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The Role of Formative Feedback in Teaching and Learning: Grade 10 Physical Sciences Teachers' Perspectives

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Abstract: This study examined the role of formative feedback in the teaching and learning of Physical Sciences. Several scholars have recognised the pedagogical value of formative feedback in science education. However, there is a need for significant improvement in the quality of formative feedback provided by teachers in science classrooms. The empirical investigation explored the nature of formative feedback, pedagogical challenges, and pedagogical practices employed by teachers when implementing formative assessment in Physical Sciences classrooms. The study is underpinned by the Assessment for Formative Purposes Cycle as the underlying theoretical framework. We utilised the interpretive paradigm and a qualitative approach, specifically employing phenomenology as a means of inquiry. The empirical investigation involved 12 Grade 10 Physical Sciences teachers selected purposively from Inkosi Sambane Circuit Schools, under UMkhanyakude District, KwaZulu-Natal, South Africa. Data were collected through semi-structured interviews and classroom observations, and thematic analysis was used to analyse the data. The findings revealed that meaningful formative feedback could have been enhanced by addressing contextual factors such as overcrowding and lack of resources in Physical Sciences classrooms. While teachers valued the quality of formative feedback, they expressed concern about learners' inability to utilise formative feedback to improve their learning. This paper recommends providing teachers with the necessary training to effectively utilise formative feedback and enhance learners' academic achievement in Physical Sciences.

Keywords: Assessment, formative feedback, physical sciences, teaching and learning, academic achievement.

1. Introduction

In the 21st century, formative feedback is widely acknowledged as an integral part of teaching and learning, particularly in science classrooms. Ferguson (2011) indicates that in order for formative feedback to be effectively implemented, it should improve learners' academic achievement, attitudes toward the subject, and self-regulation skills, ultimately guiding learners to become independent in scientific inquiry. Formative feedback encompasses any information, process, or activity that enhances learners' learning based on comments related to formative or summative assessments (Irons & Elkington, 2021). However, Black and McCormick's (2010) findings reveal that formative feedback in classroom practices still poses a challenge, as teachers tend to focus too much on written feedback rather than oral feedback. Evans (2013) suggests that written formative feedback does address some of the shortcomings in supporting learners' learning, but Carless (2007) argues that a shift to a learning-oriented approach is necessary for formative feedback to truly support learners' learning. This approach should emphasise the role of learners in the formative feedback process, rather than solely focusing on the quantity or quality of the feedback. Despite the importance of formative feedback practices in Physical Sciences teaching and learning and their impact on learners'

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learning, Florez and Sammons (2013) argue that there is limited research on evidence-based formative feedback practices, leading to a limited understanding of what type of formative feedback is most effective in different contexts.

In the South African education sector, there is a current reform that demands the facilitation of high-quality formative assessment and feedback practices (Department of Basic Education, 2011). Therefore, it is necessary to gain a better understanding of how to effectively implement formative feedback (Nicol et al., 2014). Based on the existing literature, the principles of effective teaching and learning of sciences are clear (Miller et al., 2021). However, current research is still limited when it comes to identifying the most effective formative feedback practices (Nelson & Shunn, 2009). This study aims to address the question of how teachers enact or implement formative feedback in Physical Science classrooms, as well as explore the role of formative feedback in Grade 10 Physical Sciences teaching and learning. It will examine different approaches to implementing formative feedback in order to enhance learners' scientific and conceptual understanding while also considering the challenges that Physical Science teachers encounter during this process.

2. Literature Review

Scholars Bound and Falchivok (2006) state that formative feedback aims to facilitate learning and provide information to enable learners to be more effective and close any existing gaps in their learning. In agreement, Hattie (2009) defines feedback as information about the existing "gap" between the actual level and the reference level of performance, emphasising that information is considered feedback if it alters the gap. Building on an earlier study by Sadler (1989), Florenz and Sammon (2013) describe formative assessment as informative and descriptive. The former refers to formative feedback without any references to specific criteria or commentary, while the latter refers to specific information provided through written comments or verbal conversations with learners during instruction, helping them understand what they need to know to improve.

