International Journal Of Humanities Education And Social Sciences ***(IJHESS)*** *E-ISSN:* **2808-1765**
Volume 5, Number 3, December 2025, *Page. 1364 – 1377*
Email : editorijhess@gmail.com

Constructivism: Traditionalist vs Constructivist Classrooms in Addressing Learner Misconceptions in Mathematical Literacy Measurement

Ngcobo Zanele Annatoria[1), Mulaudzi Lebohang Victoria[2)*]
[1,2)]University of KwaZulu Natal, School of Education, Department of Mathematics, KwaZulu Natal, South Africa

***Corresponding Author**
Email**: munyailebohang@gmail.com**

Abstract
This paper analyses how Constructivist teaching approaches address misconceptions in Measurement within Mathematical Literacy. Given the abstract nature of Measurement and its real-world applications, learners often struggle with common errors. This study explores strategies for improving measurement comprehension using Constructivist theory, which emphasises conceptual understanding, interactive learning, and student-centred inquiry. Employing an exploratory qualitative approach through theoretical analysis and document review, findings suggest that integrating real-world contexts, hands-on activities, and group work significantly enhances understanding. However, learners still face challenges in applying Measurement across diverse contexts. The study recommends incorporating Constructivist strategies such as real-world problem-solving, student inquiry, and interactive materials to make concepts more tangible. Ongoing scaffolding is essential to support continuous learning. In conclusion, adopting constructivist principles can transform Mathematical Literacy into a tool for equitable development, equipping learners to apply Measurement literacy to real-world challenges. By addressing systemic gaps in teacher training and resource allocation, South Africa can foster a generation capable of leveraging numeracy as a catalyst for socio-economic progress.

Keywords: Constructivist Classroom, Traditionalist Classroom, Mathematics Education, Measurement; Misconceptions.

INTRODUCTION

Addressing misconceptions is crucial for learner success, particularly in complex topics like Measurement. Mathematical Literacy varies globally, functioning either as a competency or a subject (Pillai et al., 2017). As a competency, it involves applying mathematical knowledge to real-world problems, as emphasised in PISA frameworks (OECD, 2019). In contrast, South Africa offers Mathematical Literacy as a subject, focusing on practical applications like financial mathematics and data handling (North, 2024). Misconceptions in this area can stem from a variety of factors, including the abstract nature of concepts, the relationship between units of Measurement, and the procedural understanding learners develop (Arnold et al., 2021). Research highlights that traditional teaching methods, such as rote memorization and repetitive problem-solving, are generally ineffective at eliminating these misconceptions, as they do not address the underlying faulty mental models or systems of belief that support them (Kurudirek et al., 2025). Instead, more effective strategies include constructivist approaches that focus on knowledge integration, conceptual education, and the use of visual aids and peer-supported learning, which help students reconstruct their understanding and address the root causes of misconceptions (Kurudirek et al., 2025; Sarwar et al., 2024; Stephens & Lazarus, 2024).

Targeted instructional strategies, such as writing-to-learn assignments with peer review, critical thinking exercises, and diagnostic assessments, have also been shown to promote deeper conceptual understanding and facilitate the correction of misconceptions (Dellantonio & Pastore, 2020). Engaging students through preferred media, timely feedback, and explicit deconstruction of misconceptions further enhances learning outcomes (Stephens & Lazarus, 2024). Ultimately, developing teachers' pedagogical content knowledge and integrating conceptual change theories into instruction are vital for long-term success in addressing misconceptions (Dellantonio & Pastore, 2020). Hence, this article explores two pedagogical approaches, the traditionalist and constructivist classroom, and their effectiveness in addressing learners' misconceptions in Measurement. The study seeks to critically evaluate the challenges of traditionalist methods while highlighting the relevance of constructivist approaches in promoting deeper conceptual understanding.

RESEARCH METHODS

This study is grounded in the constructivist paradigm. Constructivism is appropriate as it emphasises how learners construct their understanding and knowledge through experiences and reflection (Schaffer, 2023; Yao et al., 2024). This aligns with the aim of the study, which is to explore how different classroom approaches (traditionalist vs. constructivist) address misconceptions in Measurement. The paradigm informs the study's approach, focusing on understanding the process of knowledge construction and how educational methods impact learning. The research design for this study is exploratory qualitative. An exploratory qualitative design is well-suited to this study because it allows for a deep, contextual exploration of how theoretical approaches, like Constructivism, can influence the correction of learner misconceptions (McKenna & Silbey, 2023). Qualitative research does not rely on numerical data but rather on rich, descriptive insights from texts and theoretical frameworks, making it an ideal fit for this research's non-participant document and literature analysis (McKenna & Silbey, 2023).

There were no participants in this study. The study did not collect data from individuals but focused entirely on analysing secondary data on existing educational theories and literature related to classroom practices and addressing misconceptions in Measurement. Since there were no participants, no selection of individuals was made. Data were collected through a document analysis process guided by the constructivist paradigm. Theoretical and empirical literature related to Measurement, Constructivism, traditionalist classrooms, and addressing misconceptions was reviewed and analysed. Data sources included journal articles and theoretical writings on educational approaches. Data collection occurred continuously throughout the research process as literature and documents were reviewed and synthesised.

