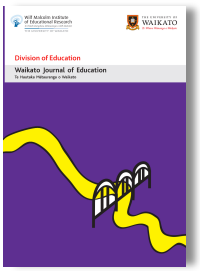

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Intermediate Phase mathematics teachers' conceptions of learner-centred teaching

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Abstract

The 2030 Sustainable Development Goals of UNESCO places a focus on quality education for all learners. However, meeting the requirements for quality education seems far-fetched for some developing countries, such as South Africa. The reason being that mathematics performance in South Africa is still an area of concern. The assumption is that this is because mathematics teachers still rely on outdated, teacher-centred strategies to teach mathematics. To address this problem of poor performance, South African curriculum policies advocate learner-centred strategies to meet the needs of diverse learners in the classroom. However, curriculum transformation has not had the desired effect. The purpose of this article therefore is to explore how mathematics teachers in the Intermediate Phase (Grades 4–6) interpret learner-centred teaching. Ernest's analytical model of beliefs provide the frame for the article. A qualitative multiple case study methodology was used with the participation of 10 mathematics teachers who teach Intermediate Phase learners in KwaZulu-Natal. The data collection method used was semi-structured interviews. The findings revealed that the mathematics teacher participants had limited understanding of learner-centred strategies; they misinterpreted how to implement learner-centred strategies; they manipulated learner-centred strategies prescribed by the policy to suit how they taught; and the many contextual factors they experienced influenced the way they taught. Recommendations are that teachers are provided with professional development in using learner-centred strategies and that they form networks with other mathematics teachers to collaborate on culturally responsive methods of teaching as a way to address the needs of the multilingual and multicultural learners that they teach. Further research should be conducted into alternative approaches that includes learner-centred strategies.

Keywords

Interpretation; diversity, learner-centred strategies; teacher-centred strategies; policy directives; quality education; mathematics instruction.

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(pp. 1–12)

Introduction

UNESCO's Sustainable Development Goals (SDG) agenda for 2030 is geared towards the sustainability of global equality, especially for developing countries (UNESCO, 1989, 1991, 1993, 1995, 1998). SDG 4, which focuses on education, aims to achieve inclusivity through quality and equality. This goal affirms that education is powerfully aligned with sustainable development and the need to ensure that all primary school learners, especially those in developing countries, have a just and free education by 2030 (Allison & Dickay, 2020). Developing countries like South Africa propose to meet this equitable agenda through a learner-centred education strategy that provides equal access to all learners (Meeran, 2017). To attain this quality education, skilled teachers are essential; however, it has been found that less than half of the teachers in Africa have the skills needed to provide quality education that meets the needs of all learners by 2030 (UNESCO, 2018). This is a matter of concern.

The South African Curriculum Assessment Policy Statement (CAPS) was designed to promote equitable education by advocating that teachers use learner-centred strategies in their classrooms (Department of Basic Education [DBE], 2011). The CAPS curriculum is considered prescriptive, and teachers are required to conduct assessments according to policy requirements (Braun, 2017; Govender, 2018; Meeran & Van Wyk, 2022). However, the mathematics performance of learners remains disappointing. The TIMSS (Trends in International Mathematical Science Study) assessments that took place in 1995, 1998, 2003, 2011, and 2015 testify to the appalling results obtained by South African learners when compared with their global counterparts (Luneta, 2015; Reddy et al., 2016; Visser et al., 2015). Therefore, more needs to be done to improve learner performance in mathematics.

Given the heterogeneity of South African classrooms in terms of culture, ability, and socioeconomic status, mathematics teachers providing an equitable education for all learners is a daunting task. Meeran and Van Wyk (2022) found that their five mathematics teacher participants used teacher-centred strategies to teach mathematics even though Simamora et al. (2019) identified that learner-centred strategies were beneficial for meaningful learning in mathematics and had been prescribed by CAPS since 2011. Guthrie (2011) alleges that teachers in developing countries tend to be more inclined towards teacher-centred approaches because their dispositions towards authoritarianism interests them in transmitting knowledge rather than allowing learners to construct knowledge. However, learner-centred approaches are known to pose a challenge to teachers across a range of contexts and countries (Corkin et al., 2019; Stephan, 2020).

