher to student. In Technology Education, LCE aligns well with hands-on and project-based learning paradigms. To define learner-centered education for this study on its prevalence and impact on learners' outcomes in Civil Technology, the authors first understood its core principles and how they differ from traditional, teacher-centered approaches. This involves examining key characteristics, pedagogical strategies, and the roles of the learner and the educator. Additionally, learner-centered education prioritizes the individual learner and their unique needs, interests, and learning styles. It shifts the focus from the teacher as the primary source of knowledge to the learner as an active participant in the learning process. Several key principles underpin this approach. Studies by Taber (2011) and Akinbobola (2015) highlight that learner-centered teaching methods improve motivation, conceptual understanding, and long-term retention in technical and scientific disciplines. However, implementation in resource-constrained environments can be problematic due to large class sizes, insufficient materials, and teacher preparedness.

2.2. Challenges in Implementing a Learner-centered Approach

Implementing the learner-centered approach (LCA) presents numerous challenges for educators, despite its potential benefits in fostering student engagement, critical thinking, and deeper learning (Ngwira, 2023). The focus of education has been radically shifted from the teacher to the learner through the learner-centered approach, sometimes referred to as the Learner-Centered Approach Weimer (2013). It prioritizes each learner's requirements, interests, skills, and learning preferences, enabling them to take charge of their educational path. Many studies have mentioned various characteristics of the LCA, but this paper will focus on two that align with this study. The first characteristic is active participation, where students are actively involved in their learning process through discussions, problem-solving activities, asking questions, and hands-on activities. This encourages students to think critically, analyze information, and solve problems independently. The second characteristic is collaboration, where students are encouraged to work together and learn from each other through group work and peer-to-peer learning. Moreover, this characteristic fosters communication and teamwork skills. However, South African research (Chisholm, 2004; Jansen, 2001) identifies numerous barriers, including inadequate teacher training, overloaded curricula, and a lack of infrastructure. In Civil Technology, these issues may be exacerbated by the technical nature of the subject; these challenges span various domains, including teacher-related factors, resource constraints, and student-related challenges. This study's literature review synthesizes the existing literature to provide a comprehensive overview of these obstacles.

2.2.1. Resource Constraints

It is the role of the teacher and their mindset that has been identified by Folashade (2023) as the most critical barrier to the adoption of LCA. Dealing with LCA and its requirements of a change from the conventional teacher as a sage to a facilitator of the learning model is a potential challenge for some educators. For this reason, Civil Technology teachers will find it difficult to let go and allow learners to take charge of their own learning. Also, teachers are expected to acquire additional competencies such as conducting student-led inquiries, formative control, and group-work supervision, which seem to be lacking in the teachers' training. In addition, it is teachers' preconceived, and more often than not, uncritical, interpretations of teaching and learning that are the result of their own schooling that will construct their readiness to respond to integrating LCA in the classroom (Dole, Bloom, & Kowalske, 2016).

If Civil Technology teachers primarily use teacher-centered methods, they might consider LCA implementation as counterproductive, inefficient, or time-wasting, hence reluctant or only nominally enacting it. Efficient LCA use in teaching most time depends on having resources, and these resources are often scarce in most educational environments (Abdullah, Mohammad, & Ameen, 2024). Thus, an inadequate stock of current and relevant teaching and learning materials like books, construction site models, and wood for hands-on construction can severely limit learners' opportunities to ask questions, conduct research, investigations, and engage in project-based learning central to learning and working with LCA. In addition, high student-to-teacher ratios can severely limit the degree to which teachers are able to offer appropriate support and attention to each learner, which is an important aspect of LCA-derived personalized learning (Lee, Huh, Lin, Reigeluth, & Lee, 2021). Lesson preparation, planning teaching and learning activities, and material assessment time are issues that can work against teachers, especially those starting with significant workloads.