The data collection process involved reviewing and analysing documents over approximately three months. This allowed ample time to gather diverse perspectives from various sources and integrate them into a comprehensive analysis. As the study did not involve human participants, no ethical clearance was required. However, ethical clearance was applied and granted by the Humanities and Social Sciences Research Ethics Committee (HSSREC). Standard ethical practices were followed, including proper citation and acknowledgement of all sources used in the document analysis. Ethical considerations around intellectual property and responsible scholarship were prioritised throughout the research. Data were analysed using the six steps of thematic analysis, as outlined by Braun and Clarke (2006), which was deemed useful in analysing how a constructivist approach can address learner misconceptions in Measurement. Below is figure (Figure 1) with an alignment of these steps with the study:

International Journal Of Humanities Education And Social Sciences ***(IJHESS)*** *E-ISSN:* **2808-1765**
Volume 5, Number 3, December 2025, *Page. 1364 – 1377*
Email : editorijhess@gmail.com

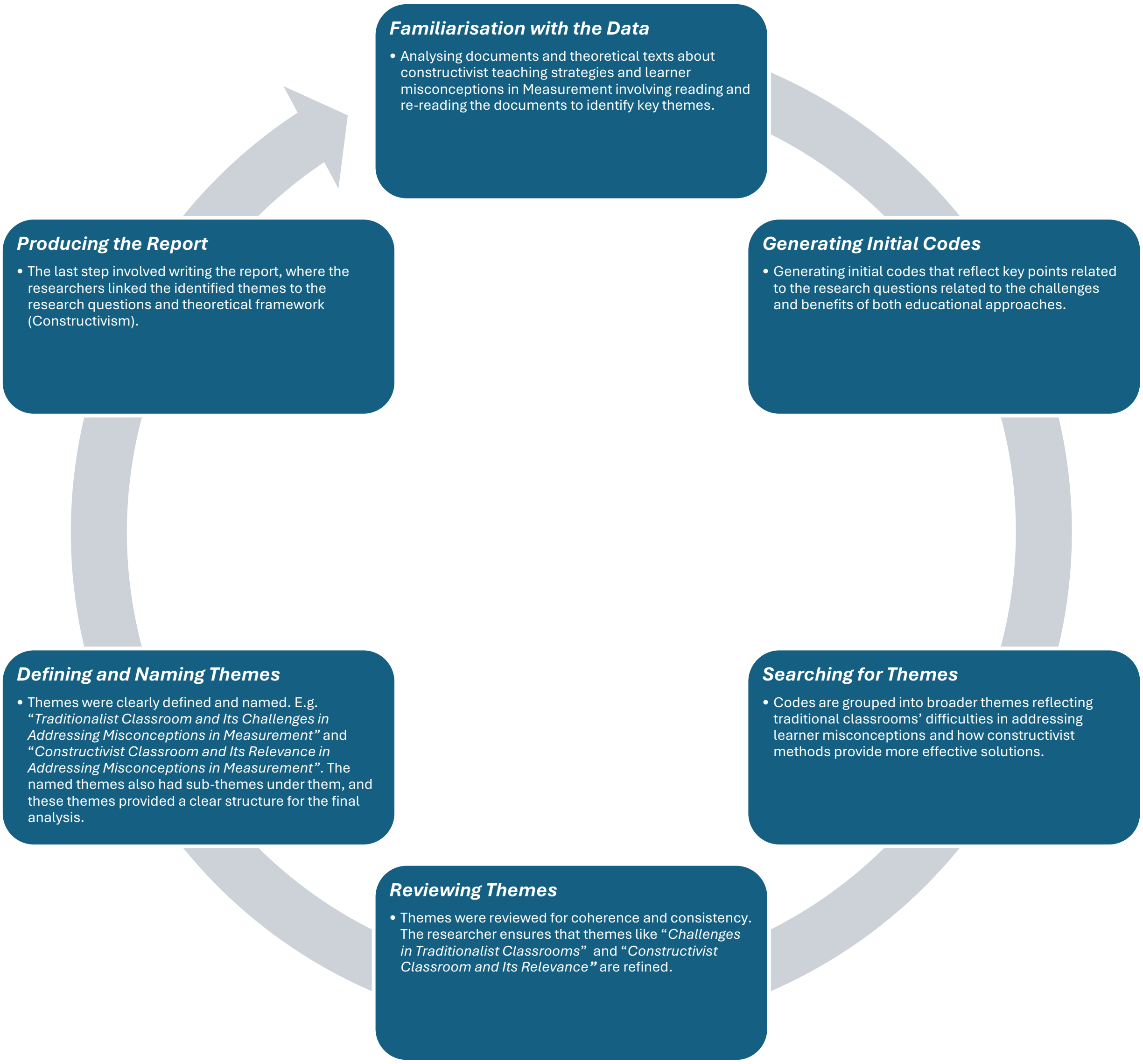

Figure 1: Alignment of Braun and Clarke's (2006) Thematic Analysis in the study

In addition to analysing data using a thematic analysis approach as applied in the steps above, aligning with the constructivist paradigm, a table below (Table 1) of the difference between the traditionalist and constructivist classrooms as adopted from Bada and Olusegun (2015:P.68-69) was also used in analysing the data.

Table 1: Difference between Traditional Classroom and Constructivist Classroom

Traditionalist classroom	Constructivist classroom
The curriculum begins with the parts of the whole. Emphasises basic skills.	The curriculum emphasises big concepts, beginning with the whole and expanding to include the parts.
Strict adherence to a fixed curriculum is highly valued.	The pursuit of student questions and interests is valued.
Materials are primarily textbooks and workbooks.	Materials include primary sources of material and manipulative materials.
Learning is based on repetition.	Learning is interactive, building on what the student already knows.
Teachers disseminate information to students; students are recipients of knowledge.	Teachers have a dialogue with students, helping students construct their own knowledge.

The teacher's role is directive and rooted in authority.	The teacher's role is interactive and rooted in negotiation.
Assessment is through testing correct answers.	Assessment includes student works, observations, and points of view, as well as tests. The process is as important as the product.
Knowledge is seen as inert.	Knowledge is seen as dynamic, ever-changing with our experiences.
Students work primarily alone.	Students work primarily in groups.

