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Humanising Pedagogy in Mathematics Education at South African Technical and Vocational Education and Training (TVET) Colleges: Influence on TVET Teaching and Learning

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Abstract. This study examines the implementation of a humanising pedagogy in teaching mathematics at a TVET college in South Africa. Despite the country's transition to democracy, disempowerment and dehumanisation persist within the education system, particularly affecting learners from previously disadvantaged backgrounds. Mostly, TVET mathematics classrooms are neither humanised as mathematics is taught in isolation with social issues nor linked to students' lived experiences. Student engagement is minimal as the classroom environment is a banking zone model. The study explores how a humanising pedagogy, based on critical pedagogy principles, can address these challenges. A humanised pedagogy has been explored through workshops and lesson presentations that were based on humanising pedagogy. Findings reveal that the adoption of a humanising pedagogy enhanced student engagement as the teaching strategies were engaging and student centred. Students were actively involved; mathematics was linked to students' lived experiences. Additionally, the adoption of a humanising pedagogy helped students and teachers to see the relationship between the content and real life and how they can use mathematics to address social problems. The study highlights the need to humanise mathematics teaching and calls for educators to become agents of social change. Embracing a humanising pedagogy can foster a more inclusive, responsive, and equitable education system.

Keywords: Humanising pedagogy; student engagement; learning outcomes; TVET college; mathematics education

1. Introduction

1.1 Research aim

Education, in general, is a form of learning in which knowledge, skills and habits are transferred. However, in a Freiran utopian didactic, education is not only about transferring skills and knowledge; it is about the transformation of both the individual, which is a student, and the society (Pietersen & Plaatjie, 2023). This transformation of an individual and society is achieved by allowing students to critically reflect and engage in dialogue with the teacher and education that can lead to social injustice (Pietersen & Plaatjie, 2023). However, the transformation of an individual and the engagement in dialogue with the teacher is solely lacking in the South African educational environment, which is still bruised by decades of inequality and unpreparedness of teachers (Pietersen & Plaatjies, 2023; Joseph, Hailu & Matthews, 2019). Engagement in dialogue requires teachers to become agents of social change, which teachers lack as they are not prepared for that. The unpreparedness of teachers to become agents of social change turns teachers into gatekeepers in the classrooms as they are perceived to be the only ones with more knowledge and skills than their students. Gatekeeping in classrooms is contrary to the main principle of humanising pedagogy (HP), which aims to promote humanity in mathematics classrooms (Joseph, Hailu & Matthews, 2019).

Additionally, dehumanisation includes the loss of learners' voices, generally, the voices of previously disadvantaged people as well as the language, used in the classrooms (Shevlin & Rose, 2022). Consequently, this act of not hearing and recognising people's voices results in dehumanisation in the classrooms (Cakata, 2023). This approach tends to pave the way for an education system that is designed to control people's thinking and behaviour, which contrasts the need for humanity in the classrooms, as noted by Joseph, Hailu & Matthews (2019).

According to Moloi (2019), students and teachers can be activated to challenge and actively struggle against any form of social oppression that dehumanises them or renders them failures. They can work together to question the inequalities and discrimination, implicit in the curriculum, which excludes cultural learning experiences (Moloi, 2019). Thus, practising a humanising pedagogy in the classroom means treating students with love and care, instead of treating them as objects with no feelings (Heywood & Goodman, 2019). However, although a few studies were conducted on humanising pedagogy in education (Rudman & Meiring, 2018; McDevitt, 2021; Kajee, 2021; Zembylas, 2018; Kajee, 2022), the majority of these studies do not discuss the implementation of a humanising pedagogy in the TVET mathematics classroom. TVET stands for Technical and Vocational Education and Training. It refers to educational programmes that focus on providing practical skills, knowledge and competencies, needed for specific occupations and industries. TVET colleges offer a range of vocational courses and technical training programmes, designed to prepare students for the job market and equip them with hands-on skills relevant to various industries.

Informed by such quest and through a critical theory, the reviewed literature addressed the following: (a) humanising pedagogy as a concept, using the work of Mapaling and Hoelson (2022); (b) mathematics teaching in TVET colleges

through the work of Vimbelo and Bayaga (2023), and Bature (2020); the mathematics curriculum by extending our attention to the work of Cakata (2023) and Ngoveni (2018).

Therefore, this study aims to investigate the impact of implementing a humanising pedagogy in student engagement and learning outcomes in the mathematics education context at a TVET college. The research seeks to understand how adopting a humanising pedagogy can enhance student engagement and improve learning outcomes in the mathematics classroom.

2. Literature review

2.1 Positioning humanising pedagogy in local and international mathematics classrooms

Humanising is derived from both the adjective 'humane' and the noun 'human' which simply implies belonging to or concerning human beings (Mapaling & Hoelson, 2022). Treating people with love and care, instead of treating them as objects with no feelings is also supported by Zinn et al. (2016) who argue that human beings are not objects, but living, breathing souls. Two key lessons could be drawn. First, generally, almost everyone wishes to be treated as a human being, not as an object, and this wish can be extended to the classroom environment, more specifically to the TVET mathematics classroom. Second, extending to the classroom environment, particularly mathematics, means treating students as human beings, that is, teaching mathematics through a humanising pedagogy, especially since mathematics is algorithmic by nature.

Considering the classroom environment in South Africa, Maluleka (2023) portrays humanising pedagogy (HP) as a relationship teachers have with their students. Meaning, globally, the student-teacher relationship through HP is visible through love, care and respect for each other regardless of where they come from, as shown in Figure 1 (Li & Rawal, 2018).

