

# The Role of Scaffolding Learning in Developing Mathematical Skills Among Low-Achieving Students at a Selected School in Zimbabwe.

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## ABSTRACT

This study examined the impact of scaffolding on the development of Mathematical skills among low-achieving Ordinary Level learners. Progress record books, mark schedule from the school where the study was carried out were consulted and proved that most learners performed below average in Mathematics. A qualitative study which employed an exploratory case study design was done, involving thirty learners from the selected school who were selected purposively using mark schedules to determine ability. The whole sample group received scaffolding support. Pre-and post-tests were administered to assess mathematical proficiency. Learners were grouped into six groups of five members to carry out focus groups on the method used in teaching. The findings suggest that scaffolding can be an effective strategy for enhancing mathematical proficiency among low-achieving learners. The results also indicated that learners in the study group demonstrated significant improvements in Mathematical skills, particularly in problem-solving and conceptual understanding. Analysis pointed out that basically scaffolding teaching and learning method encourages independence, helps learners gain and develop 21st century competencies such as critical thinking, creativity, collaboration and problem-solving skills. Scaffolding activities were found to allow learners to develop deep content knowledge, assist learners to be directly involved in making decisions about the topic and the investigations involved. Profound information suggested that scaffolding increases motivation to learn, engagement and participation of learners in Mathematics learning at Ordinary Level. Recommendations were made to parents, teachers and other stakeholders. It was suggested as a recommendation that parental involvement can also contribute to learner success and motivation. The study's implications for teaching practices and future research were discussed.

**Keywords:** Scaffolding; Mathematical Skill; Low-achieving Student; Developing

## INTRODUCTION

Mathematics is one of the most significant subjects which prepares learners for further studies in the field of Science, Technology Engineering and Mathematics (STEM) which involves the cognitive aspect of critical thinking, problem-solving, logical reasoning and analytical thinking. However, the way it is being taught especially for low-achievers does not guarantee a final product who has acquired, mastered and developed both conceptual and procedural mathematics as expected, (Van de-pol, Volman & Beishuizen, 2017). In the same vein, (Juran, 2020), opined that there is a gap or lack of developed mathematical competency among low-achieving learners at Ordinary Level. This gap could be an indication that there is a challenge in the mathematics teaching methods. Thus, the teaching methods being employed and the instructional materials used could be possible drivers of poor performance exhibited by learners in Mathematics among other factors which contribute to the learners perceived difficulty in the learning of Mathematics. (Barut, 2020), purported that the major contributors of challenges with teaching and learning of Mathematics at Ordinary Level relate to the teaching pedagogy. This implies that the teaching methodology in the Mathematics concepts should be improved, particularly for low-achievers.

The traditional way of teaching mathematics is failing to significantly contribute to good results on low-achievers and hence the need for mathematics teacher to explore other teaching and learning methodologies which assists

learners to grasp mathematical concepts stage by stage. There is need to explore methods that address conceptual development step by step so that these low-achievers are also incorporated in the teaching and learning of mathematics, methodologies which incorporates, teacher assistance as well as peer assistance in and outside the classroom environment. For instance, the scaffolding teaching methods, Peer-Assisted Learning, Project or Task-based, Ethno-mathematics, Realistic mathematics and Design-based teaching method. The use of these methods might positively change the current performance in the learning as learners might be motivated and enjoy doing teacher-guided and peer collaboration activities. With the educational reform for problem solving and critical thinking skills in the 21st century era, a large number of scholars are exploring a range of dynamic 21st century teaching and learning methodologies and are recommending the classroom practitioners to try new inquiry-based teaching and learning methods for relational understanding. Educators and other education personnel, therefore, play a crucial role in promoting and protecting learners' mental health and psychosocial well-being. Positive relationships with educators can ensure learners feel safe, seen, supported, and have a sense of belonging. Hence, this study intended to evaluate the role of scaffolding learning in developing mathematical skills among low-achieving students.

## BACKGROUND

Teaching and learning of mathematics is a global concern, with many countries facing challenges in improving student achievement in mathematics. The Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS) have consistently shown that many students worldwide struggle with Mathematics, with a significant proportion of students performing below expected levels. In European countries such as the United Kingdom, Germany, and France, researchers have identified similar challenges in Mathematics education. Studies have shown that low-achieving students in Mathematics often lack confidence, struggle with problem-solving and require additional support. In the United Kingdom (UK), research by (Gerdes, 2016) which focused on learners between the age of 16-19, affirms that the issue of teaching for understanding mathematical concepts to low-achievers is a dispute and a puzzle which has remained unsolved and need immediate attention.