Adapted from Bada and Olusegun (2015:P.68-69)

Key themes were identified, such as the challenges of traditionalist classrooms and the effectiveness of constructivist methods in addressing misconceptions in Measurement. The analysis focused on comparing both approaches' theoretical perspectives and synthesising literature findings to answer the research questions. The thematic analysis allowed for a structured and comprehensive comparison of the two teaching approaches, highlighting the relevance of Constructivism in addressing learner errors and misconceptions.

RESULT AND DISCUSSION

Traditionalist Classroom and Its Challenges in Addressing Misconceptions in Measurement

Curriculum Focus on Parts of the Whole

In a traditionalist classroom, the curriculum is often divided into smaller, isolated parts, emphasising basic skills before addressing complex problems (Bada & Olusegun, 2015). While this approach may benefit foundational understanding, it does not necessarily facilitate the conceptual understanding needed to address measurement misconceptions. For instance, in Mathematics, learners must grasp the parts (e.g., specific measurement units) and the broader application (e.g., understanding Measurement in real-world contexts). A narrow focus on isolated skills might fail to address how errors in understanding units of Measurement or conversions affect overall problem-solving.

The focus on breaking the curriculum into smaller, isolated parts means that basic skills are taught sequentially, often without immediate connections to broader, real-world applications. While this method can help build foundational knowledge, it does not always promote holistic or conceptual understanding. For example, in the context of Measurement, learners might become proficient in using specific units or performing conversions (the parts) but may struggle to apply these skills in complex, real-world problem-solving scenarios (the whole). This approach poses educational challenges, particularly in Measurement, where it is crucial to understand the relationship between different units, concepts, and their applications. Learners may memorise processes or formulas but fail to understand why or how they are applied, leading to misconceptions.

For example, a student may know how to convert from one unit of Measurement to another but might not grasp the broader context of how these conversions impact the solution of real-world problems, such as calculating the area or volume of objects in various units. The narrow focus on isolated skills can result in learners retaining procedural knowledge (how to perform a task) without achieving conceptual clarity (why the task is done a certain way). This disconnect between skills and concepts can hinder problem-solving abilities, making it difficult for learners to recognise and correct errors related to Measurement, such as confusion between metric and imperial units or misunderstanding the logic behind formulas.

Strict Adherence to a Fixed Curriculum

In a traditional classroom, strict adherence to a fixed curriculum is highly valued (Bada & Olusegun, 2015), which can hinder flexibility in addressing learner errors and misconceptions. Teachers may not be free to deviate from the prescribed curriculum to focus on addressing common misconceptions in Measurement. For example, if students consistently confuse metric and imperial units, a rigid curriculum might not allow teachers the time or space to provide the remedial activities necessary for conceptual understanding.

The emphasis on strict adherence to a fixed curriculum in traditional classrooms introduces significant educational limitations, particularly when addressing learner misconceptions. Teachers often have to follow rigid guidelines, moving from one topic to the next without sufficient flexibility to focus on learner errors or misunderstandings. In Measurement, for example, if students consistently confuse metric and imperial units, a fixed curriculum may not allow the time or freedom necessary for in-depth remedial activities. This rigid structure prioritises content delivery over conceptual mastery, leaving gaps in learners' understanding throughout their education. The inability to deviate from the prescribed syllabus restricts teachers' ability to adapt instruction to student's needs, particularly when confronting persistent errors requiring additional exploration or revision.

Textbooks and Workbooks as Primary Materials

The reliance on textbooks and workbooks as the main instructional materials in a traditionalist setting limits opportunities for students to engage with practical, real-world applications of Measurement (Bada & Olusegun, 2015). Addressing errors in Measurement requires more than rote learning; it necessitates interaction with diverse, hands-on materials and tasks that simulate real-world problem-solving. Teachers in a traditional classroom may find it challenging to incorporate these elements within the confines of textbook-driven instruction, missing opportunities to correct learner misconceptions through meaningful engagement with authentic measurement tasks.

Textbooks and workbooks as the primary instructional materials further exacerbate this problem by offering limited opportunities for students to engage with real-world applications of Measurement. In traditionalist classrooms, the heavy reliance on these materials leads to rote learning rather than the experiential, hands-on approaches necessary for addressing errors in understanding. Learners may become proficient in answering textbook questions yet struggle to apply their knowledge to practical, real-life problems that involve Measurement. For example, while textbooks might provide numerous exercises on unit conversions, they often fail to contextualise why these are important in real-world scenarios, such as determining distances or calculating areas. The absence of practical engagement reduces opportunities for learners to confront and correct their misconceptions through meaningful application, leaving them with a superficial understanding of core concepts.

Learning Based on Repetition

While repetition is a common strategy in traditional classrooms, it may not be effective for addressing the underlying causes of learner misconceptions in Measurement (Bada & Olusegun, 2015). Research indicates that students frequently do not distinguish between random and systematic errors, believing that more measurements inherently yield better results without understanding the nature of accuracy and precision (Séré et al., 1993). As such, Sarwadi and Shahrill (2014) suggest that these errors and misconceptions stem from a lack of connection of prior knowledge, which leads to systematic errors that inhibit learning from mistakes. Therefore, repeating measurement tasks without addressing the conceptual misunderstandings behind learner errors can lead to superficial learning. For example, learners might correctly convert between units through repeated practice but may not fully understand why they are making certain conversions, leaving their misconceptions unaddressed.