Several research studies have systematically investigated the implementation of formative feedback in science classrooms (Dini et al., 2020). Hattie and Timperly (2008) identify three different conceptualisations of formative feedback: as a product, as a consequence of performance, and as an aspect of one's performance or understanding. It is important to note that although the teaching and learning of Physical Science have shifted towards a learner-centred approach in schools, Nicol and MacFarlane-Dick (2006) indicate that the approaches to formative feedback have remained unchanged and continue to focus on imparting perspectives guided by narrow conceptions of its purpose (Beaumont et al., 2011). Despite the initial claims about the importance and value of formative feedback in enhancing learners' academic achievements (Hattie & Timperly, 2008) within the education context, there has been little progress in improving the quality of formative feedback practices in the classroom. Floden (2017) highlights that the integration of formative feedback in teaching and learning has been recognised from national and international perspectives. Unfortunately, the quality of formative feedback in teaching and learning in Physical Science remains a major concern (Ajani, 2018). For instance, a study by Yan et al. (2021) revealed that formative feedback quality in teaching and learning consistently receives the lowest student satisfaction. Although the concept of *quality* has not been completely denied in the report, students expressed a strong desire for it and placed significant emphasis on it (Yang & Carless, 2013).

2.1 **Pedagogical challenges Physical Science teachers face in formative feedback**

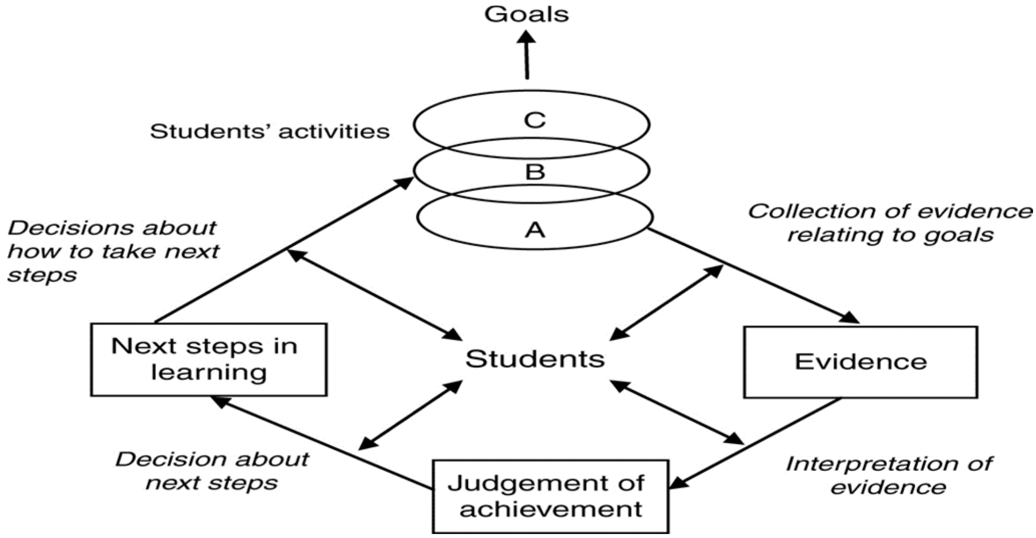
Despite the well-documented benefits of formative feedback in pedagogy, teachers face numerous challenges when incorporating it into their science classrooms. These challenges include overcrowded classrooms, lack of physical and material resources, suitability of support materials for learners and teachers, and the language used for learning and teaching (Black & Wiliam, 2011). Nakubugo (2008) argues that when teachers plan to use written formative feedback in large classes, they tend to reduce the number of activities and exercises to lessen their marking load, which compromises the sustainable use of written formative feedback. Nakubugo (2008) further explains that even if teachers intend to provide oral formative feedback in large classes, limited space hinders their ability to move around and conduct small group discussions that could enhance effective and timely coverage of content for learners.