Research by Belland, Walker, Kim & Lefler, (2017) supplement that in UK, the issue of low achievers remains an unsolved concern in the department of teaching and learning of mathematics at Ordinary level. In support to this, Palinscar, Flitzgerald, Marcum & Sherwood, (2018) in the UK exposed that the Programme for International Student Assessment (PISA) which compares the performance of learners showed that most learners are lagging behind in Mathematics proficiency. These researches reveal a gap in the teaching methods and styles in the learning of Geometrical transformations for relational understanding. Moreover, France Mathematics Education Conference held in Paris, (2021) revealed that new strategies need to be put in place to enhance the conceptual or relational understanding of Mathematics so that low-achievers are assisted. A proposal was staged that the teachers should use activity-based teaching methods so that learners are involved in the construction of their knowledge. There is need to explore hands-on learning methods as well as incorporating visuals as suggested by Vygotsky's Zone of Proximal Development (ZPD). The ZPD suggests that students should be assisted in the learning process through the stages of temporary support, gradual release of responsibility and adaptive support. More so, in Sub-Saharan countries the prevailing topic of low-achievers remains dominant in the domain of Mathematics literacy, (Reiser, 2014). Low-achieving learners in mathematics across Southern African contexts require immediate, targeted interventions that employ diverse active instructional methodologies to support the development of mathematical skills and conceptual understanding. Consequently, teachers should systematically investigate and implement evidence-based pedagogical approaches that enhance instructional effectiveness, increase student engagement, and promote measurable learning gains, (Naidoo & Hajaree, 2021). This imperative also calls for sustained professional development and reflective practice so that educators can refine strategies and adapt instruction to the needs of struggling learners.

In Africa, Mathematics faces unique challenges, including limited resources large class sizes and inadequate teacher training. Despite these challenges many African countries are working to improve Mathematics education. Research in countries such as South Africa, Kenya, and Ghana has highlighted the need for effective interventions to support low-achieving students in Mathematics, (Naidoo & Hajaree, (2021), Gobede & Masvold, (2022), Selepe & Mphahlele, (2025)). The Southern African Development Community (SADC) has recognized the importance of Mathematics education and has initiated regional programmes to improve Mathematics teaching and learning.

Zimbabwe faces the same persistent challenges in mathematics attainment observed across the region, and mathematics education is a national priority with coordinated efforts by government and educators to raise student performance. Despite these initiatives, a substantial proportion of learners continue to underperform, making low achievement in mathematics an ongoing concern that demands targeted policy and classroom responses. Evidence from Zimbabwean studies indicates that scaffolding is a promising instructional approach for improving mathematical understanding and achievement, (Mashingaidze (2015), Matunga (2024)). Implementing this strategy through sustained teacher professional development and curriculum-aligned classroom practices can help address gaps in conceptual knowledge and procedural fluency among struggling learners.

Mathematics is a foundational discipline that underpins STEM fields, financial literacy, and everyday problem solving. Despite its centrality, a substantial proportion of learners experience persistent difficulties in mathematics, and low achievement remains a widespread concern across educational systems. Although scaffolding has been investigated in diverse educational contexts, evidence regarding its efficacy specifically for low-achieving mathematics learners is still limited. This study examined the role of scaffolding in the development of mathematical skills among low-achieving learners, aiming to inform the design of evidence-based interventions that target conceptual understanding and procedural fluency. To generate meaningful and generalizable findings, the research employed rigorous methodologies and robust evaluation measures. Given the urgency of addressing underachievement, teachers and policymakers should prioritize timely implementation of validated instructional strategies to enhance learner motivation and improve mathematics outcomes.

Research by Mashingaidze (2015) indicates that Mathematics at the Ordinary Level in Zimbabwe is characterized by low pass rates; Zimbabwe Schools Examination Council (ZIMSEC) examiner reports for 2016–2022 document widespread underperformance among candidates. Matunga (2024) at Bindura University of Science Education identified the need for empirical evaluation of additional 21st-century inquiry-based pedagogies within the teaching–learning process. Consequently, the study recommends systematic testing of diverse instructional methodologies to examine how Zimbabwean mathematics teachers integrate ethno mathematical approaches into Ordinary Level mathematics instruction. These findings suggest that learners’ poor performance in mathematics may be attributed to ineffective instructional methodologies employed by teachers. Predominantly traditional approaches emphasize rote memorization of facts and procedures rather than the development of relational or conceptual understanding; as a result, students frequently fail to internalize the problem-solving processes and rapidly forget the steps required to construct valid solutions. This pedagogical shortcoming therefore impedes the acquisition of transferable skills necessary for addressing real-world problems.

At the focal school in Marondera, evidence of low achievement in mathematics was documented in departmental minutes and in teachers’ progress records, which systematically record test and exercise outcomes. Therefore, this study sought to examine strategies for supporting low-achieving learners. Identifying viable interventions for mathematics teaching and learning is necessary to promote measurable improvement in student outcomes. Related literature and international practice indicate that more substantive reforms are warranted across all grade levels in mathematics education. This observation underscores the need to evaluate whether prevailing instructional approaches remain appropriate in the context of the Fourth Industrial Revolution and whether they effectively promote conceptual understanding. Accordingly, pedagogical methods and instructional styles should be critically reviewed and revised to enhance learners’ mathematical competence and performance.

