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Mastering Numeracy Skills in Multiplication and Division of Fractions Among Grade 5 Learners Using Scaf-Ins (Scaffolded-Instruction) Approach

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A B S T R A C T

This action research explored the efficacy of the Scaffolded Instruction Strategy (Scaf-Ins), a contextual and culturally aware teaching method, in improving the numeracy abilities of Grade 5 section Pearl leraners at Guindawahan Elementary School, Pio V. Corpus, Schools Division of Masbate, specifically in the multiplication and division of fractions. The approach was based on Vygotsky's Sociocultural Theory, highlighting scaffolded assistance within learners' Zone of Proximal Development (ZPD) and cooperative learning. Using a one-group pretest-posttest design , the research involved 26 Grade 5-Pearl students whose initial performance revealed significant deficiencies in grasping fractional operations. Pretest and posttest evaluations, confirmed by content specialists, were conducted, and the data were analyzed using the Shapiro-Wilk test for normality and paired-sample t-test through Jamovi software. Results indicated that the data followed a normal distribution and that a statistically significant enhancement in learners' performance occurred after the intervention ($t = -17.2$, $p < .001$). The Scaf-Ins method, characterized by gradual guidance, teamwork among peers, and situational relevance, enabled students to comprehend abstract mathematical concepts and develop procedural skills. These results aligned with both local and global studies confirming the advantages of scaffolded, student- centered teaching. The research established that incorporating culturally relevant and structured methods can significantly close conceptual gaps, enhance confidence, and improve math performance in elementary education.

Keywords: Scaffolded Instruction Strategy (Scaf-Ins), multiplication and division, fraction, contextualized teaching, numeracy skills

1. Introduction

Historically, numerous elementary students have faced challenges in mastering operations with fractions, particularly in multiplication and division. This issue was especially evident among Grade 5 students at Guindawahan Elementary School, who achieved a mean percentage score (MPS) of only 63.74% on a mathematics test, indicating a significant shortfall in understanding fractional concepts. Operations with fractions , essential to algebra, calculus, and data analysis, continue to pose challenges due to their abstract and relational characteristics. Siegler et al. (2013) highlighted that most learners struggled to grasp fundamental fraction concepts due to rote memorization, which hindered their problem-solving and application skills. If these issues in basic math are not addressed, they could lead to lasting effects on students' academic achievement and daily numerical abilities (Geiger et al., 2021). Researchers have long noted that effective instruction in fractions requires conceptual understanding rather than just procedural practice. Lamon (2007) asserted that students are unable to comprehend a fraction divided by another fraction without significant conceptual teaching and visual representations. Similarly , Behr, Harel, Post, and Lesh (1992) emphasized that to understand multiplication and division of fractions, one must grasp proportionality and reciprocal reasoning. Furthermore , Kusuma and Retnawati (2019) found that achievement in fraction tasks was particularly low on standardized assessments due to insufficient deep conceptual comprehension. Given these findings , a clear need for contextualized, structured interventions has emerged that promote fundamental comprehension through tangible, practical applications.

To tackle this issue, a contextualized teaching method referred to as Scaf-Ins (Scaffolded Instruction Strategy) was introduced and put into action. Based on Vygotsky's Sociocultural Theory, the Scaf-Ins approach highlighted scaffolding, where educators offered structured assistance that was slowly removed as students gained autonomy. This approach was characterized as a contextualized teaching method that combines real-world and culturally significant material with structured assistance, enabling students to grasp abstract ideas like fraction operations through relatable and meaningful activities. This method aligns with the idea that social interaction and collaboration facilitate the most effective learning. Esparcia, Piñero, and Futalan (2024) indicated that scaffolding allows students to break down complex mathematical skills into manageable steps , thereby promoting a deeper understanding . In the classroom, this was implemented through collaborative learning, where students worked in pairs or groups to examine problems, exchange strategies, and receive feedback-an approach supported by Fernandez, Canadalla, and Manalo (2019), who found that peer interaction significantly improved numeracy outcomes among elementary learners.