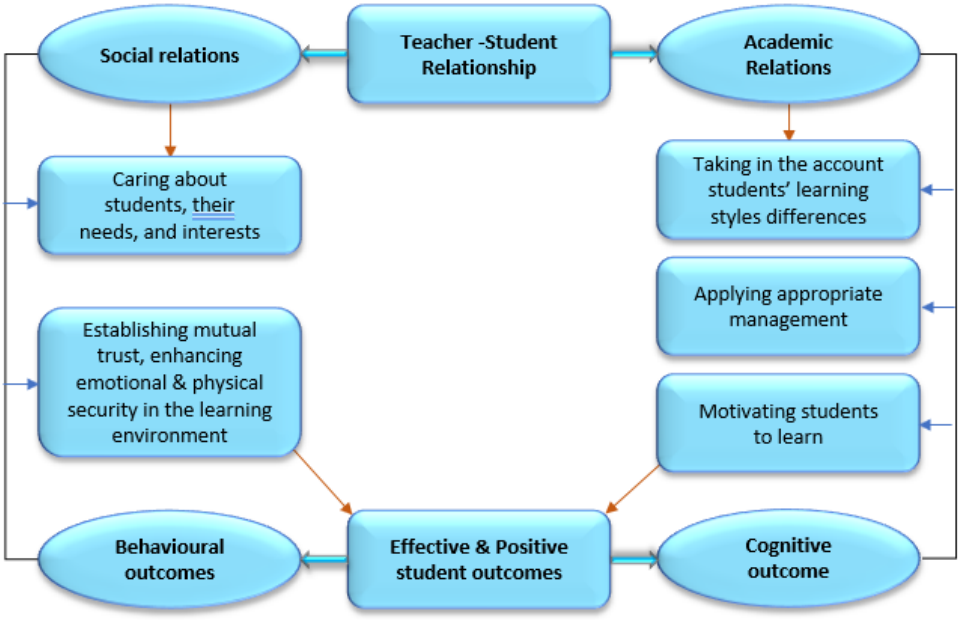

Figure 1: A teacher-student relationship framework

Figure 1 shows the relationship between a teacher and students which motivates students to learn. In TVET mathematics, in particular, showing love and respect for each other includes integrating students' prior (practical) knowledge and linking the practical knowledge to new learning (Berry III, Conway, Lawler, & Staley, 2020). Thus, TVET lecturers should get to know their students and understand what they know as knowing students is not only for early childhood education, as Becker, Rigaard and Epstein (2023) argue. Knowing students at that level can be achieved through their teaching and by building the student–teacher relationship (Kincade, Cook, & Goerdt, 2020). Such an orientation encourages humanisation in the TVET mathematics classroom; hence, a humanising pedagogy is crucial and critical for TVET students' successful academic and social resilience (Mapaling & Hoelson, 2022).

2.2 Mathematics curriculum

One of the mandates of the Department of Higher Education in South Africa is to enhance the responsiveness of the TVET curriculum to meet industry needs. Therefore, it is expected that the TVET curriculum will respond to the demand in the industry (Nkwanyane et al., 2022). Additionally, in high-quality, advanced TVET programmes today, 21st-century skills require more rigorous content than the traditional TVET curriculum provides (Ziad, 2021). TVET by its nature offers an ideal platform for the integration of Science, Technology, Engineering and Mathematics (STEM), as high-quality TVET programmes can provide a strong foundation for and serve as a delivery system of STEM (McGee, 2020). From this view, one can argue that TVET requires a responsive and relevant curriculum to the current economy, as shown in Figure 2 below.

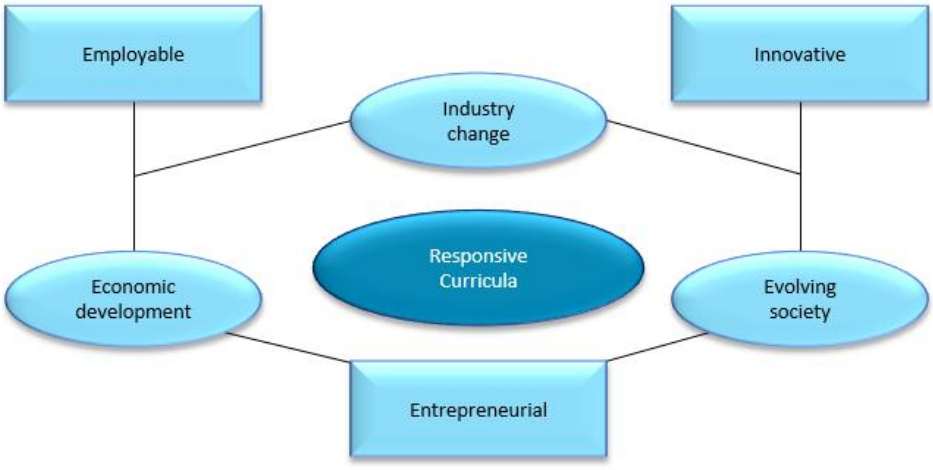

Figure 2: TVET Responsive curriculum framework (Masoabi & Alexander, 2020).

As much as TVET colleges require a responsive curriculum, as shown in Figure 2 above, STEM in TVET is still taught in a traditional approach which only refers to science and mathematics with little reference to engineering (Ziad, 2021). Various studies, drawn from the literature, indicate that the curricula content, offered in TVET programmes, is unresponsive and fails to adapt to modern development and changes in the industry (Nkwanyane et al., 2022, Ziad, 2021; & Ngwato, 2020). This shows a misalignment between what TVETs offer and what the industries

require (Nkwanyane et al., 2022). Additionally, it also shows a curriculum deficiency in TVET programmes (Essel et al., 2014).

Moreover, inequalities in the TVET curriculum, such as the use of English, which is discussed above as the language of teaching, and biases in the classroom are evident. Excluding one's language and culture from curriculum and classroom activities can be a particularly bad experience. Hence, Tai and Wei (2021) advocate for a classroom environment that will allow students to use their own languages in their learning. A humanising pedagogy considers inequality in the mathematics curriculum as leading to dehumanisation while the dehumanised curriculum reduces students to subhumans (Olawale, Mncube & Harber, 2022).

Turetsky et al. (2021) argue that teachers promote biases as they consistently demonstrate a preference for a certain ethnic group of students over another group. When these teachers perpetuate biases, they do it without noticing the impact that it might have on their students (Turetsky et al., 2021) even in the school. These biases result in promoting inequality in learning. From this view, one can argue that teachers contribute to educational inequality without noticing (Turetsky et al., 2021). This attitude and behaviour of teachers can have a huge impact on students' behaviour. For example, when students notice that they are being treated differently compared to another group, their behaviour changes even if they keep quiet and do not say anything due to fear of the teacher (Brey & Pauker, 2019; Brey & Shutts, 2018). Such an environment with prevalent biases may strengthen these biases (Turetsky et al., 2021). Moreover, this behaviour may not occur for a short period but may be consistent, causing students from marginalised groups to lose a sense of belonging and trust in such teachers (Goyer et al., 2019). These continuing biases in schools require further studies to understand the full spectrum of inequalities in TVET mathematics classrooms. Teachers are required to act as trained agents of social change. A humanising pedagogy is essential to assist teachers in becoming agents of social change to avoid biases. Their behaviour and attitudes will change towards students while building a humanised classroom environment.

Other people who contribute to inequality in the schooling system are school administrators, principals and school counsellors (Jarvis & Okonofua, 2020). According to Jarvis and Okonofua (2020), school administrators are often responsible for the admission of students and, therefore, are part of decision making whether to admit a student or not and are also responsible for matters involving discipline (Jarvis & Okonofua, 2020). Additionally, research shows that it is not teachers and administrators only who perpetuate biases but also principals and school counsellors. Principals and school counsellors show racial bias in decisions that they make; often with no input from teachers (Jarvis & Okonofua, 2020). What can be gleaned from this (Turetsky et al., 2021; Jarvis & Okonofua, 2020) is that the education system is not democratic; it is disempowering and dehumanising as students are not treated equally. Hence, a practice embedded in social justice, like humanising pedagogy, is required (Zinn & Rodgers, 2012), not only for teachers but even for school management and administrators.