2.2.2. Student-Related Challenges

The specific shortcomings of a teacher and a resource do not end at personal boundaries. Systemic and structural factors do come in the way of the adoption of LCA. In every LCA class, there is a vexatious sense of curriculum- and standards-driven instruction. The imbalance of LCA with teacher-centered rote learning surely goes against LCA principles. LCA is not the only theory of pedagogy and assessment, and there seems to be a misalignment of the framework goals in assessing the learning progress. Also, lack of encouragement from the management, limited locus of control, and the presence of a nurturing school environment do seem to be in contradiction of teachers' best intentions in implementing LCA. In the end, a lack of cherishing goals toward the students and the absence of teamwork for sharing the practice do seem to be the biggest culprits for LCA achieving its highest potential.

3. Theoretical Framework: Constructivism

In constructing this research, the authors integrated the definitions from Vygotsky and Piaget's works on constructivist theories Vygotsky (1978) and Piaget (1950) with the rest of the documentation. Constructivist view theory argues that each learner attempts to develop and make sense of the world; thus, they construct knowledge and do not simply receive knowledge. This constructivist theoretical framework attempts to respond to the impact of learner-centeredness as constructivist models guide approaches in teaching and learning, and the outcomes in the learner in the Civil Technology subject. The excerpt Jean Piaget and his theories tell us that children at any given time in their lives think in a certain way and understand their world differently, and place them in a growing order. These are the sensorimotor stage, the pre-operational stage, the concrete operational stage, and the formal operational stage. The learners in this class, especially learners at the secondary school level, are at the highest level of development and can think abstractly and apply problem-solving to any given situation. Therefore, Piaget emphasized the importance of schemas, a structured framework of the mind as a central element to learning (Bormanaki & Khoshhal, 2017).

Learners of Civil Technology put new information into existing frameworks and change existing frameworks to include new information that does not fit. This process of assimilation and accommodation fosters cognitive growth and knowledge construction. In a Civil Technology classroom or workshop, the learner-centered approach merges hands-on activities and experiments, real-world problem solving, and reflective learning. In the case of Civil Technology, Vygotsky's theory proposes that social constructivism stresses the importance of learning with and from others and the culture in which one learns. Vygotsky's key aspects of learning include the Zone of Proximal Development (ZPD), the More Knowledgeable Other (MKO), and scaffolding. The ZPD is the distance between what a learner can do alone and what they can do with the assistance of an MKO. The MKO can be a teacher, a classmate, or anyone who possesses a better grasp of the topic (Takahashi, 2014). Scaffolding is the assistance the MKO gives the learner to be able to move through the ZPD to attain a new level of understanding.

This study is guided by constructivism as a theoretical framework, which allows the authors to synthesize Vygotsky (1978) and Piaget (1950) and use their theories in a balanced manner to understand the impact of Learner-Centered Approaches in Civil Technology. Piaget's theory of learners as active participants in the construction of knowledge has been an individualistic experience and cognitive process (Waite-Stupiansky, 2022). Moreover, Vygotsky (1978) theory in which he discussed the role of teaching, social contact, and collaboration as cornerstones of the learning process (Muhayimana, 2017).

Therefore, the study examined the prevalence of strategies such as project-based learning and hands-on activities that are practiced through Practical Assessment Tasks (PAT) in schools. Thereafter, the assessment of the learners' outcomes will commence, where this study measured learners' understanding of Civil Technology concepts, their problem-solving skills, and craftsmanship in the three specializations within Civil Technology. Additionally, in this research, thematic analysis was used so the authors could easily analyze the relationship between learner-centered approaches and learners' outcomes. The study will also investigate how the use of learner-centered approaches, informed by constructivist principles, is associated with improved learning outcomes in Civil Technology. Furthermore, the constructivist framework will provide a robust foundation for understanding the impact of learner-centered approaches on learners' outcomes in Civil Technology, contributing to the development of more effective and engaging instructional practices.

4. Methodology

4.1. Research Paradigm

This study adopted a pragmatic research paradigm, which supports the use of both qualitative and quantitative approaches to better understand the research problem from multiple perspectives. However, in this study, the pragmatic research paradigm was employed for a qualitative research approach only, since the research questions are aligned with this kind of research approach (De Jager, 2022). Rather than being committed to a single system of philosophy or reality, pragmatism values what works to address the research question, making it ideal for educational settings where both objective data and personal experiences are essential to inform policy and practice (Morgan, 2014).