The Scaf-Ins method was enhanced by integrating real-world situations that connected with learners' cultural and social backgrounds. As noted by Espiritu and Vendicacion (2025), when mathematical content is presented through localized tools and contextualized resources, students are more engaged and better able to grasp abstract operations like fraction multiplication and division. Similarly, Jundos and Aldon (2021) highlighted that aligning culture in teaching improves the relevance and accessibility of mathematics for students from various backgrounds. Consequently, the introduction of Scaf-Ins at Guindawahan Elementary School sought to enhance the accessibility and significance of fraction operations through the use of manipulatives, peer dialogues, and relevant problems. This approach aimed to boost students' confidence and skill in executing these tasks. Ultimately , the intervention sought to close conceptual gaps and establish a solid numeracy foundation that would aid learners in their academic advancement and daily decision-making.

1.1 Statement of the Problem

The primary goal of this action research was to enhance the numeracy skills of Grade 5 learners at Guindawahan Elementary School, with a particular focus on multiplication and division of fractions. This was achieved through the implementation of the Scaffolded-Instruction Strategy (Scaf-Ins), a contextualized teaching approach grounded in Vygotsky’s Sociocultural Theory. The intervention aimed to strengthen students’ conceptual understanding, develop procedural fluency, and improve overall mathematical performance by integrating real-life examples and collaborative learning activities. To guide the conduct of this research, the following questions were formulated: What were the pre-test and post-test scores of Grade 5 learners before and after the implementation of the Scaf-Ins strategy? Was there a significant difference between the pre-test and post-test results of Grade 5 learners following the intervention? Lastly, was there a significant increase in the mean scores of the learners after the implementation of the Scaf-Ins strategy? These questions served as the basis for evaluating the effectiveness of the intervention in improving learners’ competence and confidence in fraction operations.

2. Methods

2.1 Research Design

The research utilized a one-group pretest-posttest framework within the context of action research to assess how effective the Scaf-Ins (Scaffolded Instruction Strategy) was in enhancing the numeracy skills of Grade 5 learners, particularly in the multiplication and division of fractions. Action research was deemed suitable as it promoted reflective teaching, prompt instructional changes, and ongoing enhancement grounded in classroom observations (Donker et al., 2014). The design enabled an empirical assessment of learning improvements by analyzing pretest and posttest outcomes before and after the intervention. Scaffolding, as an instructional approach, has demonstrated its ability to improve students' comprehension by deconstructing intricate material and progressively fostering autonomy through structured assistance (Betts et.al, 2020). The intervention was grounded in Vygotsky's sociocultural theory, which highlights that learning occurs through social interactions and is further enhanced by connecting content to real-life and culturally significant situations (Geiger et.al, 2021). These principles ensured that the strategy emphasized not only skill development but also conceptual understanding , peer collaboration, and active feedback, all of which are essential for meaningful mathematics learning in primary education.

2.2 Data Sources

The study's data sources were gathered from Grade 5 Pearl learners who willingly participated as respondents. The sample consisted of diverse types of students, effectively meeting the research requirements. These individuals were specifically chosen because they faced challenges in numeracy, particularly in fraction multiplication and division. The response profile included 26 learners, comprising 12 males and 14 females. In addition to primary data from these participants, secondary data was collected from learner profiles that included details on demographics, past academic performance in mathematics, and overall academic success. The integration of primary and secondary data enabled to obtain a comprehensive insight into the factors affecting learners' numeracy abilities, thereby aiding the creation of focused and effective educational programs.