2.3 Mathematics teaching in local and international TVET colleges

Beyond the borders of South Africa, mathematics plays a significant role in improving students' critical thinking skills (Afriansyah, Herman, & Dahlan, 2021). For this reason, generally, it demands systematic and interesting methods that will equip the students (Boafo, 2016). However, both local and international studies revealed that it is difficult for students to implement the topics they have learned in their working lives; hence, they used different strategies to teach mathematics (Sawatzki & Sullivan, 2018). This is due to lecturers who often do not relate the content to real-life vocational education, resulting in perceiving mathematics as a difficult subject (Taleyarkhan, Lucietto, & Azevedo, 2021; Vimbelo & Bayaga, 2023). The topics that are considered difficult are graphs (especially rectangular hyperbola), algebra and the application of integration (calculation of areas) (Taleyarkhan, Lucietto, & Azevedo, 2021), among others. The advanced topic for other levels is evident in Buthelezi's (2018, p. 376) research where a mathematics lecturer responded to the advanced NCV L3 mathematics content by saying, "What we teach in Mathematics N5 and N6, we now teach in Level 3 of the NCV. How can work be taught at an exit level like N5 and N6 be dealt with at Level 3? This is a very basic level and I think work needs to be made simpler and be at the level of the targeted learner". From this lecturer's comment, it can be argued that the mathematics standard for NCV L3 and L4 is pitched far too high for the targeted students of this programme. The fact that some of the targeted students have no mathematical background as some of the students, enrolled at TVETs, enter with a mathematical literacy background and not core mathematics worsens the situation (Nzembe, 2018; Ngoveni & Mofolo-Mbokane, 2019). Thus, not relating the content to real-life vocation results in a lack of mathematical skills, required for employment, specifically engineering (Chagi, 2019).

Moreover, in South Africa, TVET students come from all over the country and from the neighbouring countries. For that reason, mathematics lecturers' pedagogical and content knowledge must be strong (Kahiya & Brijall, 2021). It is also important for lecturers to know the role they play in their teaching as they pay little attention to the fact that their roles in producing skilled human capital are prevalent (Omar et al., 2020).

On the other hand, worldwide, except for a few, TVET colleges use English as the language of teaching and learning (LoLT). Arguably, access to mathematics learning and the successful interpretation of assessments depends on the understanding of the language of teaching, learning and assessment. Therefore, poor performance in mathematics is linked to poor language proficiency or a lack of it (Ngwato, 2020). Therefore, the use of English as the language of teaching has an impact on students' achievement.

In conclusion, TVET students locally and internationally need to connect real-world engineering problems to the mathematics they learn (Ngwato, 2020). This means that in TVET classrooms, mathematics cannot be taught theoretically and in a contextual vacuum. Therefore, a humanising pedagogy is required to teach

mathematics in a socially just way, hence, examining mathematics teaching in the TVET classroom.

3. Theoretical framework

In framing a humanising pedagogy, we draw on critical pedagogy (CP) to explore the influence of a humanising pedagogy in the TVET mathematics classroom through TVET teachers' perspectives. CP is based on critical theory which posits a more comprehensive means to grasp social reality and diagnose social matters (Thompson, 2017). CP connects the concepts of critical theory with education.

Uddin (2019) defines critical pedagogy as a vital teaching pedagogy, designed to strengthen the awareness of learners about justice and social equality while improving their knowledge. In that process of students' empowerment, the understanding of the relationship between ideology, culture and power structure is also built which is the main concern of critical pedagogy (Olawale, Mncube, & Harber, 2021; McLaren, 2019). Moreover, Giroux (2020) describes critical pedagogy as always being a moral and political practice that addresses matters of economic and social justice and the grounds upon which life is lived and experienced.

Thus, it was envisaged that the application of critical pedagogy would help students to question and challenge various forms of injustice. Furthermore, the approach would also be a useful tool to develop not only a more democratic classroom environment but also allow a certain understanding of students' identity and the world around them as active learning promotes greater classroom inclusivity (Henning, Ballen, Molina, & Cotner, 2019). Moreover, teachers, who use CP, would be able to create a humanising classroom environment where students would feel part of the community and have a voice in all aspects of learning.

To address these objectives, the authors adopted a critical pedagogy approach, which acknowledges the diversity of students and emphasises the use of a humanising pedagogy, tailored to individual learners. The researchers believed that by employing this approach, students would be encouraged to question and challenge various forms of injustice. Additionally, it was expected that implementing a humanising pedagogy would foster a more democratic classroom environment, enabling students to develop a deeper understanding of their identities and the world around them. Teachers, using this critical pedagogy approach, would be able to create a learning environment that promotes a sense of belonging and empowers students to have a voice in all aspects of their education.

Humanising pedagogy, as employed in this study, goes beyond traditional teaching methods. It focuses on recognising and valuing each student's unique background, experiences and perspectives. By doing so, educators can bridge the gap between the students' cultural contexts and the formal mathematics curriculum thereby increasing the relevance and meaningfulness of the subject matter for the learners.

Through the implementation of this pedagogical approach, the study intended to shed light on the potential benefits of embracing diversity and promoting inclusivity in the mathematics classroom. It was anticipated that such a transformative approach to teaching would not only enhance students' academic performance in mathematics but also contribute to their personal growth and development as socially conscious individuals.

The humanising pedagogy, in the context of mathematics education, draws upon the idea that mathematics is not an abstract and isolated subject but rather an integral part of society and culture. By infusing relevant real-world examples and applications, students are more likely to grasp the significance of mathematical concepts in their daily lives.

Moreover, the study sought to investigate the challenges and opportunities that teachers may encounter when adopting a humanising pedagogy in teaching mathematics. While the approach holds promise for improving students' engagement and motivation, it also requires a shift in the traditional roles of teachers and students.

In conclusion, this study's exploration of implementing a humanising pedagogy in teaching mathematics at a TVET college provides valuable insights into the potential benefits of adopting a critical pedagogy approach. By recognising the unique identities and backgrounds of students, and by fostering a more inclusive and democratic classroom environment, educators can create a transformative learning experience that goes beyond mere academic achievement, empowering students to become active participants in shaping a more just and equitable society.

4. Methodology

Based on the research question and the aim of examining a humanising pedagogy in teaching mathematics, a qualitative study through lesson observations purposively selected ten (10) National Certificate Vocational (NC(V)) and National Accredited Technical Education Diploma (NATED) mathematics lecturers. The reason for the small sample size was to yield as much relevant information in addressing the research aim as possible (Bhardwaj, 2019). Based on the aim, the participants of this study were particularly mathematics lecturers from one of the TVET colleges in Gauteng The data were collected through a Short Learning Programme (SLP) which consisted of six phases, as shown in Table 1 below. However, this study covers phases 3, 4 and 5. Instruments or sources of data were used in the SLP. For example, for lesson observations (see Annexure A), a video recorder was used, as well as field notes. The Short Learning Programme (SLP) was used to examine the influence of a humanising pedagogy on teaching mathematics.