Taking a pragmatic standpoint, Okongo et al. (2015) recommend that teachers be provided with resources to ensure the implementation of relevant and sufficient formative feedback without any hindrances, thus informing learners about their learning. Furthermore, the lack of resources affects the equity of formative feedback, as learners from disadvantaged backgrounds may receive less feedback compared to their peers due to disparities in resources, exacerbating achievement gaps. Another challenge in incorporating formative feedback is the language used for learning and teaching (LoLT). For example, Yore and Treagust (2006) identified three language-related challenges: home language, instructional language, and science language. Learners bring their home languages into science classes, and science teachers are expected to support learners in transitioning from their home language to the instructional language and science language. This poses a significant challenge for Physical Sciences teachers in implementing assessment and providing formative feedback within the context of science teaching and learning.

3. Theoretical Framework

The study is underpinned by the Assessment for Formative Purpose Cycle (AFPC) proposed by Herlen (2006). This theory is relevant to this paper because Irons and Elkington (2021) suggest that feedback not only supports learning but also promotes inclusion, communication, partnership, and the development of both teachers and students. The AFPC begins with a clear identification and understanding of the learning goals to be achieved. Learners then engage in activities to reach these goals. The outcomes of these activities serve as evidence for learning and are analysed to identify any gaps in learners' understanding. Based on this analysis, decisions are made on how to support learners in their learning journey. Figure 1 illustrates the theoretical framework adopted in this paper, and a brief explanation follows thereafter.

***Figure 1**: Assessment for Formative Purposes Cycle (Harlen, 2006)*



Formative feedback, as an essential aspect of formative assessment, can be described as an ongoing cyclic process in classroom practice, as depicted in Figure 1 above. This process involves gathering information on learners' progress towards the short-term goals of the lesson. The information collected is then used to determine the appropriate next steps for the learners and the actions required to take those steps. However, it is crucial to note that learners are ultimately responsible for their own learning. Therefore, the feedback learners receive on improving their understanding or skills pertaining to the specific concepts presented to them is key in classroom activities. According to Lamberg et al. (2020), formative assessment assists teachers in making effective instructional decisions to support learners. Simultaneously, the information gathered about learners' progress provides feedback to the teacher, enabling them to adjust the pace of teaching and learning or modify the teaching approach to optimise opportunities for learning. Learners, too, can play a vital role in decision-making regarding their learning and direct their efforts more effectively if they understand the purpose of the activities presented to them. Ultimately, it is not only about knowing what to do but also about understanding the desired quality and learning goals to be achieved.

4. Research Methodology

This paper employed a phenomenological research design rooted in the interpretive qualitative paradigm as a mode of inquiry. The phenomenological approach is suitable for this paper because participants' lived experience in teaching Physical sciences was the focus. Twelve urban township schools were selected as research sites. Qualitative data for this paper were generated through semi-structured focus group interviews and non-participant classroom observations. A few closed questions were asked to collect background and demographic information from the participants, such as their highest qualifications and teaching experience. However, the focus group interview questions were open-ended to allow participants to freely respond and share their experiences. After obtaining permission from the Department of Basic Education (DBE) and school principals to act as gatekeepers and explain our research procedure, we gathered 12 Grade 10 Physical Science teachers from 12 randomly chosen schools from Inkosi Sambane Circuit Schools, under UMkhanyakude District, KwaZulu-Natal, South Africa and divided them into three groups of four. Purposive sampling was used to select the teachers as participants, and they signed consent forms guaranteeing privacy and confidentiality. The Physical Science teachers were chosen as the relevant and information-rich participants to respond to the research question. The teachers were grouped based on the proximity of their schools. Each group interview lasted approximately one hour. Researchers also utilised non-participant classroom observation as an additional data collection method in the 12 schools that served as our research sites. In each school, one Grade 10 Physical Sciences lesson was observed to explore how each Physical Sciences teacher incorporates formative feedback into their classroom practice. Non-participant classroom observation was used by researchers to support the data gathered during the semi-structured focus group interviews with evidence of the actual teaching practices adopted by the teachers.

The data were analysed using thematic analysis, following the guidelines of Braun and Clarke (2006). Nhlumayo (2016) suggests that in qualitative research, thematic analysis helps to reinforce the study's focus, making it appropriate for this paper as it prevents the analysis from straying and strengthens the focus. To generate themes, we coded by identifying common findings from participants' responses in the semi-structured interviews and then corroborated those findings with the data collected from classroom observations.