Learning based on repetition, another hallmark of traditional education, tends to focus on repeated practice without addressing the deeper conceptual misunderstandings behind learner errors. While repetition can be useful for reinforcing skills, it is insufficient when learners have fundamental misconceptions. For instance, students might be able to convert units of Measurement through repeated drills correctly but fail to understand the reasoning behind the conversions. This results in learners who can perform tasks mechanically without genuinely grasping the underlying principles. The repetitive nature of traditional teaching thus reinforces procedural fluency. Still, it often neglects the need for conceptual clarity, making it difficult for learners to apply their knowledge in novel or complex situations.

Teachers Disseminating Knowledge

In the traditional model, teachers act as the primary source of knowledge, disseminating information for students to absorb (Bada & Olusegun, 2015). Klous and Wielaard (2016) and Naing et al. (2019) attest that teachers are portrayed in the classic passive education model as the knowledge owners who pose all the questions, and students are expected to do little more than copy and retain what they have learned. The instructor serves as the main conduit for knowledge transfer to passive student recipients in the traditional teacher-centred instruction paradigm. In contrast, critics such as Gupta (2011) of this method point to studies that suggest minimal learning occurs in such circumstances and stress the teacher's position as a facilitator of active student participation in the learning process.

This top-down approach limits opportunities for students to construct their understanding actively, which is essential for correcting misconceptions in Measurement. Addressing errors effectively requires learners to engage in activities that allow them to explore and reconstruct their knowledge, something that a traditionalist approach might not adequately support. In a teacher-centred approach, where the teacher is seen as the primary source of knowledge, the dissemination of information is largely one-directional. Students are expected to absorb content delivered by the teacher without actively constructing their understanding. This passive learning environment limits opportunities for learners to engage in discovery-based activities, which are essential for correcting misconceptions in Measurement. For example, a teacher may explain how to apply a formula for calculating area, but without allowing students to explore and question the reasoning behind it, their understanding remains surface-level. A more interactive, student-centred approach would encourage learners to actively participate in their learning process, leading to a deeper grasp of complex concepts like measurement conversions or spatial reasoning.

Directive Teacher Role

In a traditional classroom, the teacher's role is directive and rooted in authority, with limited opportunity for constructively scaffolding or guiding learners through their errors (Bada & Olusegun, 2015; Gupta, 2011; Klous & Wielaard, 2016; Naing et al., 2019). However, teachers must provide scaffolded support in addressing misconceptions in Measurement, allowing learners to progressively build their understanding through exploration and feedback, as outlined in Vygotsky's Zone of Proximal Development (ZPD). A directive approach may not provide the necessary guidance for learners to reconstruct their knowledge of complex measurement concepts.

The directive role of the teacher in traditional classrooms often means that learners are given instructions to follow without much guidance in scaffolding their understanding. This is a significant drawback when addressing measurement misconceptions, which often require more than direct instruction to resolve. In contrast, a constructivist approach, where teachers scaffold learning by providing incremental support as learners develop their understanding, aligns more effectively with the needs of learners struggling with complex concepts. The directive approach tends to overlook the benefits of exploratory learning, where students could benefit from gradually building their understanding of measurement concepts through guided discovery. Without such scaffolding, learners may rely on rote methods rather than developing the problem-solving skills to overcome misconceptions.

Assessment Focus on Correct Answers

Assessment in traditional classrooms is often based on correct answers, focusing on the product of learning rather than the process (Bada & Olusegun, 2015). Recent research highlights the need to shift from traditional product-focused assessment to more process-oriented approaches in education. Traditional classroom assessment often emphasises correct answers and summative evaluations, neglecting the learning process (Ahmad et al., 2020; Puad & Ashton, 2020). This approach can overlook the conceptual understanding behind learners' responses, making identifying and addressing misconceptions difficult (Puad & Ashton, 2020). In the context of Mathematical Literacy, merely testing whether learners can solve measurement problems without investigating why they make certain errors misses the opportunity to provide remedial strategies for deep understanding.

The focus on assessment based on correct answers in traditional classrooms prioritises the end product of learning over the process itself. This approach can mask underlying misconceptions because it only evaluates whether students can arrive at the right answer, not whether they understand why their approach works (Ahmad et al., 2020). In Measurement, for instance, a student might arrive at the correct answer by following memorised procedures but might not comprehend the rationale behind unit conversions or the principles of geometric measurements. This surface-level assessment overlooks the opportunity to diagnose and remediate conceptual misunderstandings. In contrast, assessments focusing on understanding the thought process behind learners' answers could provide deeper insights into the misconceptions that must be addressed.

Knowledge as Inert

In traditionalist settings, knowledge is often seen as inert, something to be memorised and recalled rather than actively constructed (Bada & Olusegun, 2015; Klous & Wielaard, 2016; Naing et al., 2019). This can lead to learners retaining procedural knowledge of Measurement (e.g., how to apply formulas) but lacking the conceptual understanding needed to apply these skills to new, unfamiliar situations (Klous & Wielaard, 2016; Naing et al., 2019). For example, learners may know how to calculate the area of a rectangle but struggle to understand why the formula works, leaving room for persistent misconceptions.

The perception of knowledge as inert, to be memorised and recalled, further limits the potential for learners to engage with and apply their learning actively. Traditional classrooms often treat knowledge as a static entity, something to be absorbed and reproduced, rather than as something to be actively constructed and connected to other concepts. In the case of Measurement, learners may remember formulas for calculating area or volume. Still, they may not fully grasp their reasoning, leading to difficulties when faced with unfamiliar problems; without opportunities to explore the why and how behind these formulas, learners are likely to retain only procedural knowledge, leaving them vulnerable to errors when asked to apply their learning to new or complex situations.