Table 1: Three phases of the SLP

PHASES	DESCRIPTION	INSTRUMENT
PRE – INTERVENTION		
1. Narratives (Not part of this study)	Participants were asked to write their narratives, reflecting on their current praxis. A prompt was used to assist participants in authoring these stories. After writing their narratives, participants were briefed about lesson observations the following day. The intention of lesson observations was discussed with the lecturers, not an act to threaten them but to observe their current pedagogies and identify the need for support where required.	Annexure B
2. Lesson observations (not part of this study)	These lessons were observed to obtain additional information to add to the information, obtained from the narratives. The data from the narratives and lesson observations were used to examine current pedagogies, employed by TVET college lecturers in their teaching. This is due to teaching mathematics which is done in an abstract way where lecturers do not often relate mathematics to the students' real-life experiences (Madimabe, Omodan, & Tsotetsi, Bature, 2020).	See Annexure A
3. Brainstorming (First workshop)-Intervention- (**part of this study)**	The outcome of this workshop was to explore a humanising pedagogy in teaching mathematics. In this workshop, a hypothetical student, named *Gugu*, was explored, who was used as a "typical" TVET student to refocus attention on a responsive pedagogy appropriate for the kind of student that enrols at TVET colleges. *Gugu* was used as a stimulus to ascertain lecturer perspectives about who they believed their students were and how they viewed students in the teaching and learning encounter.	PowerPoint slides and Gutstein's book (2006) "Reading *and writing the world with mathematics".*

4.	Workshop (second workshop) – Intervention- (**part of this study)**	The outcome of this workshop was to examine the application of HP as a practice activity before implementation in class. An overview of the principles of HP was provided. During this session, each lecturer brought a topic that they wanted to use and were allowed to use the topic, which was observed previously, before the intervention. They used these topics to explore an HP and some of these topics still had to be taught in the next trimester. They prepared lessons and were assisted and supported. The lessons were shared. Coparticipants provided input and critique and encouraged one another.	
Post-Intervention			
5.	Lesson observations (p**art of this study**)	The re-designed lessons were taught to students. Participants and the researcher were invited to observe the lessons. Lessons were video-recorded for review and discussion. A similar observation guide was used to observe lesson pre-intervention, which was used again to examine the impact of HP on their teaching. These lesson observations were done to assess if HP could transform teaching mathematics at a TVET college. Nkwanayane, Makgato and Ramaligela (2022) argue that a lack of moving from standard strategies to innovative teaching results in deficient performance in mathematics (Petancio, 2020). Additionally, teachers control procedures and do not provide students with opportunities to use their methods to solve mathematical problems (Bature, 2020).	See Annexure A
6.	Narratives (not part of this study)	The researcher examined the classroom observations and the video recordings with the lecturers who provided their thoughts and perspectives about the intervention in writing. They reflected on what is good and not good about HP in their two lesson observations and workshops. These narratives were written to assess lecturers' conceptualisation of HP in teaching mathematics.	

Table 1 shows the stages of the Short Learning Programme that was conducted. Phases one, two, and six did not form part of the study; however, they are included to give the background of the intervention. Phase three entailed the introduction of humanising pedagogy, guided by Gutstein's (2006) book. Phase four involved the practice of what they had learned before the implementation of humanising pedagogy in the classroom. Phase five was the implementation of humanising pedagogy in the mathematics classrooms. During the implementation stage in the classrooms, lessons were observed, guided by the themes that were already in place. The themes were the resources, teaching approaches, real-life examples and seating arrangement. TVET teachers were also encouraged to allow students to reflect on the lessons and ask them questions if they have any and allow them to share their views about the lessons. No interviews were conducted except the reflective discussions.

In terms of data analysis, lessons that were observed after the implementation of humanising pedagogy were analysed through thematic analysis. In this technique, we identified, analysed organised, described and reported themes, found in a data set, as suggested by Riger and Sigurvinsottir (2016). Deductive thematic analysis was used because the researchers used priori codes, as they are predetermined, based on the research questions.

5. Ethical statement

- This material is the authors' original work, which has not been previously published elsewhere.
- The paper is not currently being considered for publication elsewhere.
- The paper reflects the authors' research and analysis truthfully and completely.
- Ethical approval was sought and granted by Nelson Mandela University[1], Faculty of Education's research ethics committee and helped the researcher adhere to the norms and practices inherent to ensuring the participants were protected.
- Permission was sought to conduct the research from the principal of South West Gauteng College before collecting the data.
- The informed consent form was signed by the participants, in accordance with the Protection of Personal Information Act (POPI) Act, whereby their personal information and data were restricted. The participants were ensured that they would be notified in the event of a security compromise

Considering confidentiality, privacy and anonymity, the study used lesson observations, a video recorder and field notes after exploring humanising pedagogy in the TVET mathematics classrooms. The analysis strategy guided the researcher on whether the number of participants would be manageable or not. The data of ten participants were manageable to analyse, using the thematic deductive analysis strategy. Annexure A was used as the template that guided the researcher. The data analysis strategy that I used was the deductive thematic analysis for lesson observations. However, the study employed deductive

[1] For review purpose and to conceal identifiable sources

thematic analysis not only to analyse field notes from observations but because the researcher already had themes. In deductive thematic analysis, the majority of the collected data starts with precise content and then moves to broader generalisations (Lemon & Hayes, 2020).

In part, the lesson observations were intended to observe the use of resources, teaching approaches, student engagement and real-life examples, as shown in Table 2 below.

Table 2: Implementation of HP in the classroom

Themes	Lesson observations
Resources Used	Whiteboard (4), smartboard (2), handouts (1), textbooks (6)
Seating arrangement	3 lecturers **grouped their students,** and 4 lecturers used the **same sitting arrangement** (normal one).
Teaching approach	**No homework was used** as an introduction to the lessons. Almost **all lessons started with discussions about social matters** relevant to the mathematics topic of the day where **examples** were used. These examples **were relevant to students' lives & the field of engineering.**
Student Engagement	Students **all engaged in topic discussions which centred on their lives**. Students were allowed to come up with their ideas and examples of what was discussed in class. They even saw the relationship between the mathematics principles they were learning and social matters. They **were learning about social matters while** learning mathematics.
Real Life Examples used	**All lecturers used real-life examples** and the examples were remarkably interesting and it seemed that students did not expect them in a mathematics classroom.

Table 2 shows how the lesson observations were analysed according to the prior codes and the relevant themes.