The study that informs this paper addresses the need for empirical evidence of how teachers interpret learner-centred teaching specifically related to teaching mathematics in the Intermediate Phase in South Africa. Alipio (2014) strongly recommends that future research be based on teachers' beliefs about what constitutes learner-centred teaching in mathematics. I therefore sought to explore how Intermediate Phase mathematics teachers interpret learner-centred strategies through the following research questions:

1. How do Intermediate Phase mathematics teachers interpret learner-centred strategies?
2. What contextual factors influence the implementation of learner-centred strategies?

The literature section overviews learner-centred strategies with a particular focus on how they can be implemented in mathematics. The article uses Ernest's (1989) analytical model of the beliefs of mathematics teachers to provide a theoretical background. The methodology is based on a qualitative multiple case study approach, using semi-structured interviews as a data collection tool. The findings and discussion are provided in separate sections, followed by a conclusion).

Literature review

Benefits of learner-centred strategies in mathematics education

While mathematics was and still is widely recognised as an abstract subject with rules and prescriptions for logical thinking, research has shown that there are alternatives to teaching mathematics that make it meaningful for the learner (Meeran & Van Wyk, 2022; Phoshoko, 2018; Simamora et al., 2019). Learner-centred strategies, which are contextually based and relevant to the learner, have profoundly positive benefits for student learning (Phoshoko, 2018). Phoniphicat et al. (2014) agree that the focus of mathematics teaching must be to allow learners to solve problems in their everyday lives. Furthermore, Simamora et al. (2019) found that when learners actively engaged in solving problems in a small group, the result was improved mental function; students were able to think critically while working collaboratively. Reeve and Cheon (2021) add that the benefits include active participation of learners in mathematics lessons, them taking initiative and being motivated to learn new information. Hence, if learners are given the opportunity to think critically and work autonomously through learner-centred strategies, their mathematics learning may improve. However, since the focus of this paper is on the mathematics teacher, it is vital to discuss mathematics teachers as implementers of learner-centred strategies.

Mathematics teachers' role as facilitators of learner-centred education

The benefits of learner-centred strategies in mathematics instruction have been demonstrated in the previous section, but the role of mathematics teachers in using and understanding learner-centred strategies is the focus for this article. Teacher efficacy determines teachers' beliefs, attitudes, and approaches to how they teach mathematics (Tschannen-Moran et al., 1998). Meeran and Amin (2021) concur in that they found that when a teacher has a positive attitude towards mathematics and how it is taught, they will incorporate teaching strategies that will benefit all learners in their classrooms. Furthermore, a study in Korea (Choi et al., 2019) found that mathematics teachers who perceived their teaching to be successful in arousing the interest of their learners through learner-centred strategies achieved positive learning experiences in their classroom.

The study conducted by Keiler (2018) in two secondary schools in America involved a programme used to initiate teachers in using learner-centred strategies to teach mathematics. In Keiler's study mathematics teachers who previously saw themselves as content providers had to undergo a complete identity transformation so that they could recognise individual learner needs. On the other hand, Russo et al. (2020) and Trigwell (2012) found that teachers who enjoyed teaching and had a positive attitude towards the teaching of mathematics automatically centred their teaching on learner-centred strategies. Interestingly, Russo et al. (2020) shared anecdotes of early primary school mathematics teachers in Australia that demonstrated that teachers enjoyed teaching even more when learners achieved that "lightbulb moment" of clarification when solving a problem themselves. Endeavouring to make learning more meaningful to learners, Keazer and Nolan (2021) found that culturally sensitive teaching can involve learners more in the curriculum and facilitates learner-centred strategies. Hence, contextualising mathematics education is beneficial when adopting cultural sensitivity towards multicultural and multilingual learners and incorporating learner-centred strategies. Within the South African context, Africanising the mathematics curriculum (Phoshoko, 2018) is conducive to making mathematics meaningful and relevant in the lives of learners. Suryawati, Osman and Meerah (2010); Yuniasih and Wahyuningtyas (2019) and Triwahyuningtyas et al., (2022) all confirm that mathematics teaching and learning needs to relate to the daily lives of learners if the subject is to be understood, beneficial, and relevant to learners. However, teachers may lack the ability to integrate indigenous knowledge within the curriculum (Vaughn & De Beer, 2020). If teachers can use ethnomathematics skills, which allow for indigenising the curriculum, Machaba and Dhlamini (2021) have demonstrated that this will have a profound effect on the use of learner-centred strategies that make learning relevant in the lives of the learners. A deeper understanding of teachers' beliefs when using learner-centred strategies is discussed next through Ernest's analytical model.