## LITERATURE REVIEW

### INTRODUCTION

World-wide, poor grades in Mathematics phenomenon has gained significant attention in the recent years. Ordinary level low-achievers learners face various challenges in trying to understand mathematical skills and competencies. This section, therefore, reviews related literature on various studies involving teaching methodologies in the teaching and learning of mathematics at different learning levels. By interrogating existing literature, this study aims to shed light on effective interventions that may result in positive and fruitful ways of teaching mathematics for relational understanding. (Arbarelo, 2014) suggests that students are able to construct

their own knowledge, reflect upon their learning using scaffolding. Scaffolding teaching and learning results in increased motivation and self-efficient, enhancement of creative thinking skills, promotes and provide student interaction, increases student retention, self-esteem and responsibility and promotes ethno mathematics. When afforded opportunities for independent exploration, learners are more likely to develop a deeper and more durable conceptual understanding.

### **Scaffolding: Benefits and challenges**

Scaffolding is generally viewed as an interactional process between a person with educational intentions and a learner, aiming to support this learner's learning process by giving appropriate and temporary help, (Van Oers, 2019). In mathematics education scaffolding entails the enactment of this purposive interaction for the learning of mathematical actions and problem solving strategies. Basir & Wijayanti, (2020), explain that scaffolding needs to build on what learners already know and be tied to continuous assessment of learners' abilities. As a result of this, in scaffolding teachers only tell the learners what to do and how to do it. Thus, according to Basir & Wijayanti, (2020), provision of scaffolding refers to assistance that is tailored to the needs of the learner.

Literature reveals that scaffolding is one of the key strategies for creating independent and critical thinkers. Scaffolding in education works very much as it provides a system of support for students to build their skills, first through demonstration and modelling, then through guided practice according to Vogel et. al (2017). Over time, students develop greater confidence and progressively complete tasks and retrieve knowledge independently, as guided opportunities provide a structured framework for constructing and consolidating understanding. As learners attain the intended levels of comprehension or mastery, instructors should systematically withdraw instructional support, thereby transferring responsibility for problem solving and learning to the students.

Chang & Linn (2013) argued that scaffolding encourages learners to challenge themselves in grasping new concepts within their Zone of Proximal Development leading to success in learning new concepts. Bulu & Pedasern (2016) supported this when they pointed that Instructional scaffolding is one of the great methods in assisting low-achievers in difficult subjects as it breaks larger concepts and skills into smaller, more manageable chunks of information which is easier to assimilate.

Furthermore, Wong, Boticki, Sun & Looi (2020), opined that scaffolding helps connect foundational knowledge to new concepts. This is aligned to (Walker, 2022) when he purports that scaffolding ensures foundational skills are solid before building on them further. Thus, scaffolding provides support to low-achievers so that they feel more confident trying new things building on existing information. Therefore, this means that scaffolding encourages more autonomy and independence in the classroom as practitioners gradually remove support in the process of their teaching.

Wong et. al (2020), further said scaffolding reduces students' feelings of frustration, confusion and negative self-perceptions in the classroom. This is in agreement with Matunga (2024) when he reiterated that scaffolding enables students to "fail productively" and to seek assistance. This observation suggests that scaffolding fosters deeper comprehension and improved retention by promoting inclusive classroom participation and by providing cognitive support that facilitate reasoning and information exchange. Thus, scaffolding contributes to the development of student confidence, even when tasks initially appear nearly insurmountable.

For educators scaffolding provides more formative assessment opportunities and improves communication between students and teachers according to Vogel et.al (2017). Swayer (2019) also added that scaffolding assists low-achievers in tracking their own progress and reducing student frustration by slowing the pace and supplying support tools for relational understanding to prevail.

Various literature concurs that unlike traditional methods that rely solely on a teacher's instruction, scaffolding puts students in active roles. Both students and teachers participate collaboratively in instructor-assigned activities, offering individual contributions and integrating the ideas of their peers (Belland 2016). The mutual exchange in scaffolding sharpens communication, critical thinking, and empathy and educators are now incorporating structured scaffolding into curricula across various age groups and disciplines according to Juran (2020). This implies that unlike passive learning models, scaffolding learning promotes critical thinking,

discussion, and deeper comprehension. When students engage in scaffolding tasks or projects, they teach each other and also reinforce their understanding while helping others grasp difficult concepts in relatable, accessible ways. It is a process that naturally supports cognitive development. This means students review materials together, they reinforce their understanding by teaching one another. By explaining complex topics in their own words, learners are able to solidify knowledge and highlight any gaps in comprehension. Collaborative tasks benefit significantly from scaffolding teaching and learning.

Beyond academics, collaborative scaffolding teaching and learning builds essential life skills. According to Chang (2013) it enhances communication, teamwork, empathy, and leadership qualities that are vital in both education and the workplace. Researchers also retain that students become more confident, collaborative, and capable of expressing their ideas clearly. In virtual environments, collaborative scaffolding keeps students socially connected. It also reduces feelings of isolation by creating supportive digital learning communities. Scaffolding teaching and learning fosters cultural exchange, builds mutual respect, and encourages inclusion. It allows students to learn from different perspectives and develop empathy.