Moreover, to ensure credibility, the participants were known to us as one of the researchers used to work with them; thus, it was easy for the researchers to have continuous conversations with them concerning the study, which assisted the accuracy of the data. To address validity, the transferability of the data, which refers to whether the data and findings would yield similar results in a similar setting since the data were collected from one TVET college and one campus, was considered. In this instance, the researchers gave a clear description of the data analysis to ensure that the findings could be transferred to other colleges or campuses (Munthe-Kaas, Nokleby, Lewin & Glenton, 2020). Moreover, the researchers shared the data analysis with the respondents to ascertain the credibility of responses. This practice was conducted to confirm whether the data

were interpreted correctly. To ensure dependability, which refers to ensuring that the research process is logical and documented (Janis, 2022), the participants received feedback from the observed lessons. This practice was also conducted to ensure the consistency of the data (Creswell and Poth 2018).

6. Findings

As directed by the research question, as well as the methodology, to examine humanising pedagogy in teaching mathematics, the following themes were examined: the use of resources, seating arrangement, teaching approaches, student engagement and the use of real-life examples. While the themes were examined through lesson observations, they emanated from the previous works.[i] A detailed discussion of these findings is provided in the next section.

6.1 Resources and seating arrangement

According to the lesson observations, TVET lecturers used common resources, such as whiteboards, smartboards and textbooks, if they were available. Only two lecturers used smartboards. No other resources were used for their mathematical teaching in all the observations. This study also considered seating arrangement as it determines the approach that is used in the mathematics classroom. It was also revealed that the seating arrangement was traditional whereby students were seated in columns, facing the board.

6.2 Teaching approaches, student engagement and real-life examples

During the lessons, students were engaged and real-life examples were used. Teachers did not use a traditional approach whereby they would start their lessons with homework review and classwork, but they started their lessons with discussions and were able to learn from their students through discussions in the classroom. For example, while discussing loadshedding, the lecturer had a chance to get to know the students better, how they felt about loadshedding and how it affected them at home.

> *"When there is load shedding, it is difficult for us to study nor do our homework as I could not do your homework you gave us yesterday."* (Student B).

> *"We cannot even iron our clothes, you just grab what is in front of you and it is not fair for some of us as we would be out of electricity for many hours not only for two hours, but these municipalities madam are also useless as they fail to fix the problems."* (Student C).

The comments of the students above (Students B & C) gave the lecturer a chance to get to know the students better and know how they felt. Asking students how they felt about loadshedding helped the students to feel human in the mathematics classroom. Moreover, lecturers were able to learn from their students.

Considering real-life examples, lessons included discussions that were based on current matters. For example, the discussion of floods in KwaZulu-Natal (KZN) as the province was experiencing floods that left many without homes.

Did you watch TV news last night where they showed the damage caused by the rain in KZN more especially in rural areas? As we know that KZN is big, how do news reporter get those numbers of houses that were damaged? M1

The real-life examples motivated students to appreciate the mathematical principle under study and to see the relationship between the mathematics they were learning and their lived experiences. During the reflective practice with their lecturers (lecturers were encouraged to take a few minutes and reflect on the lesson before the sessions end), students shared their perspectives on various aspects of the mathematics classroom and the implementation of a humanising pedagogy:

> "*I wish we had more hands-on activities and visual aids to help us understand difficult concepts. Sometimes, the whiteboard and textbooks alone don't really capture my attention. If we had more resources like interactive simulations or practical applications, it would make learning math more engaging and relatable.*" (Student A).
>
> "*I often find it challenging to interact with my classmates during class because we're all facing the front. It would be nice to have more group discussions or activities where we can work together. When we get a chance to talk and exchange ideas, it feels like a more inclusive environment, and I learn better from my peers too.*" (Student B).
>
> "*I really appreciate how our teacher starts the lessons with discussions. It makes us feel like our ideas and opinions matter, and we're more motivated to participate and learn. In one class, we discussed load shedding, and it was eye-opening to see how it affects different students differently. It helped me understand the subject in a more meaningful way.*" (Student C).
>
> "*When our teacher discussed the floods in KwaZulu-Natal, it made me realize that math is not just a bunch of abstract numbers and formulas. Seeing how math is used to understand and solve real-world problems gave me a deeper appreciation for the subject. It feels like math is not just something we learn for exams but something we can use to make a difference in our lives and communities.*" (Student D).

These students' quotations emphasize the importance of incorporating diverse resources and teaching methods to enhance students' engagement and understanding of mathematics. Using real-life examples and fostering an inclusive classroom environment through results, enables students to connect the subject to their lived experiences and recognise the relevance of mathematics in their daily lives. By considering these perspectives, educators can create a more humanising and empowering learning environment that supports the development of critical thinking skills and active participation among students.
The provided analysis and quotations shed light on the various aspects of the implementation of a humanising pedagogy in teaching mathematics at a TVET college. The findings revealed that the resources that were used and the seating arrangement in the mathematics classrooms could be improved. Students

expressed a desire for more hands-on activities, visual aids and interactive simulations to make learning mathematics more engaging and relatable. The traditional seating arrangement, where students face the front of the classroom, was seen as a hindrance to student interaction and collaboration.

> *"I often find it challenging to interact with my classmates during class because we're all facing the front. It would be nice to have more group discussions or activities where we can work together."* (Student B).

Students preferred more group discussions and activities, which would foster an inclusive learning environment and allow for peer learning and idea exchange. Encouraging student-student interactions is crucial for humanising pedagogy, as it values the contributions and unique perspectives of each student.

The non-traditional teaching approach, starting lessons with discussions, was positively received by students. It made them feel that their opinions and ideas mattered, leading to increased motivation and active participation. Engaging students in discussions about real-life matters, such as loadshedding and floods, not only helped them connect mathematics to their everyday experiences but also fostered a sense of empathy and understanding of others' perspectives.

The interviewees' quotations highlight the significance of humanising the mathematics classroom by creating an inclusive and relevant learning environment. The use of real-life examples, along with discussions and peer interactions, helps humanise the subject and promotes a deeper appreciation for mathematics beyond rote learning. This approach aligns with the principles of critical pedagogy where education becomes a transformative process that empowers students to question, analyse and actively engage with the world around them.

In conclusion, the analysis and quotations emphasise the importance of adopting a humanising pedagogy in teaching mathematics. Incorporating diverse resources, facilitating student interactions and using real-life examples can enhance students' engagement, motivation and understanding of mathematics. By humanising the mathematics classroom, educators can create an empowering and inclusive learning environment that nurtures critical thinking, fosters empathy and prepares students to become active participants in society.

7. Discussion

The current section considers the discussion of the results in line with the aim to examine humanising pedagogy in teaching mathematics. This discussion aligns with the gaps and the theory, used in this study.

7.1 Resources

The results revealed that TVET college mathematics lecturers did not use any innovative teaching and learning tools and resources, available to them. No improvisation was made as they simply used a whiteboard, smartboard and textbooks. However, even if there was a shortage of resources as a result of the government's inability to provide instructional resources, it becomes imperative

that mathematics lecturers must improvise by creating and using locally produced instructional material, as George and Amadi (2016) argue. Moreover, the lack of innovative resources that do not relate to mathematics could be the reason why teachers do not try to improvise (Okori & Jerry, 2017).