2.3 Research Procedure

The research process began with administering a pretest to the Grade 5-Pearl students to assess their baseline abilities in multiplying and dividing fractions. Both the pretest and posttest instruments were validated by experienced master teachers to confirm their content validity and alignment with the study's learning objectives. Similarly , the scaf-ins teaching method was reviewed and approved by these specialists to ensure its effectiveness in addressing students' challenges in numeracy (De la Cruz & Navarro, 2020). Ethical guidelines were meticulously followed during the research. Consent was obtained from the parents or guardians of the participating learners, and the learners willingly agreed to take part. The privacy and confidentiality of the participants were maintained, and they were informed that their involvement was voluntary and that they could withdraw at any time without consequence. These ethical protocols adhered to the standards established by the Department of Education for studies involving minors (Department of Education [DepEd], 2017). After the pretest, the Scaf-Ins method was implemented using scaffolded teaching aimed at addressing students' specific difficulties with fraction multiplication and division. Following the intervention, a posttest was administered to assess the learners' progress . Data gathered from the pretest and posttest scores were analyzed using Jamovi software, an easy-to-use and accessible statistical tool commonly employed in educational research in the Philippines (Santos & Reyes, 2022). Normality assessments using the Shapiro-Wilk technique confirmed that the data distribution met the criteria for parametric analysis, allowing the application of paired-sample t-tests to evaluate the significance of learning improvements (De la Cruz & Navarro, 2020).

3. Results and Discussion

3.1 Normality Assessment of Data

The results of the study showed that the data obtained from the pretest and posttest of Grade 5-Pearl students were normally distributed. As indicated in Table 1, the Shapiro-Wilk (S-W) test outcomes for the pretest (S-W = 0.950, p = 0.605) and posttest (S-W = 0.956, p = 0.688) produced p-values exceeding the 0.05 significance threshold. This suggested that the normality assumption was satisfied for both data sets. Evaluating the normality of data distribution is a crucial phase in parametric statistical evaluation. The Shapiro-Wilk test is frequently recommended for small to medium sample sizes due to its high effectiveness in detecting departures from normality (Razali & Wah, 2011). In this case , as both p-values were above the threshold, it was appropriate to proceed with further analysis using parametric tests such as the paired-sample t-test.

The outcomes were consistent with similar research that investigated educational programs and conducted normality assessments before performing inferential statistical analyses. For example, Jamir and Baldovino (2022) highlighted the importance of conducting normality tests in educational research that utilizes pretest-posttest designs, as it confirms the statistical reliability of the results obtained. Similarly, Aquino and Diaz (2023) emphasized that when datasets meet the normality criteria, researchers can reliably use t-tests to evaluate differences in student performance before and after the intervention.

Table 1

Normality Data Assessment During the Pretest and Posttest of Grade 5-Pearl Learners

Variables	N	S-W	P-value	Interpretation
pretest	26	0.950	0.605	Normally distributed
posttest	26	0.956	0.688	Normally distributed

3.2 Statistical Interpretation of Pretest and Post Utilizing Scaf-Ins Approach

The findings from the paired-sample t-test indicated a notable improvement in the math performance of Grade 5-Pearl learners following the adoption of the scaf-ins (scaffolded instruction) method. Table 2 showed a calculated t-value of -17.2 with 12 degrees of freedom and a p-value of <.001, indicating a statistically significant difference between the scores of the pretest and posttest. This indicated that the intervention significantly enhanced students' comprehension of multiplying and dividing fractions. The results confirmed the success of scaffolded and culturally relevant teaching methods in bridging gaps in numeracy abilities among elementary students. The scaf-ins method focused on breaking down intricate fraction operations into smaller, achievable learning segments, combined with collaborative learning activities.

These teaching elements helped minimize cognitive overload for learners and enabled them to gradually build knowledge. As stated by Angeles and Cabardo (2023), Filipino elementary students thrived in scaffolded learning environments where teaching aids were gradually withdrawn as students became more self-sufficient. In this study, the posttest scores showed notable enhancement as learners gained confidence and precision in solving fraction problems, indicating effective internalization of mathematical concepts. Moreover, the notable enhancement corresponds with the results from David and Fabillar (2022), who found that scaffolded teaching, especially when integrated with peer-assisted learning and relevant materials, resulted in improved academic achievement in mathematics. This result also reflected the tenets of Vygotsky's (1978) sociocultural theory, which suggested that students advance more efficiently within their Zone of Proximal Development (ZPD) when supported by organized and interactive guidance . In this study, the scaf-ins approach provided such guided instruction, helping learners progress from surface-level understanding to deeper conceptual comprehension .