Students Working Alone

Traditional classrooms often emphasise individual work, which limits opportunities for collaborative learning and peer interaction—key components of the social Constructivist approach to correcting errors (Bada & Olusegun, 2015; Kariippanon et al., 2019). Group activities, discussions, and peer collaboration are crucial for learners to confront their misconceptions and gain new insights from others. In Measurement, learners might benefit from group work that allows them to explain their thinking and reconstruct their understanding through dialogue and shared problem-solving.

The emphasis on students working alone in traditional settings restricts the opportunities for collaborative learning, which is essential for confronting and correcting misconceptions. Collaboration allows learners to articulate their thinking, receive peer feedback, and challenge their understanding through dialogue. In Measurement, group activities and peer interactions could help learners clarify their misconceptions, as explaining concepts to others often leads to deeper understanding. By isolating learners, traditional classrooms miss out on the benefits of social learning, where the exchange of ideas and problem-solving strategies among students can significantly enhance conceptual understanding.

Constructivist Classroom and Its Relevance in Addressing Misconceptions in Measurement

Curriculum Emphasises Big Concepts

In a Constructivist classroom, the curriculum begins with a focus on big concepts, starting with the whole and gradually expanding to include the parts (Bada & Olusegun, 2015). Research indicates that Constructivism is a learning theory that emphasises active knowledge construction by learners based on their experiences and reflections (Mugambi, 2018). In constructivist classrooms, teachers focus on big concepts to trigger students' curiosity and guide them in investigating topics (Mugambi, 2018). The curriculum encourages students to construct their understanding through interaction with the environment rather than passively receiving information (Mugambi, 2018). This approach is particularly beneficial in addressing learner misconceptions in Measurement. For example, rather than teaching units of measurement or conversion methods in isolation, teachers can present measurement problems within real-world contexts that learners can relate to. This holistic approach helps learners see how the parts (e.g., units of Measurement, conversions, formulas) fit into a larger framework, which can lead to a deeper understanding and correction of errors in measurement-related tasks.

Focusing on big concepts before addressing individual parts means that learners begin by understanding the broader context before delving into specific details. This implies a shift from traditional, fragmented teaching to a more holistic approach where learners see how different components of knowledge interrelate. In subjects like mathematics, this method is particularly effective in addressing misconceptions about Measurement. By situating measurement problems within real-world contexts, learners can make connections between abstract concepts (such as units or formulas) and practical applications. This deepens understanding and helps correct common errors in Measurement, such as misapplying units or failing to grasp the purpose of conversion methods.

Pursuit of Student Questions and Interests

In a Constructivist classroom, the pursuit of student questions and interests is highly valued (Bada & Olusegun, 2015). Zita (2021) concurs with Bada and Olusegun (2015) that Constructivist mathematics classroom activities require higher-order thinking, prior knowledge, and social interaction beyond discovery learning. This is essential for addressing misconceptions, as learners' questions often reveal areas of confusion or misunderstanding. In the context of Mathematical Literacy, encouraging students to ask questions about measurement concepts—such as why certain units are used or how formulas are derived—can lead to more meaningful engagement with the material. Teachers can use these questions as entry points to provide targeted remedial strategies that address specific misconceptions.

The emphasis on student questions in Constructivist classrooms underscores the importance of student engagement and inquiry-based learning (Zita, 2021). This approach encourages learners to explore areas of confusion, revealing misconceptions that might otherwise go unnoticed. By addressing learners' specific questions, teachers can develop more targeted remedial strategies to address gaps in understanding. In Mathematical Literacy, for instance, students asking about why particular units are used or how formulas are derived can provide crucial insights into their thinking processes. This approach promotes more personalised and meaningful learning, essential in correcting misunderstandings and fostering deeper comprehension.

Use of Primary Sources and Manipulative Materials

Constructivist classrooms employ various materials, including primary sources and manipulative materials, to help learners build on their prior knowledge (Bada & Olusegun, 2015;

Sarwadi & Shahrill, 2014; Zita, 2021). In the context of Measurement, using manipulatives—such as rulers, measuring tapes, and other tools—allows learners to engage with measurement concepts hands-on. This interactive engagement helps learners connect abstract mathematical concepts with tangible experiences, which is crucial for addressing misconceptions. For example, learners may better understand the difference between area and perimeter when physically measuring and comparing objects rather than relying solely on textbook explanations.

Using manipulatives in Constructivist classrooms allows learners to engage with abstract concepts in a hands-on, practical way. This reflects the value of experiential learning, where students connect theoretical knowledge with tangible experiences. In Measurement, providing learners with tools like rulers or measuring tapes enables them to physically interact with measurement concepts, making abstract ideas more concrete. This interactive approach helps clarify distinctions between concepts like area and perimeter, which are often a source of confusion. It demonstrates that active, experiential learning is key to overcoming misconceptions and promoting deeper understanding.

Learning Builds on What the Student Already Knows

In a Constructivist approach, learning is interactive and builds on the learner's existing knowledge (Bada & Olusegun, 2015). As such, teachers' awareness of the constructivist approach to learning is important because it involves active engagement, inquiry, problem-solving, and collaboration with others (Laskar & Bhattacharjee, 2022). Pricopie (2020) attests that building on the student's knowledge is essential. Constructivism in learning involves reflection, active construction, and intersubjective interpretation, with knowledge gained through reflection, past experiences, and cultural background. This is particularly relevant to addressing errors in Measurement, as learners often enter the classroom with pre-existing misconceptions. By tapping into what learners already know, teachers can identify the gaps and inaccuracies in their understanding of measurement concepts. For instance, if students incorrectly apply volume formulas, a teacher can guide them to revisit their prior knowledge of length and area and scaffold the learning process to bridge the gap to volume.