Teachers also benefit from peer scaffolding teaching and learning by shifting into a facilitator role, guiding rather than directing. This is supported by Pear (2016) as he retains that peer scaffolding allows for more personalized support and encourages independent learning leaving teachers as facilitators guiding the learning process. In essence, according to Palinscar et. al (2018), scaffolding teaching and learning in education, particularly, peer scaffolding nurtures a supportive, student-driven environment that cultivates academic growth and real-world readiness. The literature suggests that scaffolding teaching and learning is a versatile instructional strategy that can be integrated into many educational settings and learning stages as it works exceptionally well when used intentionally to enhance comprehension, collaboration, and engagement among students.

According to Bulu & Pedasern (2016), scaffolding help low-achievers increase their academic confidence and boost student's resilience as it enhances collaborative learning through peer assistance. After the guidance of the teacher students bring diverse ideas and strengths to the table, allowing for richer discussions and better problem-solving outcomes. Peers often explain concepts in more relatable terms than teachers, making it easier for learners who need additional help to grasp difficult topics.

However, according to Palinscar et.al (2018) students may become overly reliant on scaffolding tools if the instructor does not remove them gradually and appropriately. Walker (2022), also pointed out that some students may be bored with the slower pacing of scaffolding and ready to move on before their peers. The literature suggests that it takes skill and practice to learn to recognize when students are ready for scaffolding to be removed so they can work independently as removing scaffolding too soon can break down the confidence students have built over time. This also suggests that if teachers are new to scaffolding, implementing the strategy into practice can be challenging or time consuming.

With regards to reviewed literature, it is evident that educators need to explore scaffolding teaching method for the benefit of low-achievers in developing mathematical skills. For this reason, this study sought to gain an in-depth understanding.

### **The following research questions guided the study:**

- I. How do scaffolding strategies improve mathematical skills among low-achieving students?
- II. What types of scaffolding strategies are most effective in developing mathematical skills among low-achieving students?
- III. How do scaffolding strategies impact learners' engagement and motivation in mathematics among low-achievers?

## **METHODS**

### **Research paradigm, approach and design**

The study was grounded in an interpretivist philosophical paradigm, which posits that social reality is constructed through the meanings and interactions of participants. Under this orientation, the research sought to understand how scaffolding practices are experienced and enacted in classroom contexts, privileging

participants' perspectives rather than testing causal laws. Framing the inquiry interpretively enabled the researchers to explore the nuanced, context-dependent processes through which scaffolding may support the development of mathematical skills among low-achieving learners.

This research employed a qualitative, exploratory interpretive design to examine how teachers and learners co-construct learning opportunities through scaffolding. Data were collected using purposive sampling to select participants where scaffolding strategies were actively used, and through focus group discussions on learners and three teachers for interviews and analysis of instructional artefacts to capture rich, contextualised accounts. The iterative analytic process combined thematic and narrative techniques to surface patterns of interaction, instructional moves, and learners' sense-making in relation to mathematical tasks.

To enhance the study's credibility and analytic depth, the design incorporated strategies for trustworthiness: prolonged engagement in the field, methodological triangulation across data sources, member checking with participants to validate interpretations, and reflexive documentation of the researcher's positionality. Ethical considerations included informed consent, protection of learners' confidentiality by using pseudonyms and gatekeeper permission was granted. Collectively, these design choices aligned with interpretivist commitments to contextualised understanding, co-constructed knowledge, and rigorous qualitative inquiry into how scaffolding influences mathematical learning for low-achieving learners.

In this study, twenty-five learners both girls and boys were selected. The involvement of girls and boys on participants acts as a true indicator that low-achieving in mathematics is a challenge happening to both female and male learners. This suggests that results may be safely generalizable to all learners without stereo-typing. All staff members who participated in this study were all senior with more than eight years' experience in the teaching field and this gives them credit on understanding most of the issues pertaining their learners in mathematics education. In particular mathematics teachers were involved in the interviews as they have the experience in the teaching of mathematics which makes them to be more understanding and knowledgeable in mathematics issues. The school policies, administrative support and resources availed might have influenced the implementation of the role of scaffolding learning in developing mathematical skills among low-achieving learners. Lastly, on constrains, the learner background and socio-economic status and prior-experiences might have influenced their engagement and success with scaffolding.

The study examined participants' engagement with scaffolding and their subsequent achievement in mathematical tasks, focusing on how instructional supports influenced learners' problem-solving processes and performance. Emphasis was placed on capturing both behavioural indicators of engagement and evidence of learning gains to provide a holistic account of scaffolding effects.

Triangulation was employed to strengthen the credibility of the findings. Following Patton's conceptualisation, triangulation involved the use of multiple methods and data sources to develop a more comprehensive and corroborated understanding of the phenomenon. In practice this included methodological triangulation (focus group discussions, semi-structured interviews, and analysis of learner work and instructional artefacts). These complementary strategies enabled cross-validation of emergent themes and supported claims about how specific scaffolding moves are related to learner engagement and skill development.

Ethical procedures and documentation were rigorously observed. All participants provided written informed consent via a signed consent and briefing letter that explained the study's purpose, procedures, confidentiality measures, and the voluntary nature of participation. Additional safeguards included anonymization of data, secure storage of records, the option to withdraw without penalty, and institutional ethical clearance where applicable. An audit trail, reflexive field notes, and member checking with participants were also used to enhance dependability and confirmability. Collectively, the combination of triangulation, reflexive practice, and formal ethical safeguards served to increase the trustworthiness of the study's interpretations regarding scaffolding, engagement, and learner success in mathematics.