7.2 Seating arrangement

It is far better when students are seated in a semicircle, for example, than seated individually, facing the board (Nehyba, Juhanak, & Cigan, 2023). Hence, Branco (2017) suggests that teachers should promote social interaction instead of controlling the learning process. Researchers were expected to ensure that students are engaged and seated perhaps in groups instead of individually. However, even though students were still seated individually facing the board, they were able to interact with other students. The discussions that were used in the classroom accommodated the seating arrangement. Teachers were able to create an environment that allowed students to work toward social change. The environment that was created was a more socially just learning environment and it addressed the needs of all the students (Chan – Anteza, 2020).

7.3 Teaching approaches

Even when lecturers did not improvise their resources and the seating arrangement, the teaching approaches were engaging. Students were actively involved as they were all partaking in the classroom discussions. Lessons provided students with opportunities to become part of their learning since teachers were relating mathematics to their lived experiences (Berry III et al., 2020). Lessons allowed students to discuss matters that were important to them and how to address these matters by using mathematics. Without a humanised classroom, it would be difficult for students to become social, thinking, transferring humans, working with others in the same environment. The student engagement showed that exploring a humanising pedagogy can help lecturers to engage students fully.

As outlined above, lecturers were learning from their students by sharing their experiences of loadshedding (Bature, 2020.)

7.4 Real-life examples

Lessons included discussions and real-life examples that were based on current matters. For example, the discussion of floods in KwaZulu-Natal (KZN). The real-life examples motivated the students to appreciate the mathematical principle under study and see the relationship between the mathematics they are learning and their lived experiences. Thus, shifting this power to the students supported the research where teachers are encouraged not to deposit knowledge only but also to develop lifelong learning skills in their students.

Exploring HP helped lecturers to see the significance of relating mathematics to students' lives. HP is expecting teachers to use humanising stories that show how mathematical ideas have developed over time and present mathematics as a unique discipline that has the potential to add to an enriched sense of their applications (Berry III et al., 2020). Furthermore, the humanising stories raise students' awareness of mathematics in society and relate to students' interests

(Berry III et al., 2020). Moreover, the humanisation of the process of teaching and learning mathematics helps students develop their mathematical and general competencies thereby becoming educated and intelligent individuals (Olawale, Mncube, & Harber, 2022).

Drawing on the discussions that took place in the classroom through students' reflections, one can say that exploring HP helped lecturers see the significance of relating mathematics to students' lives. Therefore, HP is required to develop quality TVET college lecturers, which are needed in the TVET space. Moreover, exploring HP could encourage lecturers to use teaching approaches that would avoid creating a passive learning space.

Therefore, the uniformity of the resources and the seating arrangement before and after the introduction of HP does not mean no transformation took place, as significant transformation happened regarding the teaching approach, which is the most important. The teaching approach changed from a traditional to a more humanistic student-centred approach where the level of student engagement and the use of real-life examples enhanced the teaching and learning experience. It is against this background that the researcher explored a humanising pedagogy with the assumption of transforming the current pedagogies that TVET lecturers use when teaching mathematics. It can be concluded that exploring a humanising pedagogy transformed teaching mathematics at a TVET college.

In conclusion, while gaps exist in the resource use and seating arrangement in the mathematics classroom, the implementation of humanising pedagogy brings about positive changes to the teaching approach, student engagement and the use of real-life examples. The study underscores the importance of promoting student agency, fostering an inclusive and socially just learning environment, and connecting mathematics to students' lived experiences. By exploring and implementing humanising pedagogy, TVET college lecturers can create a more empowering and meaningful learning experience for their students.

8. Contribution of the study

The theoretical implication of this study lies in its exploration and application of humanising pedagogy in teaching mathematics. By adopting a critical pedagogy approach, the study highlights the potential benefits of moving away from traditional teaching methods and embracing a student-centred, socially just, and inclusive learning environment. This theoretical implication supports the idea that education should be relevant and meaningful to students, fostering their motivation and engagement in learning.

Overall, the theoretical implication of this study emphasises the transformative power of humanising pedagogy, which can empower students, promote critical thinking and encourage active participation in shaping a more just and equitable society. It encourages educators and policymakers to reconsider traditional teaching practices and embrace pedagogical approaches that prioritise student agency, social interaction and the integration of real-life experiences into the curriculum

9. Conclusion

In conclusion, this study examined the implementation of humanising pedagogy in teaching mathematics at a TVET college. The findings highlighted the importance of adopting a critical pedagogy approach that values student agency, promotes social interaction and connects mathematics to students' lived experiences. While limitations in the use of resources and seating arrangements were observed, the study demonstrated a significant transformation in the teaching approach, student engagement and the use of real-life examples. The theoretical implication underscores the potential benefits of humanising pedagogy, contributing to a more inclusive and meaningful learning environment. By embracing such pedagogical approaches, educators can empower students, foster critical thinking and create a pathway to a more just and equitable society.

10. References

Afriansyah, E. A., Herman, T., & Dahlan, J. A. (2021, February). Critical thinking skills in mathematics. *Journal of Physics: Conference Series,* 1778(1), 012013. http://doi.org/0.1088/1742-6596/1778/1/012013

Bature, I. (2020). *Students' Engagements Patterns during Mathematics Classroom Practice*. *Open Access Library Journal*, 7, e6695. https://doi.org/10.4236/oalib.1106695.

Becker, I., Rigaud, V. M., & Epstein, A. (2023). Getting to know young children: Alternative assessments in early childhood education. *Early Childhood Education Journal*, 51(5), 911-923. https://doi.org/10.1007/s10643-022-01353-y

Berry III, R. Q., Conway IV, B. M., Lawler, B. R., & Staley, J. W. (2020). *High school mathematics lessons to explore, understand, and respond to social injustice*. Corwin Press. https://doi.org/10.5951/mtlt.2020.0152

Bhardwaj, P. (2019). Types of sampling in research. *Journal of Primary Care Specialties*, *5*(3), 157-163.

Boafo, F. A. (2016). The impact of Mathematics on Academic Performance of Students in TVET institutions in Ghana. *African Journal of Applied Research,* 2(2), 110-120.