Analytical model profiling mathematics teacher knowledge, beliefs, and attitudes

For this study, a model of mathematics teachers' beliefs is needed, as the purpose of the article is to interpret teacher conceptions of learner-centred teaching. Ernest's (1989) analytical model is used for this purpose. This profiles mathematics teachers according to their knowledge, beliefs, and attitudes. Here, this model is used to understand why teachers conceptualise learner-centred teaching in the way they do. Ernest makes the argument that the focus of mathematics teaching should be problem solving and critical thinking, which blends with learner-centred education, where mathematics teachers provide skills to learners to actively engage in higher-order thinking. Ernest (1989) further contributes that learner-centred teaching is new for many mathematics teachers and requires an understanding of their knowledge, skills, and attitudes to teaching approaches.

Ernest (1989) provides three views that reflect teacher beliefs about how mathematics should be taught. The first view (the dynamic view) of how mathematics should be taught is that of dynamic problem solving as a human inquiry that is open to revision. The second view is of mathematics as Platonistic, where mathematics is viewed as static, interrelated structures, which are discovered and not created. The last and third or instrumentalist view is that mathematics is a useful but unrelated collection of facts, rules, and skills. Depending on how teachers believe mathematics should be taught, they would reflect differently on how they incorporate learner-centredness into their teaching. The first view allows acceptance of teachers' roles as facilitators of learner-centred activities, while a Platonistic or instrumentalist view causes teachers to believe that there is just one correct way to do mathematics. It therefore becomes obvious that teacher beliefs about how mathematics should be taught affect how they embrace curriculum transformations, such as learners taking responsibility for their own learning in mathematics.

In the following section, I discuss the methodology used for this study.

Methodology

The purpose of this paper is to explore the perceptions Intermediate Phase mathematics teachers have of learner-centred strategies. To achieve this purpose, a qualitative multiple case study approach was used (Yin, 2014). Research questions were compiled and presented to teachers to allow myself an understanding on how mathematics teachers interpret learner-centred strategies; this, in turn, affects how they teach Intermediate Phase mathematics. A multiple case study approach was used, as there were 10 different contexts in which the participants taught. Moreover, the cases were examined within the framework of Intermediate Phase mathematics teachers' perceptions of learner-centred strategies.

Selection of participants: The study focused on teachers who taught mathematics in the Intermediate Phase (Grades 4 to 6) in rural and semi-rural KwaZulu-Natal. Teachers from rural and semi-rural schools in one area in KwaZulu were invited to participate, as there are diverse cultures among learners in these schools, most of whom belong to indigenous communities in South Africa and come from low to middle socioeconomic backgrounds. Purposive sampling was used to select 10 teachers (Cohen et al., 2018) who had trained to teach mathematics in the Intermediate Phase and who were teaching mathematics in that phase in public schools.

Method of data generation: Data was collected using semi-structured interviews with participants. Each of the participants were asked the same questions, which allowed for further probing (Cohen et al., 2018). This process allowed for acquiring deep descriptions of how the teachers conceptualised learner-centred strategies. The semi-structured interviews were focused on the challenges teachers had in teaching mathematics in the Intermediate Phase in South Africa. The interviews were audio recorded so that I did not miss any details. Participants were interviewed once, and each interview was approximately one hour long.

Analysis of data: I used Clark and Braun's (2013) six steps of thematic analysis as follows:

1. Familiarisation with the data: Interviews were transcribed verbatim for the purpose of analysis. The transcriptions were checked by the participants to verify their accuracy. Familiarisation involved reading and rereading of the transcripts.
2. Coding: Commonly used words, concepts, and expressions, such as learner-centred activities, groupwork, and class discussion, were colour-coded to identify patterns and categories.
3. Searching for themes: The codes, such as learner-centred strategies, group teaching, policy, discover, overcrowded, and language, were reviewed as part of the search for themes that answered the research questions.
4. Reviewing themes: Themes were synthesised into four themes related particularly to the use of learner-centred strategies.
5. Defining and naming themes: The themes were then carefully reviewed to find appropriate names that were interesting and relevant to the phenomenon of the study.
6. Writing up: Where appropriate data was added to the themes and analysed.