Constructivist education is grounded in the idea that learning is an active process that builds on the learner's prior knowledge. This has significant implications for addressing errors in Measurement, as learners often bring misconceptions into the classroom. By identifying and building on what students already know, teachers can bridge gaps in understanding. For example, if students struggle with volume calculations, teachers can scaffold learning by revisiting foundational concepts such as length and area. This approach emphasises the importance of recognising learners' pre-existing knowledge and using it as a foundation for correcting errors and advancing understanding.

Teacher as a Dialogue Partner

Rather than simply transmitting information, teachers in a Constructivist classroom engage in a dialogue with students, helping them construct their understanding (Bada & Olusegun, 2015). Constructivist-based teaching emphasises students' active role in creating knowledge through problem-solving, leading to better understanding, shifting the focus from passive listening and memorisation to active learning, experimenting, exploring, and discovering cause and effect relations among studied phenomena and objects (Thu & Thu, 2023). Hence, Constructivist teaching in mathematics is more successful than traditional methods, as students construct their knowledge and apply it to new situations (Banu & Mahmood, 2019).

This dialogue is essential for identifying and addressing misconceptions in Measurement. Through questioning, probing, and discussion, teachers can uncover why learners are making errors and guide them toward correcting their misunderstandings. For example, suppose learners struggle to understand why they must convert units in a real-world measurement task. In that case, the teacher can engage them in a conversation about the practical implications of unit conversion, fostering deeper understanding.

In a Constructivist classroom, the teacher is not just an instructor but a partner in dialogue. For education, this shifts the teacher's role from transmitting knowledge to facilitating understanding through interaction. In Measurement, for instance, a teacher might converse with students to explore why they struggle with unit conversion. This dialogical approach allows teachers to probe learners' thought processes, uncover misconceptions, and guide them toward correct conclusions. By fostering a two-way conversation, teachers can better understand and address the underlying causes of errors, leading to more effective remediation and deeper learning.

Teacher's Role is Interactive and Rooted in Negotiation

In a Constructivist classroom, the teacher's role is interactive and involves negotiation with learners (Bada & Olusegun, 2015). In the constructivist approach, knowledge is constructed by the learner under the active guidance of the teacher, with teachers playing different roles (Shakeela & Vijayalakshmi, 2023). Constructivist teaching methods, such as advanced requesting for elaboration, help students understand, recall, and apply essential information, concepts, skills and better application of concepts in real-life applications (Frita, 2021).

This is particularly important for remedial strategies, as teachers need to negotiate meaning with learners, helping them reconstruct their knowledge of Measurement. Instead of simply correcting errors, teachers work with students to explore the reasons behind their misconceptions, fostering a collaborative learning process. For example, a teacher might help learners who consistently calculate incorrect areas by engaging them in a discussion about their thought process and working together to rebuild the correct understanding.

Constructivist teaching involves negotiation between teacher and learner, emphasising collaboration in constructing knowledge. This has important educational implications, particularly in addressing misconceptions like Measurement. Rather than simply providing the correct answers, teachers work with students to reconstruct their understanding. For example, if a student consistently calculates incorrect areas, the teacher engages the learner in a discussion about their thought process, guiding them toward a more accurate understanding. This collaborative approach helps learners take ownership of their learning, fostering a deeper engagement with the material and a more thorough correction of errors.

Assessment Focus on Both Process and Product

In Constructivist classrooms, the assessment includes tests, student work, observations, and points of view (Bada & Olusegun, 2015; Frita, 2021; Shakeela & Vijayalakshmi, 2023). This approach values the learning process as much as the final product, which is essential for addressing misconceptions in Measurement. Rather than assessing whether learners can solve a measurement problem correctly, teachers can evaluate how learners arrive at their answers—whether their process shows misconceptions or incomplete understanding. For example, when learners make errors in calculating volume, a Constructivist approach to assessment would examine how they approach the problem, where their reasoning breaks down, and how they can be guided to a correct understanding.

Constructivist classrooms emphasise assessing the final answer and the process through which learners arrive at their conclusions. In education, this represents a shift from traditional assessment methods to more holistic evaluations focusing on understanding students' reasoning. In Measurement, a Constructivist assessment approach would look at how learners approach a volume problem, identifying where their reasoning breaks down. This focus on process and product enables teachers to diagnose misconceptions more effectively and provide tailored interventions rather than merely focusing on whether an answer is right or wrong.

Knowledge as Dynamic

In a Constructivist classroom, knowledge is seen as dynamic and ever-changing, shaped by learners' experiences (Bada & Olusegun, 2015). Sharma (2020) concurs that Constructivist teaching and learning focus on process rather than product, engaging students through dynamic and interactive feeding of information, allowing them to comprehend themselves through past experiences. Similarly, Raturi (2023) agrees that human learning and knowledge are created via social interaction and shared experiences rather than passively transferring information. As such, in the classroom, the focus shifts from teacher to student, allowing students to use their abilities constructively and build meaning according to their understanding (Sumarna & Gunawan, 2022).

This view is particularly relevant for addressing misconceptions, as learners' understanding of Measurement is not static but evolves through interaction with new problems, experiences, and real-world contexts. Teachers can encourage learners to rethink and refine their understanding of measurement concepts, helping them move beyond their misconceptions and develop a more accurate and flexible understanding of how Measurement works in various contexts.