### **Scaffolding Protocols used in the intervention**

The instructional intervention employed structured scaffolding strategies grounded in socio-constructivist learning theory, particularly the Zone of Proximal Development (ZPD), which asserts that learners perform

beyond their independent capability when supported by a more knowledgeable other. Specifically, the study utilised prompting, modelling and cueing, as systematic instructional supports during remedial mathematics lessons. Prompting was operationalised through targeted questions designed to activate learners' prior knowledge and guide learners' cognitive processes toward solution strategies, consistent with findings that well-designed prompts enhance learning outcomes when matched to learner needs, (Thomann & Deutscher, 2025).

Modeling involved explicit teacher demonstrations of solution procedures followed by guided learner practice on similar tasks which they did independently. This was consistent with cognitive apprenticeship principles that emphasised on observable expert behaviour for novice internalisation. Cueing, on the other side, consisted of verbal and visual signals directing learners' attention to critical features of mathematical tasks. This was applied through verbal hints and visual representations to draw learners' attention to key mathematical relationships without providing direct solutions.

As learners demonstrated increased conceptual understanding and procedural fluency, scaffolding support was progressively withdrawn to promote learner autonomy and self-regulated problem solving. This structured approach, hence ensured consistency in instructional delivery and enhanced the replicability of the intervention in similar remedial education contexts.

### **Limitations of the study**

Despite its contributions, this study has several limitations that should be acknowledged. First, the research was conducted at a single secondary school, which limits the extent to which the findings can be generalised to other schools or regions within Zimbabwe. Secondly, the dual role of the researcher as both facilitator and evaluator may have introduced researcher bias. Although standardised assessment instruments and consistent instructional procedures were employed to mitigate the risk, complete objectivity cannot be guaranteed. Future research could strengthen methodological rigor by adopting multi-site designs and incorporating independent observers or external assessors to validate findings.

### **Implications for Zimbabwe's Curriculum and Remedial Education Policy**

The findings align with key goals of Zimbabwe's Heritage-Based Curriculum (Ministry of Primary and Secondary Education, 2025), which seeks to equip learners with technological and scientific skills while preserving the country's rich cultural heritage and diversity. Scaffolding strategies such as prompting, modeling, and cueing directly support these curriculum priorities by enabling learners to engage with mathematics tasks at increasingly complex levels and by addressing diverse needs.

This study contributes empirically grounded insights that can inform remedial practices and policy discussions by demonstrating how explicit instructional support mechanisms can be integrated into teacher practice. Such evidence can help bridge classroom research with national initiatives aimed at improving mathematics outcomes for learners who struggle academically.

## **RESULTS**

### **How Do Scaffolding Strategies Improve Mathematical Skills Among Low-Achieving Students?**

The study wanted to find out the views and opinions of the participants on how scaffolding strategies improve mathematical skills among low-achievers. The data revealed that most of the respondents were of the view that scaffolding teaching and learning methods are very effective and efficient. Evidence from the 84% of the respondents harmonized and concurred that scaffolding encourages independence, helps students gain and develop 21<sup>st</sup> century competencies such as critical thinking, creativity, collaboration and problem-solving skills. The 84% respondents also strongly consent that scaffolding allow students to develop deep content knowledge, assists learners to be directly involved in making decisions about the topic focus and the investigations involved. More so, they supplemented that scaffolding increases motivation to learn, engagement and participation of learners in Ordinary level mathematics achievement.

I believe that scaffolding teaching method instills 21<sup>st</sup> century skills, promoting critical thinking and collaboration in the learning of mathematics among the low-achieving students at O level said one of the interviewees. All in all, the data showed that most respondents, believed that the scaffolding are very operational.

## What Types of Scaffolding Strategies Are Most Effective In Developing Mathematical Skills Among Low-Achieving Students?

Ninety percent of respondents reported that the combined application of scaffolding techniques substantially enhanced conceptual understanding among low-achieving students. This finding indicates a strong perceived association between integrated scaffolding strategies and improved mathematical comprehension in this cohort. For instance, modelling scaffolding where a teacher demonstrated a task or skill providing a model so that students follow is one of the most effective ways of developing students research skills as it fosters and enhance learners' autonomy, motivation and engagement. Bridging scaffolding, on the other hand, where the teacher connects new concepts to prior knowledge, thus building on existing understanding have been found to be very helpful especially on aspects of Geometry where a student needs to collaborate the previous learnt theorems to incorporate them in the new concept. Bridging scaffolding also assisted students to see the relationship between ideas. Furthermore, Contextualising scaffolding is where the teacher makes real connections to real-world applications, helping students see the relevance of the material. One teacher interviewee said:

Contextualising Scaffolding provides an interactive and engaging learning experience that requires learners to apply their knowledge in real-world contexts.