5. Presentation of Data

The study sampled twelve (12) Grade 10 Physical Sciences teachers from 12 randomly selected schools in one township in KwaZulu-Natal. It is important to mention that pseudonyms were used to identify the participants in this study. T1 to T12 refers to Physical Sciences teachers 1 to 12. The demographic profile of the participants is provided in Table 1 below.

Table 1: *Demographic profile of participants*

Participant	Qualifications	Gender	School Quintile	Teaching Experience
T1	B.Ed.	Female	1	3 Years
T2	B.Ed.	Male	2	2 Years
T3	B.Ed. Honours	Female	2	9 Years
T4	BSc & PGCE	Female	3	7 Years
T5	B.Ed.	Female	1	4 Years
T6	B.Ed.	Male	2	5 Years
T7	B.Ed. Honours	Female	3	7 Years
T8	B.Ed.	Female	1	11 Years
T9	B.Ed.	Male	1	4 Years
T10	BSc & PGCE	Male	2	3 Years
T11	B.Ed.	Male	2	5 Years
T12	B.Ed.	Male	2	7 Years

Keys: B.Ed. = Bachelor of Education Degree, **BSc** = Bachelor of Science Degree, **PGCE** = Post Graduate Certificate in Education

After collecting the data, researchers organise it in a way that facilitates analysis. This involves transcribing interviews, categorising observations, or coding textual data. Through constant comparison and iterative analysis, researchers identify similarities and differences in the coded data. They check for recurring ideas, concepts, and experiences across the collected data. Throughout this process, researchers maintain reflexivity, acknowledging their biases and assumptions, and staying open to unexpected findings. Key findings that emerged from the study were clustered according to the themes that emerged during the data analysis. These themes include the nature of formative feedback in Physical Science classrooms, the challenges teachers face when implementing formative feedback in Physical Science classrooms, and the professional development needs for effectively and meaningfully implementing formative feedback in the science classroom. Verbatim quotes from participants represent the individual voices of the participants in the focus groups, and the findings from the classroom observations enhance the data.

5.1 **The nature of formative feedback in Physical Sciences classroom**

When asked about the types of formative feedback that Physical Science teachers give to their learners during class, the data revealed that participants utilise a variety of feedback methods. These methods aid learners in developing a deeper understanding of the subject. Here is how they responded:

> *I usually use small group discussions and peer assessments as these strategies help my learners understand certain concepts better when explaining among themselves.* **T7**
>
> *I use concept maps or else flow diagrams depending on the nature of the concept I am presenting.* **T2**
>
> *I use questioning; I don't allow them to raise their hands; instead, I do random pointing.* **T1**
>
> *We revise previous question papers.* **T4**
>
> *I used to refer to the exam guidelines and question papers from other provinces.* **T9**
>
> *I write corrections on the board, and learners mark their work with a pencil.* **T4**
>
> *I provide detailed comments on learners' activities as feedback.* **T3**

These data show that participants have a broad understanding of strategies for implementing feedback that is intended to help learners improve their knowledge of physical sciences and ultimately enhance their academic performance. The variety of formative feedback implemented by the participants aligns with King's (2023) assertion that different approaches to formative assessment can effectively support student learning. According to Pinto (2022), each formative assessment has the potential to serve as a valuable tool for assessing learners' current abilities and tracking their progress in each subject. Therefore, the range of Physical Science assessments used in participants' classrooms can have an impact on student performance. This highlights the role of formative assessment in classroom practice, which involves measuring student progress, identifying their needs during the learning process, and responding to those needs. Classroom observations revealed that participants implemented formative assessments in various ways. It is important to note that the strategies employed by participants in the classroom had the potential to support teaching and learning, which is the ultimate goal of formative assessment (Schildkamp et al., 2020). It became evident that these practices by participants involved innovative strategies to support learners and enable them to self-regulate their learning in physical sciences.