To ensure the trustworthiness of the study, member-checking, use of thick descriptions, and participant confirmation techniques were applied (Cohen et al., 2018). The four themes that were derived from the data analysis are outlined in the findings section.

As part of a broader project, ethical clearance for the semi-structured interviews was applied for and provided by the institutional ethics authority (Ref No.: 2020/09/09/90441435/10/AM). Written informed consent was obtained from all individual participants. For ethical reasons, pseudonyms were used for the participants so that they could not be easily identified.

Findings

The four themes that constitute the findings are as follows:

- *Limited understanding of learner-centred strategies*
- *Misunderstanding of how to implement learner-centred strategies*
- *Misinterpretation of provisions for learner-centred strategies within policy directives*
- *Influence of contextual factors on the implementation of learner-centred strategies.*

Limited understanding of learner-centred strategies

The first theme demonstrates that the participants in this study had inadequate understanding of what learner-centred strategies are and how they should be used to teach mathematics. They believed that group work is the only form of learner-centred strategy to be used.

> Nonto: *Group teaching I like it because they are all involved. They are helping each other. They learn from each other instead of staying there and me preaching and preaching.*

> Carey: *But I am actually also moved towards a learner-centred approach and I am seeing it working … You know that they are learning from their peers. What I see, I will explain a concept to them, I will, I know my learners that you know basically grasp a concept, so I mark their book individually, so I have about eight learners that do their work, so I mark their books and see that they understand it. So, I say, okay, you know, who needs help, who doesn't know what is going on? So that child would go to that learner and explain to him and I tell them, you know what, you don't explain in English, you explain in the language that they understand, so they will explain to them in Zulu, and I know what they explain will be right because I have marked their work. So yes, that is how I do it.*

Both Nonto and Carey offered group work as an example of learner-centred teaching. Their responses suggest a belief that group teaching is a form of a learner-centred strategy that can be used to teach mathematics in the Intermediate Phase. Although working in groups is a form of learner-centredness, the way in which participants use it was for scaffolding so that more capable peers assisted weaker learners. Ernest's instrumentalist view is revealed here, as mathematics seemed to be perceived as a collection of unrelated facts that needs to be taught by the teacher herself or by brighter learners. The teacher or more knowledgeable learners in the group worked together to assist less knowledgeable learners to understand the problem rather than learners working in a group to solve problems on their own. Carey also indicated that she uses group work to overcome the language barrier in her classroom, as learners respond better to each other in their mother tongue. Although groupwork does assist weaker learners in the classroom, it seems that this meets the need for progression to the next grade rather than developing critical thinking that learner-centred strategies are believed to achieve. Carey reveals that she does group work to ensure that learners understand the concepts she has taught rather than providing examples where learners collaborate to work it out together. However, it should also be noted that Nonto recognised the fallacy of using teacher-centred strategies, as she said that learners working in groups are more open to learning than when the teacher does all the talking (in her words, "preaching").

Misinterpreting the implementation of learner-centred strategies

While some teachers associated learner-centred teaching with group work alone, others believed they were implementing learner-centred strategies when they were not. For example, some participants believed that when learners answered their questions it meant that they were using learner-centred strategies. While Kate considered learner-centred approaches build student confidence, she linked learner-centred teaching with the whole class working together through question and answer towards a particular or managed answer. The lesson was, therefore, still teacher-directed in that she helped learners to find specific answers.

> Kate: *You know when you work in a learner-centred manner, and a child also gains confidence in what the teacher is doing. What I am saying is taking the number that I said is written there on the board, the operation is there, but you work with it all together. Then you manage the answer.*

Nosi also clearly articulated a misunderstanding of what learner-centred strategies are when she explained how she uses concrete objects and worksheets to explain fractions. She believes that by doing this she is using learner-centred strategies, whereas she is demonstrating an idea, and her students are working through worksheets.

> Nosi: *It is like, question and answer and explain to them and wait for them to come up with some [answers] … you know, those are the things [concrete materials] that they can see. Like when you are teaching fractions you have to like divide that into how many slices, sometimes we do that. Then there are also some worksheets.*

Kate and Nosi believe that when learners interact with them during lessons the involvement of their learners means that they are employing learner-centred strategies. Ernest's instrumentalist view is evident here. These teachers appear to believe that learning mathematics has to be knowledge driven by the teacher rather than discovered by the learners.