There is also, Schema Building Scaffolding where the teacher helped students organise and structure knowledge, creating mental frameworks for understanding and building on the existing schemas. This was also found to be very relevant and significant in assisting low-achieving students to understand mathematical concepts being taught at a particular time. Strategic Scaffolding is another scaffolding method where the teacher teaches the learning strategies and techniques helping students acquire problem-solving skills and encouraging critical thinking. The last is the Metacognitive Scaffolding method where the teacher encourages reflection and self-assessment helping students monitor their own learning and developing metacognitive skills. These types of scaffolding were used in combination to support student learning and promoting student independence among low-achieving students. Thus, supporting low-achieving students build a strong foundation in mathematics and develop the skills and confidence needed to succeed. The ninety percent credited that scaffolding in general provide learners with an increased efficiency in technological aspects and that learners are much involved in the learning process such that they feel learning is meant for them, learning becomes more relevant and meaningful as it enables learners to acquire and apply knowledge in real-life aspects, fostering relational understanding of mathematical concepts in low achievers.

Respondents revealed that scaffolding provide learners with a sense of ownership and autonomy, allowing them to feel more invested in their learning which in turn increases motivation and engagement. As learners are much involved in the learning process, they feel that learning is meant for them, learning becomes relevant and meaningful.

## How Do Scaffolding Strategies Impact Student Engagement And Motivation In Mathematics Among Low-Achieving Students?

Scaffolding was found to help students build increased confidence by breaking down complex tasks into manageable steps among the low-achieving learners in mathematics. The research also earthed out that by providing support and structure, scaffolding can reduce mathematics anxiety and make students feel more comfortable. Improved understanding has been also identified by the research as one of the key aspects brought out by scaffolding in the teaching and learning of mathematics among low-achieving students and this led to increased engagement and motivation. Through scaffolding low-achieving students develop a sense of accomplishment. As students complete scaffolded tasks, they experience a sense of accomplishment boosting their motivation according to Chang & Linn (2013). Scaffolding has been found to be providing targeted support, addressing specific areas of struggle in low-achieving students. Increased participation and engagement among low-achieving students was also noted.

However, over-reliance was noted as one of the weaknesses of scaffolding teaching and learning method among low-achieving students in mathematics. Some of the students might become too dependent on scaffolding and struggle with independent problem solving. Hence there is a danger of limited opportunities in critical thinking and creativity skills for some learners.

Establishing from the above information, it is clear that the scaffolding teaching methods are demanding and nerve-racking to both the learner and the teacher as shortage of resources limits the effectiveness of the scaffolding learning approach. More so, the scaffolding method is time consuming and leads to partial or incomplete tasks in a given project, some learners battle and strain to grasp the concepts done through scaffolding method.

### **Observed Student Engagement**

Data observed on engagement revealed that 90% of the scaffolding learners were being involved in the learning process, through participating in class, asking tangible and sensible questions for relational understanding in the mathematics concepts. Most learners showed that they were intrinsically motivated to carry the projects and tasks in the learning of mathematics concepts through the scaffolding teaching and learning method. Learners showed great interest in the learning process. They felt they had a greater percentage in contributing to the creation of new knowledge. They were willing to go an extra mile in carrying out project tasks. Social engagement was noted through group work interactions they created themselves in helping each other. The researchers witnessed that scaffolding helps learners to learn effectively from one another, learn how to collaborate with others, develop organizational and planning skills, evaluate their own learning, and enable them to give and receive constructive feedback. Researchers spotted that by allowing learners to see each other's perspectives, it helped them progress their knowledge, and teaching others helped themselves to learn a topic in an even more depth criterion. These observations suggest that the scaffolding teaching and learning method inculcate a sense of belonging in learners and hence create the zeal and curiosity to explore more on a particular topic or concept for relational understanding.

### **Observed Learner-Teacher Consultation**

Observed data revealed that learners engaged in scaffolding had acquired some practical confidence in consulting the teachers and this suggested that they have developed some assurance of relational understanding in the mathematics concepts being taught. Grounding on this observation, this means that consultations in scaffolding carry a very significant role as they provided the opportunity for individualised support to learners in understanding expectations and demands of the mathematical concepts. It also entails clarifying objectives, developing an appropriate plan, and acquiring strategies, techniques, and requisite tools to achieve success while safeguarding overall well-being.

### **Observed Learner Collaboration**

The researchers noticed that learner collaboration was a key aspect in scaffolding teaching method. Learners were very active, through oral communication on the given tasks collaboratively and formulating effective team work. Owing to this observation, it is evident that scaffolding is an excellent and efficient methods which encourages team work, leadership skills, communication skills, collaborative learning, positive interdependence and interpersonal skills.