In a Constructivist framework, knowledge is viewed as dynamic and evolving, shaped by learners' experiences. For education, learners' understanding is never static; it grows as they interact with new information and contexts. In Measurement, this dynamic view allows students to continuously refine their understanding as they encounter new measurement tasks in real-world settings. Teachers can encourage students to revisit and rethink their misconceptions, helping them move toward a more flexible and accurate understanding of how measurement concepts apply in various situations. This approach fosters lifelong learning and adaptability in students.

Students Work Primarily in Groups

Group work is central to the Constructivist approach, allowing learners to collaborate, share ideas, and correct misconceptions (Bada & Olusegun, 2015). Research indicates that collaborative learning in group tasks supports active learning and engagement, as supported by key elements of constructivist learning environments (Lee & Yang, 2020). As such, collaborative learning supports complex and relevant learning environments and allows students ownership in learning (Taggart & Wheeler, 2023). Kraatz et al. (2020) concur that teacher scaffolding and existing student processes amplify one another, encouraging productive intellectual collaboration when social norms are present.

Collaborative learning environments are beneficial for addressing errors in Measurement because learners can observe their peers' reasoning, challenge each other's misunderstandings, and offer alternative solutions. For example, in a group activity focused on calculating area or volume, students who hold misconceptions can learn from others who approach the problem differently, providing an opportunity for peer-assisted learning and conceptual clarification.

Group work is central to Constructivist learning, emphasising collaboration and peer-assisted learning. In education, this approach highlights the importance of social interaction in correcting misconceptions and building knowledge. In the context of Measurement, group activities allow students to share ideas, challenge each other's misunderstandings, and explore alternative problem-solving strategies. For example, when calculating area or volume, students with misconceptions can learn from their peers who might have a different or more accurate approach. This collaborative learning environment not only helps correct individual errors but also promotes the development of collective problem-solving skills and a deeper understanding of mathematical concepts.

CONCLUSION

This study has explored how the Constructivist approach can address learner misconceptions in Measurement. The research has demonstrated that the Constructivist method, which emphasises a learner-centred, inquiry-driven, and interactive classroom environment, offers significant potential for overcoming common errors and misunderstandings in

Measurement. By focusing on the holistic understanding of concepts, fostering dialogue, and using real-world contexts, the Constructivist approach enables learners to construct meaning from their prior knowledge, make connections between different mathematical ideas, and actively engage in problem-solving.

REFERENCES

Ahmad, S., Sultana, N., & Jamil, S. (2020). Behaviorism vs Constructivism: A Paradigm Shift from Traditional to Alternative Assessment Techniques. Journal of Applied Linguistics and Language Research, 7, 19-33. https://www.jallr.com/index.php/JALLR/article/view/1092/1261

Alali, R., & Wardat, Y. (2024). Innovative Teaching: Building Engagement, Critical Thinking, and Lifelong Learning Skills. *International Journal of Religion*. https://doi.org/10.61707/fdpxd919.

Arnold, J., Mühling, A., & Kremer, K. (2021). Exploring core ideas of procedural understanding in scientific inquiry using educational data mining. Research in Science & Technological Education, 41, 372 - 392. https://doi.org/10.1080/02635143.2021.1909552.

Bada, S. O., & Olusegun, S. (2015). Constructivism learning theory: A paradigm for teaching and learning. Journal of Research & Method in Education, 5(6), 66-70. https://doi.org/10.9790/7388-05616670

Banu, S. K. M., & Mahmood, S. M. (2019). Effect of Constructivist Teaching Approach on Students' Achievement in Mathematics at Secondary School Level. International Journal of Scientific Research in Science and Technology. https://doi.org/10.32628/ijsrst207220

Brau, B. (2020). Constructivism. United Nations peace operations and International Relations theory. https://doi.org/10.4135/9781483375519.n148.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative Research in Psychology, 3(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Dellantonio, S., & Pastore, L. (2020). Ignorance, misconceptions and critical thinking. *Synthese*, 198, 7473 - 7501. https://doi.org/10.1007/s11229-019-02529-7.

Gupta, S. (2011). Constructivism as a paradigm for teaching and learning. International Journal of Physical and Social Sciences, 1, 23-47. https://www.indianjournals.com/ijor.aspx?target=ijor:ijpss&volume=1&issue=1&article=002&type=pdf

Herman, C. (2022). Group Work that Works: Peer-Assisted Learning in Large Ensemble Classrooms. *Music Educators Journal*, 109, 52 - 59. https://doi.org/10.1177/00274321221115417.

Kariippanon, K. E., Cliff, D. P., Lancaster, S. J., Okely, A. D., & Parrish, A. M. (2019). Flexible learning spaces facilitate interaction, collaboration and behavioural engagement in secondary school. PloS one, 14(10), e0223607. https://doi.org/10.1371/journal.pone.0223607

Klous, S., & Wielaard, N. (2016). The Question Is More Important Than the Answer. In: We are Big Data. Atlantis Press, Paris. https://doi.org/10.2991/978-94-6239-183-3_8

Kraatz, E., Nagpal, M., Lin, T., Hsieh, M., Ha, S., Kim, S., & Shin, S. (2020). Teacher Scaffolding of Social and Intellectual Collaboration in Small Groups: A Comparative Case Study. Frontiers in Psychology, 11. https://doi.org/10.3389/fpsyg.2020.587058.

Kurudirek, A., Karim, B., Sarhang, D., & Tulqin, S. (2025). Math misconceptions: Mistakes, misunderstanding, and confusion. *Educenter : Jurnal Ilmiah Pendidikan*. https://doi.org/10.55904/educenter.v4i1.1322.

Laskar, A., & Bhattacharjee, S. (2022). Teachers awareness on constructivist approach in learning. International journal of health sciences. https://doi.org/10.53730/ijhs.v6ns1.5792.