Misinterpretation of provisions for learner-centred strategies within policy directives

This theme highlights how teachers interpret the learner-centred strategies in the CAPS. The following response was recorded when Saras was asked how they used the CAPS document to plan learner-centred strategies:

> Saras**:** *Okay, explanation, it is more explanation and exercises. But where they do have to discover for themselves, if I have to leave them they are not going to do it. That is what I noticed. If I have to leave them to do it on their own, they wouldn't do it, like you know like discovery. I mean exploring on their own, they wouldn't want to do that. They need extra help to do, you know like, do their work as is.*

From the statement by Saras, it can be assumed that she does not believe that learners can think for themselves, as she says that if you leave it to them, they are not going to do it or discover explanations by themselves. Perhaps she needs assistance on how to be a facilitator so that she can support her learners to discover knowledge rather than her transmitting the required knowledge.

Kammy and Thandi described how they used assignments:

> Kammy: *For maths it is an assignment, they need one assignment, but now because of Covid and the children not being around and forgetting so much, so if it is an assignment, we will give them the assignment, and we actually do a revision for the assignment so that they can pass. We just drill things, drill the whole assignment with them so that they pass.*
>
> Thandi: *When we give them with the assignment, we don't tell them it is assignment, because once you say it is assignment, they will take it home and then the parents will do it for them, most of the time. By the time you do the test, then the result just shows, we just tell them that it is a test, because they don't understand the difference between the two, and then they will do it in class.*

The CAPS policy prescribes assignments and investigations as learner-centred strategies. CAPS assignments include examples and word problems that learners can do on their own or working with others; investigations are where learners work through a problem to discover the solution. Investigations are generally done in a group. However, it can be assumed that the teachers believe that learners are incapable of doing these assignments on their own and perhaps, as Thandi indicates, parents will do it for them. So the teachers teach what is in the assignments and "drill" (Kammy's word) the answers so that learners can pass the assignment which is now regarded as a test (Thandi's statement).

Although I have selected only four participants' responses to highlight this theme, the other six participants gave similar responses. The learner-centred strategies prescribed within the CAPS mathematics policy for the Intermediate Phase were misconstrued by the participants or used in ways that deviated from how they were intended to be used. This shows that the teachers' beliefs were similar to Ernest's instrumentalist teacher belief that mathematics concepts have to be taught and learnt through memorisation as an unrelated collection of facts. Saras understood that the discovery method is a learner-centred strategy, but she chose to ignore this approach because she believed that her learners would not be able to cope on their own using this method. The responses of Nosi, Kammy, and Thandi indicated they manipulated the learning-centred strategy initiatives prescribed in the CAPS curriculum to implement them in a teacher-centred way, where they guided students towards an intended answer. Overall, the participants did not want to give the responsibility for their learning to their learners. Therefore, it seems that learner-centred policy directives that are aimed at critical thinking and problem-solving skills are not being implemented as intended. This theme suggests that the study participants struggled to implement the suggested CAPS strategies as envisaged by the curriculum planners and indicates the need for professional development.

Influence of contextual factors on the implementation of learner-centred strategies

The final theme in this paper orientates us to the possible reasons why Intermediate Phase mathematics teachers in this study chose not to implement learner-centred strategies. Kammy explained why learner-centred strategies are challenging:

> Kammy: *Oh it is very, very challenging. We actually call parents, we have a meeting, we ask the parents, you know, to help on your side. Then we tried to help. We actually call our Zulu teachers also to come and intervene and help with interpretation, but as I said some kids are doing quite badly. They fail but some of them they try. They change, they adapt, and they improve. There are some of them, they cannot. They will have to go back because it is too much for them.*

Kammy seems to be struggling to meet the diverse needs of her learners. She tries to get parental support and involves the school Zulu teachers to help with language matters, but this does not seem to be helping all her students. She mentions that some learners can cope and improve, while others cannot. While Kammy introduces several initiatives, they are teacher rather than learner-centred. Perhaps she could have allowed for scaffolding from peers.