### **Observed General Performance**

The researchers observed that scaffolding helps learners to develop critical thinking, gain new perspectives, and build positive relationships. During scaffolding, the researchers witnessed that personal growth, increasing retention of learning, deeper understanding of new concepts was achieved and increased through informal learning. Scaffolding was noted to be fostering communication skills, inclusivity and diversity, improved efficiency, better learning outcomes, and better organizational skills. Participants performed well in classroom participation, they also showed high intrinsic motivation, they showed a high drive in classwork and assignments and group work given. The observed data emphasized learners' higher-order cognitive skills—analysis, evaluation, and creative thinking—and their ability to apply knowledge to authentic problem-solving tasks. It also examined knowledge and content acquisition by assessing the depth and breadth of learners' understanding of the subject matter addressed in the tasks. Together, these measures provided evidence of learners' capacity to apply and integrate learned concepts and skills across contexts. This suggest that learners taught using the scaffolding are able to generate most of the 21<sup>st</sup> century skills such as critical thinking, creativity, communication skills, negotiating and problem-solving skills.

## DISCUSSION

The results of the study revealed that scaffolding has been found to be positively multi-dimensional. The most imperative acknowledged effects were that; scaffolding teaching method encourages independence, helps learners gain and develop 21st century competencies such as critical thinking, creativity, collaboration and problem-solving skills. Scaffolding learning activities were found to allow learners develop deep content knowledge, assists learners to be directly involved in making decisions about the topic focus and the investigations involved. Profound information suggested that the scaffolding teaching increases confidence, motivation to learn, engagement and participation of learners among low-achieving students in mathematics.

The findings of this study further indicated that scaffolding is one the most effective way of developing students research skills, fosters and enhance learners' autonomy, motivation and engagement than traditional method. The scaffolding teaching and learning were found to provide an interactive and engaging learning experience that requires learners to apply their knowledge in real-world context in the learning of mathematics. More so, results showed that the scaffolding teaching and learning provide learners with an increased efficiency in technological aspects. Learners are much involved in the learning process such that they feel learning is meant for them, learning becomes more relevant and meaningful.

## CONCLUSION AND RECOMMENDATIONS

In a nutshell the role of scaffolding learning in developing mathematical skills among low-achieving learners in a selected school in Marondera district revealed that it is one of the most effective teaching methods. Scaffolding proved to be encouraging independence, helps learners gain and develop 21<sup>st</sup> century competencies such as critical thinking, creativity, collaboration and problem-solving skills in the process of learning. Scaffolding was found to increase motivation to learn, engagement and participation of learners. Results outcome settled that the scaffolding teaching method in the learning of mathematics provides an interactive and engaging learning experience that requires learners to apply their knowledge in real-world contexts.

However, the research results from respondents also showed that the scaffolding teaching and learning method is time consuming and leads to incomplete projects. Hence, it is recommended that classroom practitioners clearly outline the project's objectives, deliverables and timelines as this will assist both the teacher and the learner create a project schedule with milestones and deadlines. More so, teachers are recommended to use task delegation and work collaboratively to manage time efficiently. The provision of a detailed rubric and assessment criteria might help learners to understand the evaluation process and provide learners with a list of relevant resources such as textbooks, articles, or online tutorials. Teachers may also use time-tracking tools such as Trello or Asana to track progress and stay organized. Technology Integration and Digital Tools such as GeoGebra, Geometer's sketchpad to facilitate quick exploration and visualization. By implementing these strategies teachers can help mitigate the time-consuming nature of scaffolding when teaching some mathematical concepts such as geometrical transformations, while still providing learners with a rich and engaging learning experiences.

Another limitation on resources; teachers are recommended to utilise free or low-cost Digital Resources such as Maths Open Reference and GeoGebra .in addition to, both teachers and learners might opt for re-purpose and re-use of existing materials for instance, use outdated textbooks as a resource for project ideas diagrams or problems. The teachers might utilize or incorporate everyday objects such as scissors papers, mirrors to demonstrate geometrical transformations. Learners are recommended to create their own Geometrical tools like protractors and compasses using locally available materials. The study recommends that the curriculum planners and designers should emphasise on the use of scaffolding teaching method when teaching some challenging maths concepts such as transformation at ordinary level for relational understanding as scaffolding method encourages learners to learn skills and apply their knowledge for given tasks.

## REFERENCES

1. Arbarello, M. (2014). *Geometry of Algebraic Curves*. Berlin: Berlin Springer.
2. Asterhan, C., & Schwarz, B. B. (2017). The effects of monological and dialogical argumentation on the concept learning in evolutionary theory. *Journal of Educational Psychology*, 626-639.