5.2 Challenges Physical Science teachers face when enacting formative feedback

The data revealed numerous challenges that participants faced when implementing formative feedback in the Physical Sciences classroom. Some of these challenges include a shortage of materials and resources required for Physical Science lessons, as well as difficulties with using the language of learning and teaching (LOLT). This section will present the participants' perspective on the lack of resources in the Physical Science classroom.

> *Formative feedback sometimes becomes a challenge to integrate due to the lack of resources; for instance, at some point, we are forced to teach practically in a theory form because of insufficient resources and chemicals.* **T12**
>
> *Resources are the challenge, but we must improvise by using the materials we normally use in our homes, such as potassium per magnate and glycerine.* **T6**
>
> *We need science laboratories.* **T12**
>
> *Here, we improvise by using materials from our homes, such as glycerine and potassium permanganate, so that learners can do practicals and understand reactions other than teaching reactions with theory.* **T10**
>
> *Since resources are a challenge, we then tend to ignore experiments and practicals in Science.* **T6**

According to the Curriculum and Assessment Policy (CAPS), schools must use science laboratories and laboratory chemicals to conduct experiments for learners (Department of Basic Education, 2011). However, the research conducted on schools revealed a lack of resources, making it challenging to implement formative feedback. On the other hand, having science laboratories available makes science lessons more engaging and helps improve learner achievement (Obo et al., 2023). However, the lack of instructional materials negatively impacts the learning and assessment processes (Mngomezulu et al., 2022). It was observed that eight of the visited schools did not have science laboratories, and teachers had to rely on improvisation to expose learners to science materials.

The use of learners' main languages was found to be a powerful means for learners to explore their ideas. This view is from Rollnick and Rutherford's (1996) study of science classrooms in Swaziland. When asked about the language of learning and teaching in the Physical Sciences classroom, the data revealed that this was another challenge participants experienced. This is what they said:

> *I normally use English as a medium of instruction; however, I sometimes explain other concepts in IsiZulu because they understand better since it is their mother tongue.* **T7**
>
> *Although code-switching in science teaching is not acceptable, the reason behind using the home language at other times is that my learners can do formative assessments.* **T8**

> *Sometimes, I do explain certain concepts in IsiZulu because they understand better in their mother tongue, although assessments are administered in English.* **T3**

During classroom observations, it was noticed that many Physical Sciences teachers code-switched while giving formative feedback. Participants frequently used IsiZulu out of habit and comfort without contributing to further explanation or the comprehension of scientific and conceptual concepts by the students. Ticheloven et al. (2019) argue that learners who are not fluent in the language of instruction often lack support from teachers. Busch (2016) suggests that adjustments should be made when assessing learners for whom English is a second language. The author also emphasises the importance of utilising a variety of authentic feedback strategies, such as pictures, posters, portfolios, oral responses, and self-assessment. According to Busch (2016), these strategies effectively evaluate learners' scientific and conceptual knowledge development and can be used alongside formative assessment. This intervention may be beneficial for struggling learners.

5.3 Physical science teachers' professional development needs

Extracts from the data highlight the necessity for professional development among physical sciences teachers to enhance the implementation of formative feedback in their classrooms. Investing in the professional development of teachers is a proven method to enhance students' learning. This development necessitates teachers to consistently learn and acquire new expertise in their teaching practice. When participants were questioned about their experiences and beliefs regarding formative assessment in the implementation of physical science, their responses were as follows:

> *The department organises workshops and cluster meetings, mainly focusing on summative assessment. Although we attend those workshops and cluster meetings, they last less than an hour and do not consider teachers' professional development needs.* **T4**

> *I am still determining what formative assessment is, but I think it is about assessing learners to understand difficult science concepts.* **T6**

> *Most of the time, I rely on textbooks to give me the tasks I can set for learners as formative assessments because I am still determining what I should do.* **T4**

> *I revise with my learners and have question and answer sessions with them before and after presenting new information, I wonder if that is regarded as formative assessment.* **T2**

> *I understand that formative assessment does not require me to allocate marks to learners, but it helps me to track their performance in the subject because we do it every time after class, as feedback, and after every assessment so that they also can check their performance.* **T11**