Desiree also identified challenges due to diversity of student languages:

> Desiree: *It is a struggle with some learners, the language. It is a struggle, so as much as I would love to meet all the needs it is very difficult because as I just said that the language is a problem, so if the learner doesn't understand me, I cannot [help].*

It seems that language diversity and differences are a barrier, as both Kammy and Desiree found it difficult to adopt and implement learner-centred strategies for these reasons. The students in their classes were from both multicultural and multilingual backgrounds. Perhaps they could have allowed students to work collaboratively to understand the mathematics concepts.

Nosi makes us aware of the implications of the large class size she has to teach:

> *But when they are 46, I cannot lie, I can never be very noisy like most of them so really I cannot reach all of them. I can't reach all of them.*

Here, she openly declares that she is not providing an equitable education for all the learners in her class, as she is unable to reach them all. Carey also identified class size and the time to address the needs of all her students as an issue:

> Carey: *I think the system that we have, the system is sort of like, you see it is not the learner it is the system. The system is failing us to an extent because, remember, we have overcrowded classrooms. Where is the time to use learner-centred strategies, we want to give it 100%.*

For Thandi, the time allocated to teach the syllabus is an issue:

> Thandi: *It is so difficult to cover up everything but we just manage because of the time frame; for me, they say it is six hours for Maths period.*

On the other hand, Carey blames the COVID-19 situation for having to use a teacher-centred approach only:

> Carey: *The last term before Covid, there was peer learning, where you get them into groups and they meet conditions and you get the one child that knows the work and you check their work, and then buddy would be alert as you try and help them, but now with Covid it also becomes a challenge, because you are not supposed to touch each other and interact with each other.*

For Carey and Thandi, curriculum prescription and having to complete the syllabus on time were issues. So while the curriculum prescribes learner-centred strategies, teachers seem unable to implement these strategies due to other curriculum demands. Carey wanted to use the buddy system for learner interaction before COVID-19, but this was curtailed due to restrictions on social interaction. This indicates that learner-centred strategies require collaboration and interaction, but some circumstances (COVID-19) may prevent teachers from employing these strategies.Participants were faced with many contextual

factors that influenced the way they taught mathematics. Some of these contextual factors were lack of parental support, learner abilities, language barriers, large class sizes, completing the syllabus on time, and COVID-19. Owing to the large class sizes, Nosi and other participants stressed that they struggle to teach mathematics adequately in the Intermediate Phase.

I provide a discussion of the findings using the appropriate literature in the section that follows.

Discussion of findings

The first research question for this paper is 'How do Intermediate Phase mathematics teachers conceptualise learner-centred strategies?' The first three themes answer this research question. Firstly, some participants were able to grasp what learner-centred strategies might be, but they had a limited understanding of how they would be used. Participants correctly identified group work as a learner-centred strategy, but did not demonstrate how it could be used effectively in teaching mathematics in a learner-centred way. They understood group work to be where more capable peers help their weaker peers rather than group work as a process where students work together to solve problems that are contextually relevant (Suryawati, Osman & Meerah 2010; Triwahyuningtyas et al., 2022; Vaughn & De Beer, 2020). This finding indicates that the teachers fit the profile of instrumentalist mathematics teachers, as they view mathematics to be taught as a useful but unrelated collection of facts, rules, and skills (Ernest, 1989). The findings indicate that the teachers teach for an assessment so that learners learn and reach the intended solution. This also suggests that the teachers in the study can be seen as instrumentalist mathematics teachers. The SDG 4 data book (UNESCO, 2018) found many teachers do not have the skills needed to teach using learner-centred strategies and they cannot make mathematics relevant in the lives of their learners by integrating indigenous knowledge into the mathematics curriculum (Vaughn & De Beer, 2020). This would seem to be the case with the study teachers. While they did discuss the language challenges and barriers, they did not discuss linking to their students' lives.

The second theme highlights that some of the participants understood learner-centred strategies to be the interactions they have with learners during teacher-centred teaching. They viewed learners' responses to questions posed by them as part of a learner-centred strategy. Again, this belief positions mathematics teaching and learning as instrumentalist (Ernest, 1989), as it construes learning as finding a solution that is predetermined rather than students working to discover the solution or even whether there is more than one solution. However, some teachers, for example Nosi, reflected the profile of Ernest's Platonist view when she acknowledged the advantages of student directed learning, although she also pointed out the time limitation of doing this. Nosi allowed learners to do some discovery, as in the Platonist view, and she also showed that the instrumentalist view as the answer is predetermined. Students just answering teachers' questions does not make learners responsible for their own learning. They also need to learn to solve problems on their own (Phonicat et al., 2014). This theme corroborates the UNESCO (2018) study that found that most African school teachers do not have the skills to teach in a learner-centred way.