This paradigm allows for methodological pluralism and flexibility in collecting and analyzing data, enabling the researcher(s) to explore both the observable aspects of classroom behavior and the subjective experiences of Civil Technology teachers (Shannon-Baker, 2020). Furthermore, it ultimately prioritizes outcomes and actionable insights, which align with the study's aim to propose meaningful improvements in teacher support and training.

4.2. Research Approach

In this study, a qualitative research approach was employed. Hence, this research approach is designed to provide deep, descriptive insights into social phenomena through open-ended data (Denzin & Lincoln, 2011). Therefore, it is appropriate for this study because the aim is not to quantify experiences but to explore and find the performance outcomes and challenges of implementing the Learner-Centered Approach in the Civil Technology didactic situation. Moreover, this research approach was used to guide the selection of flexible data collection tools

such as semi-structured interviews and open-ended questionnaires that allowed participants to express their views in detail.

4.3. Research Design

The study used a case study design, which focuses on a specific, bounded system to explore a phenomenon in depth (Yin, 2014). This design is ideal because the research is concerned with a detailed exploration of the challenges specific to technology and vocational secondary schools in the uMgungundlovu District of KwaZulu-Natal, South Africa. Also, this research design allows for a holistic analysis of how local contextual factors will guide the selection of a single district as the case and enable triangulated, multi-source data collection.

4.4. Population and Sampling

4.4.1 Population

According to Casteel and Bridier (2021) a research population is a fundamental concept in research, representing the entire group that a researcher is interested in studying and drawing conclusions about. Hence, the target population of this study included only Civil Technology teachers who specialize in any of the three subject specializations within the Civil Technology subject at secondary school level across uMgungundlovu District, of the KwaZulu-Natal Province of the Republic of South Africa.

4.4.2. Sampling

In this study, a purposive sampling was used; purposive sampling is regarded as a non-probability sampling technique, and researchers intentionally select participants based on specific characteristics relevant to their study Vehovar, Toepoel, and Steinmetz (2016). In this research study, seven Civil Technology teachers from both technical and secondary schools that specialize in a variety of Civil Technology subject specializations across the uMgungundlovu district of the KwaZulu-Natal Province were randomly selected regardless of their gender or race. Civil Technology teachers were purposefully selected since they are participants with a wealth of information; they are already working in the field of education. Furthermore, these participants were selected based on their degrees and expertise in the area of Civil Technology, with a minimum of two years of teaching experience recommended for experience purposes. Additionally, this study included seven participants who offer different Civil Technology subject specializations (construction, woodworking, and Civil Services) to obtain data from qualified and experienced Civil Technology teachers.

5. Data Presentation and Discussion

This study found that Civil Technology teachers generally perceive the Learner-Centered Approach (LCA) as a beneficial method for teaching both practical skills and theoretical lessons in their classrooms. However, its effective implementation was seen as requiring significant support from the KwaZulu-Natal Department of Education, including targeted professional development and opportunities for collaborative planning. Additionally, Civil Technology teachers' perceptions of implementing LCA in schools were varied but generally emphasized the need for professional development, sufficient time for teaching and learning, time for collaboration, availability of resources for practical lessons, and a deeper understanding of the philosophy itself. While most participants recognize its potential benefits, some challenges related to inconsistent implementation of LCA in the Civil Technology classroom and adapting to diverse learners' needs were frequently reported by the seven participants from the uMgungundlovu District of KwaZulu-Natal Province, South Africa. The results of this study were reported thematically, adopting two main themes.