The participants' statements indicate a need for professional development for physical science teachers to effectively use formative assessment and continuously benefit learners. Participants need to have a broader understanding of formative assessment, which should encompass assignments, tests, questioning, and informal tasks to be implemented during lessons. This highlights the need for capacity building by the DBE to ensure effective and meaningful utilisation of formative feedback. The highlighted professional development should include providing appropriate training on enacting formative feedback, offering opportunities to demystify the use of inquiry-based learning, and providing suitable training on integrating improvised resources into physical science teaching and learning. Physical science teachers expressed dissatisfaction with the structure and purpose of professional development interventions implemented by the DBE, as illustrated in the following excerpt.

> *Some of us still need to be taught how to use formative feedback effectively because, although we do it, we are still determining whether we are doing the right thing.* **T12**

These observations are consistent with Ajani's (2018) view, which suggests that certain professional development programs hinder the effectiveness of teachers. Professional development can enhance teachers' knowledge and skills, thereby improving their content and pedagogical knowledge in the field of physical sciences. This, in turn, enables them to provide effective and efficient formative feedback. When implementing formative assessment, professionally developed teachers are better equipped to encourage learner inquiry and cooperative learning among their students (Cimer, 2007).

6. Discussion of the Findings

Formative feedback in the teaching and learning of Physical Sciences should be precise, well-timed, and supportive of student learning. The objective of formative feedback is to assist learners in becoming self-regulated learners (Rubner & Saunders, 2014). However, the findings of this study uncovered varying understandings among teachers regarding the definition and purpose of formative feedback. The study also revealed that formative feedback can be given verbally or in written form and can be utilised before, during, and after a lesson. These findings align with the idea that formative feedback can be implemented in diverse ways within different teaching contexts (Daly et al., 2010). Furthermore, the study emphasised the importance of offering constructive and detailed formative feedback in order to create a positive and effective science classroom environment that fosters productive learning and improved outcomes in physical sciences. Additionally, formative feedback was shown to have a positive impact on classroom communication, student engagement, and academic achievement in the subject. While there is a general acceptance of the role of formative feedback in teaching and learning, there is also a lack of a comprehensive program that supports the theoretical and practical foundations of the formative assessment process. According to Smith and Gorard (2010), the absence of such a program may raise concerns about the effectiveness of the current assessment system in terms of student performance, leading educational departments to consider reevaluating the nature of continuous assessment as formative rather than summative. In light of this, Mackintosh-Franklin (2021) suggests that formative assessment be formally and regularly incorporated into the assessment practices of all subjects in order to transform and support learning.

The study revealed challenges that physical science teachers faced when conducting formative assessments during lessons. One challenge was the lack of materials and resources for Physical Science lessons. The research was conducted in township schools that were not located in high-poverty areas. However, many of these schools still lacked the necessary science facilities and equipment to support physical science learning. The absence of these materials seemed to compromise the quality of feedback provided to learners. Maffea (2020) argues that in schools like these, teachers have to improvise in order to make learning meaningful. Shepard, Penuel, and Pellegrino (2018) suggest that in schools where a lack of resources hinders the provision of quality education through formative feedback, a well-planned collaborative approach between education departments and external partners can establish a coherent instructional practice system that aligns with teachers' assessment programs. Another challenge identified in the findings was the use of language during formative feedback sessions. It was observed that teachers use the learners' native languages to facilitate formative feedback in order to make it more comprehensible. While Physical Sciences teachers displayed enthusiasm for using formative feedback as an innovative pedagogical tool to enhance the teaching and learning of Physical Sciences, the integration of high-quality formative feedback is hindered by critical factors such as the lack and inaccessibility of instructional resources and language barriers. The AFPC suggests that physical science teachers provide feedback to learners through formative assessment to adjust ongoing teaching and learning and enhance learners' achievements towards instructional goals. However, contextual factors such as overcrowded classrooms in township schools have a negative impact on the provision of constructive formative feedback as well as the development of learners' self-regulation skills. Additionally, a range of contextual factors has been identified that make it more challenging for Physical Science teachers and learners to fulfil their roles when integrating formative feedback in the science classroom.