Theme three demonstrates that teachers interpreted the learner-centred strategies detailed in CAPS in a limited way. Although the CAPS policy has been designed to allow for learner-centred strategies (DBE, 2011) and the policy is prescriptive in the use of learner-centred strategies (Braun, 2017; Govender, 2018; Meeran & Van Wyk, 2022), the participants in this study elected to follow it in the way that limited learner opportunity to collaborate and develop critical thinking skills. Student input into investigations and assignments was restricted because teachers believed that their learners would not cope with working independently. The reiterations of Saras, Kammy and Thandi suggest that all three follow Ernest's (1989) third view of mathematics as an unrelated collection of facts, rules, and skills. In response to the second research question, the fourth theme identifies the contextual factors that caused teachers to implement learner-centred strategies in a limited way or not at all. The multilingual, multicultural, and diverse ability of the learners in their large classes made it very challenging to impossible for them to implement learner-centred strategies. Meeran and Van Wyk (2022) concedes

that meeting the needs of all learners in a classroom is a daunting task. Alipio (2014) and Lumadi (2014) also testify that there is limited use of learner-centred strategies in the South African classrooms and teacher-centred approaches are favoured. Now we can understand why the teachers struggled to use learner-centred strategies. Perhaps, if appropriate professional development programmes were used to assist teachers to implement learner-centred strategies, they would be better positioned to use these strategies (Keiler, 2018). Such programmes, as well as encouraging teacher efficacy (Tschannen-Moran et al., 1998), would be valuable in assisting teachers to cope with the challenges of learner-centred strategies. Any programme would need to consider the implications of teachers' instrumentalist beliefs where students' task is to learn a static set of unrelated facts rather than engage in problem solving and continuous revision of their ideas as in the dynamic view. However, contextual factors need to be considered. For some teacher participants who used learner-centred strategies in a limited way, circumstances, such as the COVID-19 pandemic, prevented them from using collaborative learning.

Conclusion

The participants in this study had a limited understanding of what learner-centred strategies are and, therefore, failed to implement these strategies adequately in their mathematics classrooms. A range of contextual factors contributed to them using teacher-centred strategies in their classrooms. This indicates that teachers need support to implement learner-centred strategies. Teachers in this study were placed at the lowest level of Ernest's (1989) analytical model with profiles that were instrumentalist and teacher-centred. Ernest's dynamic view makes the learner part of the learning process through problem solving and continuous revisions, as mathematics is not viewed as static and never changing. The second Platonistic view allows learners to discover themselves, which allows the learner a vital role in the learning process. It is therefore recommended that there be programmes to assist teachers in changing their beliefs on how mathematics should be taught. These need to consider the study findings, which indicate that participants adapted prescribed learner-centred strategies to teacher-centred strategies and the challenges they found in using learner-centred strategies rather than embracing the approach. Furthermore, mathematics teachers could be supported to form networking relationships that allow them to collaborate on how to implement learner-centred strategies in their classrooms, as I did notice that they worked in isolation. Another recommendation is for teachers to be specifically trained in culturally responsive pedagogies in mathematics. This would help them to meet the needs of the diverse learners in their classroom. Participants were adamant that they could not meet the needs of all learners in the classroom and that there were language barriers. The teachers in this study were doing what they could to address language barriers for the multilingual and multicultural learners in their classroom.

This study contributes to the recognition of the misconceptions teachers have about learner-centred strategies and is significant in identifying the need for culturally responsive teaching in mathematics. While we recognise the benefits of learner-centred strategies, how they are conceptualised and implemented in the mathematics classrooms needs to be addressed; otherwise, initiatives such as the learner-centred strategies prescribed in the CAPS policy will likely be manipulated into teacher-centred strategies. Further research needs to be done into alternative approaches for incorporating learner-centred strategies to gauge whether these strategies would improve learner performance in mathematics in Sub-Saharan countries and South African provinces other than KwaZulu-Natal.

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