- Teachers' perceptions concerning the implementation of learner-centered approaches.
- Challenges in Implementing Learner-centered Approaches

Thus, the findings from this research study were illustrated as follows:

Theme 1: Teachers' Perceptions concerning the Implementation of Learner-centered Approaches

The findings from this research study indicated that Civil Technology teachers recognized the value of Learner-Centered Approaches. All participants expressed their interest in this teaching method, believing it can facilitate effective teaching and learning in their classrooms. According to Mr. Smith's interview, when asked about his perceptions of implementing LCA in the Civil Technology classroom, he responded as follows:

> *"I am interested in and support it because the Learner-Centered Approach can increase learners' engagement in their practical lessons. For example, when we conduct brick-laying, everyone will be hands-on, which can assist in developing the problem-solving skills of my learners."* (Mr. Smith's interview response)

Also, Mr. Clarke substantiated by mentioning that Civil Technology learners show increased enthusiasm when involved in projects, and that makes teaching and learning easier for him; hence, the learners are happily learning. From the above responses, it was clear that all of the teachers were conversant with what can be the development and implementation of this philosophy, which may be influential in their classrooms.

Theme 2: Challenges in Implementing Learner-centered Approaches

During the data collection process, this study found that all the participants, who are Civil Technology teachers, face several challenges, including constraints related to didactic resources that support the implementation of LCA in schools. Based on Mr. King's interview, when asked about the challenges he faces in implementing LCA in the Civil Technology classroom, he responded as follows:

> *"The learner-centered approach is straining me because, in my Civil Technology workshop, I have limited materials such as tools, equipment, personnel protective equipment (PPE), and other consumables, which affect the effective use of this approach in my classroom" (Mr. King's interview response).*

Additionally, Cawood mentioned that the source of all the outcry is the very limited budget from the schools. Not all that, but all the participants mentioned that their academic timetables do not adequately promote the implementation of LCAs in their schools because they are very short; this study found that all of the participants' practical lessons are scheduled for minus sixty minutes per session. Also, the overloaded curriculum leaves little time for exploratory learning. Large class sizes make it difficult to individualize instruction and provide adequate

supervision during Civil Technology hands-on practical lessons; hence, there is only one teacher in a class, and they do not have any assistance. Some of the participants, Mr. Webster and Ms. Hulley, felt inadequately prepared to facilitate the LCA to conduct project-based activities in the classes, and also said they seek more training to use this approach in their classes.

5.1. Summary of Findings

The study found that while the Learner-Centered Approach has significant benefits for learner motivation, understanding, and skill acquisition in Civil Technology, its implementation is uneven. The effectiveness of this pedagogical method is hampered by contextual constraints such as a lack of resources, teacher preparedness, and time constraints. Also, this study found that learners were motivated by the implementation of the Learner-Centered Approach because they were all involved and fully participating. Although some of the students mentioned that it sometimes felt unfair because their practical lesson sessions are very limited and the teacher cannot give full attention to all the students in the room.

5.2. Conclusions and Recommendations

Learner-centered approaches are particularly suitable for Civil Technology education, given the subject's practical nature. However, meaningful implementation requires systemic support, including ongoing professional development and infrastructure investment. Thus, this study recommends continuous in-service hands-on skills training for Civil Technology teachers on Learner-Centered Approach strategies specific to Civil Technology. Additionally, this study emphasizes that schools must invest more in teaching and learning infrastructure. Investment in this area should ensure the availability of adequate tools, materials, and safety equipment in the workshop to facilitate effective learner outcomes. This research also recommends a curriculum review supported by the academic timetable. Such a review would provide flexibility in curriculum pacing, allowing for deeper Civil Technology learner engagement. Furthermore, Civil Technology teachers, together with their headmasters, should monitor and evaluate the teaching approaches implemented in schools to ensure effectiveness. Monitoring and evaluation mechanisms are essential to track the implementation and impact of Learner-Centered Approaches (LCAs) across schools. Lastly, since teachers have the autonomy to design their own practical lessons, they should consider structuring simulations that can be conducted individually to foster learner-centeredness. This approach aligns with the Civil Technology Practical Assessment Task policy, which emphasizes the importance of skilling learners both individually and in groups to achieve satisfactory learner outcomes.

6. Limitations

As is well known, one of the limitations of qualitative research is that there is a limit to how far a study may go, which occasionally influences the final product and conclusions that can be made. This study was restricted to uMgungundlovu District technical and secondary schools in the KwaZulu-Natal province, Republic of South Africa.

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