It became evident from the data that physical science teachers were in need of professional development. Teachers expressed that they were implementing methods they believed aligned with the concept of formative assessment. However, this practice clearly indicated that teachers required a deeper understanding of formative assessment, highlighting the need for professional development. In their study on ways to enhance teaching methods, Olimov and Mamurova (2022) stress the importance of teachers not only imparting theoretical knowledge and practical skills, but also preparing learners for independent learning. This necessitates skilled and professionally developed teachers who can assist learners effectively. Proficiency in using formative feedback to improve teaching and learning is an essential skill for every physical sciences teacher. Consequently, Leahy and Lyon (2005) argue that assessment is not a one-sided process, but rather involves both teachers and learners through activities that enhance teaching and learning. This further underscores the need for professional development in order to effectively employ high-quality formative assessment techniques. Therefore, the main obstacle to achieving this key strategic imperative is primarily the insufficient professional competencies of teachers in implementing formative feedback in the classroom.

7. Conclusion and Recommendations

This paper aims to explore the role of formative feedback in teaching and learning, with a focus on the perspectives of Grade 10 Physical Sciences Teachers. Based on the findings from literature and data, it is evident that formative feedback is crucial for enhancing learner outcomes in Physical Sciences. However, there are numerous challenges that hinder its implementation, such as the lack of resources and facilities, such as science laboratories and laboratory chemicals for conducting science experiments, as well as the use of instructional language for teaching Physical Sciences. One strategy to address the issue of inconsistent implementation of formative feedback in Physical Sciences is to prioritise structured and ongoing professional development for teachers. Since the school is a learning organisation, it is essential for Physical Science teachers to actively participate in professional development activities that focus on improving their assessment methods in order to enhance academic performance.

Based on the conclusion, this study proposes the implementation of formative feedback to enhance learner achievement in Physical Science classrooms and recommends capacity-building through continuing professional development for Physical Science teachers. The study also recommends that the Department of Basic Education (DBE) should focus on building teacher capacity to effectively and meaningfully incorporate formative feedback in Physical Science classrooms. Additionally, it is recommended that the DBE provides relevant physical science resources and facilities to benefit both teachers and learners, thus making formative feedback a reality.

7.1 **Implications of the study and research practice**

Formative feedback can have practical implications for teaching Physical Sciences and future research. Firstly, this study enhances teaching practices in Physical Sciences by providing insights into how Grade 10 Physical Sciences teachers perceive and utilise formative feedback. Understanding their perspectives can inform the development of strategies and interventions to enhance the effectiveness of formative feedback practice in the classroom. Secondly, by understanding how teachers perceive and implement formative feedback, this study improves learners' learning. Teachers can better tailor feedback approaches to meet the needs of Grade 10 Physical Sciences learners, leading to improved engagement, motivation, and learning outcomes. Thirdly, the study's findings highlight that Grade 10 Physical Science teachers require additional support and training in delivering effective formative feedback. This can inform the design of professional development programs to enhance teachers' feedback practices and pedagogical skills.

The study can inspire further research into the role of formative feedback in teaching and learning across different subject areas and grade levels. Other researchers can explore how teachers' perspectives on formative feedback vary across contexts and cultures and investigate the impact of specific feedback interventions on learners' outcomes. Overall, this study contributes valuable knowledge to the field of education by shedding light on the importance of formative feedback in teaching and learning, particularly within the context of Grade 10 Physical Science teaching and learning.

8. Declarations

Authors contributions: Conceptualisation (H.M., T.F.M. & B.S.N.); Literature review (H.M., T.F.M. & B.S.N.); methodology (H.M., T.F.M. & B.S.N.); software (N/A); validation (B.S.N); formal analysis (H.M., T.F.M. & B.S.N.); investigation (H.M., T.F.M. & B.S.N.); data curation (H.M.) drafting and preparation (H.M., T.F.M. & B.S.N.); review and editing (H.M., T.F.M. & B.S.N.); supervision (B.S.N.); project administration (H.M.); funding acquisition (N/A). All authors have read and approved the published version of the article.

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