Branco, A. U. (2017). Values, education and human development: the major role of social interactions' quality within classroom cultural contexts. In *Alterity, values, and socialization: human development within educational contexts* (pp. 31-50). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-70506-4_2

Brey, E., & Pauker, K. (2019). Teachers' nonverbal behaviors influence children's stereotypic beliefs. *Journal of Experimental Child Psychology*, *188*, 104671. https://doi.org/10.31219/osf.io/hdxba

Brey, E., & Shutts, K. (2018). Children use nonverbal cues from an adult to evaluate peers. *Journal of Cognition and Development*, *19*(2), 121-136. https://doi.org/10.1080/15248372.2018.1449749

Buthelezi, Z. (2018). Lecturer experiences of TVET College challenges in the post-apartheid era: a case of unintended consequences of educational reform in South Africa. *Journal of Vocational Education & Training*, *70*(3), 364-383. https://doi.org/10.1080/13636820.2018.1437062

Cakata, Z. (2023). "Because Of This Khephu": Dehumanisation Through Language in 'South African'Media. In *Decolonising Journalism Education in South Africa* (pp. 205-214). Routledge. https://doi.org/10.20853/37-3-4855

Chagi, N. (2019). A critical investigation of leadership in a Technical, Vocational Education and Training college in the Eastern Cape.

Chan-Anteza, T. K. (2020). Management of a Conducive Classroom Environment: A Meta-synthesis. *Management*, *11*(26). https://doi.org/10.7176/jep/11-26-06

Creswell, J. W., & Poth, C. N. (2018). Qualitative inquiry and research design (international student edition): Choosing among five approaches. *Language*, *25*(459p), 23cm. doi.org/10.23943/princeton/9780691182186.001.0001

Essel, O. Q., Agyarkoh, E., Sumaila, M. S., & Yankson, P. D. (2014). TVET Stigmatization in Developing Countries: Reality or Falacy?. https://doi.org/10.1093/med/9780199797639.003.0003

George, N. R., & Amadi, O. (2016). Improvisation skills possessed by mathematics teachers in junior secondary schools in rivers state, Nigeria. *International Journal of Education and Research,* 4(7), 35-48.

Giroux, H. (2020). *Critical pedagogy,* (pp. 1-16). Springer Fachmedien Wiesbaden. https://doi.org/10.3917/puf.girou.2020.01

Goyer, J. P., Cohen, G. L., Cook, J. E., Master, A., Apfel, N., Lee, W., ... & Walton, G. M. (2019). Targeted identity-safety interventions cause lasting reductions in discipline citations among negatively stereotyped boys. *Journal of Personality and Social Psychology*, 117(2), 229. https://doi.org/10.1037/pspa0000152

Gutstein, E. (2006). *Reading and writing the world with mathematics: Toward a pedagogy for social justice*. Taylor & Francis. https://doi.org/10.1080/10986060709336607

Henning, J. A., Ballen, C. J., Molina, S. A., & Cotner, S. (2019, November). *Hidden identities shape student perceptions of active learning environments.* In *Frontiers in Education* (Vol. 4, p. 129). Frontiers. https://doi.org/10.3389/feduc.2019.00129

Heywood, E., & Goodman, S. (2019). How Palestinian students invoke the category "human" to challenge negative treatment and media representations. *Journal of Community & Applied Social Psychology, 29*(2), 133-145. https://doi.org/10.1002/casp.2389

Janis, I. (2022). Strategies for establishing dependability between two qualitative intrinsic case studies: A reflexive thematic analysis. *Field Methods,* 34(3), 240-255. https://doi.org/10.1177/1525822x211069636

Jarvis, S. N., & Okonofua, J. A. (2020). *School deferred: When bias affects school leaders*. *Social Psychological and Personality Science*, 11(4), 492-498. https://doi.org/10.1177/1948550619875150

Jarvis, S. N., & Okonofua, J. A. (2020). School deferred: When bias affects school leaders. *Social Psychological and Personality Science*, 11(4), 492-498. https://doi.org/10.1177/1948550619875150

Joseph, N. M., Hailu, M. F., & Matthews, J. S. (2019). *Normalizing Black girls' humanity in mathematics classrooms. Harvard Educational Review*, *89*(1), 132-155. https://doi.org/10.17763/1943-5045-89.1.132

Kahiya, A., & brijall,D. (2021). Mathematics lecturers and students views on the role of language in a multilingual classroom at TVET College level. *PONTE International Scientific Research Journal,* 77(9). https://doi.org/10.21506/j.ponte.2021.9.1

Kajee, L. (2021). Teacher narratives and understandings of (de) humanising pedagogy. *South African Journal of Higher Education,* 35(6), 138-150. https://doi.org/10.20853/35-6-3721

Kajee, L. (2022). Humanising Pedagogy in Times of the COVID-19 Emergency: Student and Academic Voices in South Africa. In *The Emerald Handbook of Higher Education in a Post-Covid World: New Approaches and Technologies for Teaching and Learning* (pp. 195-212). Emerald Publishing Limited. https://doi.org/10.1108/978-1-80382-193-120221017

Kincade, L., Cook, C., & Goerdt, A. (2020). Meta-analysis and common practice elements of universal approaches to improving student-teacher relationships. *Review of Educational Research*, 90(5), 710-748 https://doi.org/10.3102/0034654320946836.

Lemon, L. L., & Hayes, J. (2020). Enhancing trustworthiness of qualitative findings: Using Leximancer for qualitative data analysis triangulation. *The Qualitative Report,* 25(3), 604-614. https://doi.org/10.46743/2160-3715/2020.4222

Li, W., & Rawal, H. (2018). Waning and waxing of love: unpacking layers of teacher emotion. Chinese *Journal of Applied Linguistics,* 41(4), 552-570. https://doi.org/10.1515/cjal-2018-0038

Madimabe, Makhosi P., Bunmi I. Omodan, and Cias T. Tsotetsi. (2020). "Indigenous knowledge as an alternative pedagogy to improve student performance in the teaching and learning of mathematical Geometry in TVET College." Proceedings of ADVED 2020 – 6th International Conference on Advances in Education. 5–6 October 2020. https://doi.org/10.47696/adved.2020186

Maluleka, P. (2023). Teaching and learning sensitive and controversial topics in history through and with decolonial love. *Yesterday and Today,* (29), 30-51. https://doi.org/10.17159/2223-0386/2023/n29a3

Mapaling, C., & Hoelson, C. N. (2022). Humanising Pedagogy within Higher Education: A Ten-Year Scoping Literature Review. *Scholarship of Teaching and Learning in the South,* 6(3), 68-81. https://doi.org/10.36615/sotls.v6i3.197

Masoabi, C. S., & Alexander, G. (2020). Possible merger, entrepreneurship education in TVET engineering studies: A case for South Africa. *Journal of Entrepreneurship Education*, 23(52).

McDevitt, S. E. (2021). Inclusion in practice: humanising pedagogy for immigrant children with and without disabilities. *International Journal of Inclusive Education*, 1-16. https://doi.org/10.1080/13603116.2021.1973123

McGee, E. O. (2020). Interrogating structural racism in STEM higher education. *Educational Researcher, 49*(9), 633-644. https://doi.org/10.3102/0013189x20972718

McLaren, A. (2019). *Impotence: A cultural history*. University of Chicago Press.