Lee, W., & Yang, M. (2020). Effective collaborative learning from Chinese students' perspective: a qualitative study in a teacher-training course. Teaching in Higher Education, 28, 221 - 237. https://doi.org/10.1080/13562517.2020.1790517.

McKenna, M. P., & Silbey, J. (2023). *Chapter 16: A qualitative method for investigating design*. In Research Handbook on Empirical Studies in Intellectual Property Law. Cheltenham, UK: Edward Elgar Publishing. https://doi.org/10.4337/9781802206210.00026

Mugambi, M. M. (2018). Linking constructivism theory to classroom practice. International Journal of Humanities Social Sciences and Education, 5(9), 96-104. http://dx.doi.org/10.20431/2349-0381.0509014

Naing, C., Chellappan, D. K., Wong, S. F., Riegelman, A., & Whittaker, M. A. (2019). The effects of flipped classrooms to improve learning outcomes in undergraduate health professional education: A systematic review, 15(3) https://doi.org/10.1002/cl2.1041

Pricopie, V. (2020). Constructivism. In The SAGE International Encyclopedia of Mass Media and Society (Vol. 5, pp. 377-378). SAGE Publications, Inc., https://doi.org/10.4135/9781483375519

Puad, L. M. A. Z., & Ashton, K. (2020). Teachers' views on classroom-based assessment: an exploratory study at an Islamic boarding school in Indonesia. Asia Pacific Journal of Education, 41(2), 253–265. https://doi.org/10.1080/02188791.2020.1761775

Raturi, S. (2023). A Social Constructivist Approach to E-Learning: Methodologies and Challenges. BSSS Journal of Education. https://doi.org/10.51767/je1206.

Sarwadi, H. R. H., & Shahrill, M. (2014). Understanding students' mathematical errors and misconceptions: The case of year 11 repeating students. Mathematics Education Trends and Research, 2014(2014), 1-10. http://doi.org/10.5899/2014/metr-00051

Sarwar, M., Shahzad, A., Ullah, Z., Raza, S., Wasti, S., Shrahili, M., Elbatal, I., Kulsoom, S., Qaisar, S., & Nazar, M. (2024). Concept mapping and conceptual change texts: a constructivist approach to address the misconceptions in nanoscale science and technology. *Frontiers in Education*. https://doi.org/10.3389/feduc.2024.1339957.

Schaffer, F. C. (2023). Interpretivist Interviewing. in Janet M. Box-Steffensmeier, Dino P. Christenson, and Valeria Sinclair-Chapman (eds), Oxford Handbook of Engaged Methodological Pluralism in Political Science . https://doi.org/10.1093/oxfordhb/9780192868282.013.7

Séré, M., Journeaux, R., & Larcher, C. (1993). Learning the statistical analysis of measurement errors. International Journal of Science Education, 15(4), 427–438. https://doi.org/10.1080/0950069930150406

Shakeela, K., & Vijayalakshmi, N. (2023). Constructivism and diversified role of teachers and students in teaching and learning. i-manager's Journal on Educational Psychology. https://doi.org/10.26634/jpsy.17.1.19333.

Sharma, N. (2020). Constructivist Teaching and Learning. Bjedu, Jun.. https://doi.org/10.51767/JE0905.

Singh, C., Ong, E., & Singh, T. (2019). Redesigning Assessment for Holistic Learning. *The Journal of Social Sciences Research*. https://doi.org/10.32861/JSSR.53.620.625.

Stephens, G., & Lazarus, M. (2024). Anatomical MythBusters: An approach to addressing misconceptions in foundational sciences education. *Medical Education*, 58. https://doi.org/10.1111/medu.15514.

Sumarna, C., & Gunawan, H. (2022). Foundations of Constructivism Philosophy in Classroom Learning. International Journal of Science and Society. https://doi.org/10.54783/ijsoc.v4i3.499.

Taggart, J., & Wheeler, L. (2023). Collaborative learning as constructivist practice: An exploratory qualitative descriptive study of faculty approaches to student group work. Active Learning in Higher Education. https://doi.org/10.1177/14697874231193938.

Thu, H., & Thu, H. (2023). Applying constructivist theory in teaching mathematics at grade 2. International Journal of Education and Social Science Research. https://doi.org/10.37500/ijessr.2023.6219.

Vygotsky, L., & Cole, M. (2018). Lev Vygotsky: Learning and social Constructivism. Learning Theories for Early Years Practice. UK: SAGE Publications Inc, 68-73.

Vygotsky, L.S. (1978). Mind in society: The development of higher psychological processes (ed. by Cole M, John Steiner V, Scribner S & Souberman E). Cambridge: Harvard University Press

Yang, L., Huang, L., Wu, X., Xiong, J., Bao, L., & Xiao, Y. (2024). Assessment of preservice physics teachers' knowledge of student understanding of force and motion. *Physical Review Physics Education Research*. https://doi.org/10.1103/physrevphyseducres.20.010148.

Yao, A., Chan, N. and Yao, N. (2024). "Understanding consumer behavior in phygital environments: an interpretivist methodological framework", Qualitative Market Research, Vol. 27 No. 3, pp. 449–470. https://doi.org/10.1108/QMR-08-2023-0100

Zita, J., Aguilar, A. B., Arcilla, C., Domdom, E., Llorin, C. G., Malabanan, M., Reyes, A., Vargas, E. A., & Elipane, L. (2021). Encompassing Learner-Centered Activities through Lesson Study Towards a Constructivist Classroom. Turkish Journal of Computer and Mathematics Education, 12(10), 4247-4254. https://ezproxy.ufs.ac.za/scholarly-journals/encompassing-learner-centered-activities-through/docview/2628340897/se-2