3. Barut, W. (2020). Geometry Learning in Vocational High School: Investigating the students' difficulties and levels of thinking . *Journal of Physics: Conference series 2020* (pp. 256-266). Peneliti: Mahasiswa publishers.
4. Battista, M. T. (2017). The Development of Geometric and Spatial Thinking .*Second Handbook of Research on Mathematics Teaching and Learning . Mathematics Journal VOL.2*, 843-908.
5. Belland, B.R; Walker, A.E; Kim, N.J; Lefler, M. (2017). Synthesising Results From Empirical Research on Computer-Based Scaffolding in STEM Education: A Meta-analysis. *Review of Education Research*, 309-344.
6. Bulu, S.T; Pedasern , S. (2016). Scaffolding Middle-School Students Content Knowledge and Ii-structured Problem Solving in a Problem-based Hypermedia Learning Environment. *Education Technology Research and Development*, 507-529.
7. Carl, B. A. (2016). The Dilemma in Geometry. *The Mathematics Journal for Life*, 165-169.
8. Chang, H.Y; Linn, M.C. (2013). Scaffolding Learning from Molecular Visualisations . *Journal of Research in Science Teaching* , 494-858.
9. Charlotte, Skipp , Dommett, Eleanor . (2021). Understanding and addressing the deficiencies in ukmathematics education. Taking an International Persperctive, 141-159.
10. Diaz, A; Nussbaum, M; Nopo, H; Corredar, J. (2015). Providing Teachers with Scaffolding to Address Curriculum Standards and Students' Pace of Learning. *Journal of Educational Technology and Society*, Google Scholar.
11. Gerard, L; Matuk, C; MC Elhaney, K; Lynn, M.C. (2015). Automated Adaptive Guidance for K-12 Education. *Education Research Review*, 41-58.
12. Juran, J. M. (2020). *Juran's quality handbook*. NEW YORK: MACGROW-HILL.
13. Matunga, O. (2024). *Exploring E-Learning in Zimbabwe Physics Education*. Bindura: Bindura University Journal.
14. Palinscar, A.S; Flitzgerald, M.S; Marcum, M.B; Sherwood, C.A. (2018). Examining the Work of Scaffolding in Theory and Practice. *International Journal of Educational Research*, 191-208.
15. Pear, R. (2016). Technological Dimensions of Scaffolding and Related Theoretical Concepts for Learning Education and Human Activity. *Journal of the Learning Sciences*, 423-451.
16. Puntambekar, S; Hubscher, R. (2017). Tools for Scaffolding Students in a Complex Learning Environment . *Educational Psychologist*, 1-12.
17. Quintana, C; Reiser, B.J; Davis , E.A. (2018). A Scaffolding Design Framework for Software to Support Science Inquiry. *Journal of the Learning Sciences* , 337-386.
18. Raes, A; Schellens, T; De Wever, B; Vanderhoven, E. (2019). Scaffolding Information Problem-solving in Web-Based Collaborative Inquiry Learning . *Computer and Education*, 82-94.
19. Reiser, B. (2014). Scaffolding Complex Learning: The Mechanism of bStructuring and Problematising Students' work . *Journal of the Learning Sciences*, 273-304.
20. Reiser, B.J; Michaels, S; Moon, J. (2017). Scaling up three-dimension Science Learning Through Teacher-Led Study Groups Across a State. *Journal of Teacher Education*, 280-298.
21. Shevin, B.L; Reiser, B.J; Edelson, D.C. (2016). Scaffolding Analysis; Extending The Scalfolding Metaphor To Learning Artfacts. *Journal of the Learning Sciences*, 387-421.
22. Suyutino, H., Eka, N. U., & Budhiati, V. (2019). The development of geometry concepts understanding based on NCTM reference in learning using discovery learning model. *Unnes Journal of Mathematics Education* , 42-48.
23. Swayer, R. (2019). *The Creative Classrom ;Inovative Teaching 21st-Century Leaners* . New York: Teachers' College Press.
24. Tabak, I; Kyza, E.A. (2018). *Research on Scaffolding in the Learning Sciences: A Methodological Perspective* . New York: Routledge,Google Scholar.
25. Taber, K. S. (2018). *Effective Teaching and Learning Pesrspective, Strategies and Implementations*. Nova Science , 1-43.
26. Taber, K. S. (2020). *Mediated Learning Leading Development-The Social Development Theory of Levy Vygotsky*. New York : American Press.
27. Taber, Keith S; Brock , Richard. (2019). *A Study to Explore the Poetential of designing Teaching Activities to Scaffolding Learning:Understanding Circular Motion*. New York: American Press.

28. Thomann, H. & Deutscher V, (2025). Scaffolding through prompts in digital learning: A systematic review and meta-analysis of effectiveness on learning achievement. *educational Research Review* 47(2025)100686
29. Van de-pol, J; Volman, J; Mecer, N. (2018). Scaffolding in Teacher-Student Interaction: A Decade of Research. *Educationa Psychology Review*, 271-296.
30. Van de-pol, J; Volman, M; Beishuizen, J. (2017). Scaffolding Student Understanding in Small Group Work. *Journal of the Learning Sciences*, 206-239.
31. Vogel, F; Weckes, C; Kollar, I; Fischer, B. (2017). Socio-Cognitive Scaffolding with Computer Supported Collaborationn Scripts: A Meta-Analysis. *Educational Psychology Review*, 477-511.
32. Walker, A. E. (2022). *The Cambridge Handbook of the Learning Sciences*. Cambridge University Press, 53-71.
33. Wong, L., Boticki, I., Sun, J., & Looi, C. (2020). Improving Scaffolding of a Mobile-Assisted Chinese Character Forming Game via a Design-based Research Cycle. *Computer in Human Behavior* Google Scholar, 1783-1793.
34. Yoon, S., Anderson, E., Park, M., Elinich, K., & Lin, J. (2018). How Augmented Reality, Textual and Collaborative TO Improve Learning in a Science Meusium. *Reasearch in Science and Technology Education*, 261-281.