Moloi, K. (2019). Learners and educators as agents of social transformation in dysfunctional South African schools. *South African Journal of Education,* 39. https://doi.org/10.15700/saje.v39ns1a1800

Munthe-Kaas, H., Nøkleby, H., Lewin, S., & Glenton, C. (2020). The TRANSFER Approach for assessing the transferability of systematic review findings. *BMC medical research methodology,* 20(1), 1-22. https://doi.org/10.1186/s12874-019-0834-5

Nehyba, J., Juhaňák, L., & Cigán, J. (2023). Effects of Seating Arrangement on Students' Interaction in Group Reflective Practice. *The Journal of Experimental Education*, 91(2), 249-277. https://doi.org/10.1080/00220973.2021.1954865

Ngoveni, M. A., & Mofolo-Mbokane, B. (2019). Students' misconceptions in algebra: A case of National Certificate (Vocational) Level 2 Engineering Mathematics Students. *Association for Mathematics Education of South Africa*, 1, 232.

Ngwato, S. E. (2020). Factors which contribute to poor academic achievement in TVET colleges: A case study (Doctoral dissertation). https://doi.org/10.31274/rtd-180813-8429

Nkwanyane, T.P., Makgato, M., & Ramaligela, S.M. (2022). Inquiry into students' perceptions of Civil and Building Construction Curricula in South African TVET colleges. *Universal Journal of Educational Research*, 10(6), 369-377. https://doi.org/10.13189/ujer.2022.100601

Nzembe, A. (2018). Access, participation, and success: The tri-dimensional conundrum of academic outcomes in a South African TVET college. Academic *Journal of Interdisciplinary Studies,* 7(2), 31-31. https://doi.org/10.2478/ajis-2018-0044

Okori, O. A., & Jerry, O. (2017). Improvisation and utilization of resources in the teaching and learning of science and mathematics in secondary schools in Cross River state. Global Journal of Educational Research, 16(1), 21-28. https://doi.org/10.4314/gjedr.v16i1.4

Okori, O. A., & Jerry, O. (2017). Improvisation and utilization of resources in the teaching and learning of science and mathematics in secondary schools in Cross River state. Global *Journal of Educational Research,* 16(1), 21-28. https://doi.org/10.4314/gjedr.v16i1.4

Olawale, B. E., Mncube, V., & Harber, C. R. (2022). Democratic citizenship education: Towards a model for establishing democratic mathematics teacher education. *South African Journal of Higher Education,* 36(3), 177-193. https://doi.org/10.20853/36-3-4681

Olawale, B. E., Mncube, V., & Harber, C. R. (2022). Democratic citizenship education: Towards a model for establishing democratic mathematics teacher education. *South African Journal of Higher Education,* 36(3), 177-193. https://doi.org/10.20853/36-3-4681

Omar, M. K., Zahar, F. N., & Rashid, A. M. (2020). Knowledge, skills, and attitudes as predictors in determining teacher's competency in Malaysian TVET institutions. *Universal Journal of Educational Research,* 8(3), 95-104. https://doi.org/10.13189/ujer.2020.081612

Petancio, J. A. M. (2020). Concepts in Context for Technical-Vocational and Livelihood Track Mathematics Curricular Enhancements. *The Normal Lights,* 14(2). https://doi.org/10.56278/tnl.v14i2.1656

Pietersen, D., & Plaatjies, B. (2023). Freirean Utopian Didactic: A Retrospective View of Education in the South African Education Environment. *Journal of Culture and Values in Education,* 6(2), 123-137. https://doi.org/10.46303/jcve.2023.12

Riger, S. T. E. P. H. A. N. I. E., & Sigurvinsdottir, R. A. N. N. V. E. I. G. (2016). Thematic analysis. *Handbook of methodological approaches to community-based research: Qualitative, quantitative, and mixed methods*, 33-41. https://doi.org/10.1093/med:psych/9780190243654.003.0004

Rudman, N., & Meiring, L. (2018). Transforming vocational education: on lecture at a time. *Journal of Vocational, Adult and Continuing Education and Training,* 1(1), 88-103. https://doi.org/10.14426/jovacet.v1i1.15

Sawatzki, C., & Sullivan, P. (2018). Shopping for shoes: Teaching students to apply and interpret mathematics in the real world. *International Journal of Science and Mathematics Education,* 16, 1355-1373. https://doi.org/10.1007/s10763-017-9833-3

Shevlin, M., & Rose, R. (2022). Respecting the voices of individuals from marginalised communities in research—"Who is listening and who isn't?". *Education Sciences,* 12(5), 304. https://doi.org/10.3390/educsci12050304

Tai, K. W., & Wei, L. (2021). Constructing playful talk through translanguaging in English medium instruction mathematics classrooms. *Applied Linguistics,* 42(4), 607-640. https://doi.org/10.1093/applin/amaa043

Taleyarkhan, M. R., Lucietto, A. M., & Azevedo, T. M. (2021). How engineering technology students perceive mathematics. *How Engineering Technology Students Perceive Mathematics. https://doi.org/10.31756/jrsmte.413*

Thompson, M. J. (2017). Introduction: What is critical theory?. *The Palgrave handbook of critical theory*, 1-14. https://doi.org/10.1057/978-1-137-55801-5_1

Turetsky, K. M., Sinclair, S., Starck, J. G., & Shelton, J. N. (2021). Beyond students: how teacher psychology shapes educational inequality. *Trends in Cognitive Sciences,* 25(8), 697-709. https://doi.org/10.1016/j.tics.2021.04.006

Uddin, M. S. (2019). Critical pedagogy and its implication in the classroom. *Journal of Underrepresented & Minority Progress, 3*(2), 109-119. https://doi.org/10.32674/jump.v3i2.1788

Vimbelo, S., & Bayaga, A. (2023). Current pedagogical practices employed by Technical Vocational Education and Training college's mathematics lecturers. *South African Journal of Higher Education,* 37(4), 305-321. https://doi.org/10.20853/37-4-5292

Zembylas, M. (2018). Decolonial possibilities in South African higher education: Reconfiguring humanising pedagogies as/with decolonising pedagogies. *South African Journal of Education,* 38(4), 1-11. https://doi.org/10.15700/saje.v38n4a1699

Ziad, S.A.I.D. (2021). Integrating STEM in to TVET Education Programs in QATAR: Issues, Concerns and Prospects. *The Eurasia Proceedings of Educational and Social Sciences,* 23, 15-24. https://doi.org/10.55549/epess.1051080

Zinn, D., & Rodgers, C. (2012). A humanising pedagogy: Getting beneath the rhetoric. Perspectives in Education, 30(4), 76-87.

ANNEXURE A: OBSERVATION GUIDE (Prior and Post intervention)

Date:
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Lesson:
……
…….
Duration of the lesson.
……
…….
College
……
…….
DESCRIPTION OF LEARNING ENVIRONMENT

1. Resources used

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2. Seating arrangement

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3. Teaching approach used

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4. Student engagement

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5. Real – life examples

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[i] Nkwadipo and Rabaza 2021