Furthermore, the findings emphasized the significance of culturally relevant teaching methods. Students reacted favorably to tasks that were situated within known and relatable contexts. This echoed the findings of Torres and Balbin (2021), who highlighted that embedding mathematical content within real-life situations relevant to students significantly boosts engagement and retention. The enhanced posttest results of the learners indicated that they not only excelled in procedural tasks but also acquired a more profound comprehension of fraction operations, thanks to the careful incorporation of local examples and group activities during the scaf-ins sessions.

The findings of the study reflected how critical instructional design is in improving learners' academic performance, particularly in mathematics. The statistically significant improvement in posttest scores highlighted the effectiveness of the scaf-ins approach in supporting conceptual understanding. It became evident that when learners were provided with step-by-step instructional scaffolds, they could better comprehend abstract mathematical concepts such as multiplication and division of fractions. This underscored the value of guided learning and the gradual release of responsibility, which are key principles in effective teaching practices (David & Fabillar, 2022).

From a teaching perspective, the results reinforced the importance of adopting learner-centered strategies that accommodate individual differences in pace, ability, and learning styles. The collaborative nature of scaf-ins fostered a more inclusive learning environment where learners felt more engaged and confident. This approach resonated with the findings of Angeles and Cabardo (2023), who stressed that the integration of localized and interactive instruction helped bridge learning gaps and made mathematics more relatable. For teachers, this affirmed the need to rethink traditional, lecture-based instruction and shift toward methods that promote active, cooperative, and reflective learning.

For learners, the intervention offered a transformative experience. They became more active participants in the learning process, engaging in peer discussions, solving contextualized problems, and applying fraction operations in meaningful situations. These positive changes demonstrated that with the right strategies, learners previously perceived as low-performing could thrive academically. The success of this instructional method suggested that similar scaffolded approaches could be adapted in other content areas, contributing to holistic learner development and sustainable academic success.

In conclusion, the research offered empirical proof that the scaf-ins method greatly improved the numeracy skills of Grade 5 students in multiplying and dividing fractions. By utilizing scaffolded, contextualized, and collaborative learning approaches, students showed significant enhancement in their scores from pretest to posttest. The method was consistent with Vygotsky's sociocultural theory and was backed by contemporary local literature that confirmed the advantages of guided instruction in Filipino classrooms. These results not only added to the expanding field of research on instructional enhancement but also provided practical insights for improving teaching methods in primary education. Going forward, teachers are urged to utilize scaffolded, inclusive, and culturally relevant strategies to foster profound learning and fair academic results.

Table 2

Statistical Interpretation of Pretest and Posttest Utilizing Scaf-Ins

Variables	N	stat	df	P-value	Interpretation
Pretest-posttest	26	-17.2	12.0	<.001	Statistically significant

4. Conclusion

The findings of this research confirmed that the ongoing challenges encountered by Grade 5 students in learning to multiply and divide fractions can be successfully tackled through contextualized and scaffolded teaching methods. Before the intervention, students at Guindawahan Elementary School exhibited poor understanding of fractional operations, reflected in the low average percentage score of 63.74%. This discovery corresponds with previous studies that recognized procedural instruction and rote learning as major obstacles to grasping mathematics. By implementing the Scaf-Ins (Scaffolded Instruction Strategy), the research sought to convert abstract mathematical ideas into understandable and relevant content via gradual support and localized resources. The notable enhancement in posttest scores validated that these teaching methods played a key role in bridging conceptual gaps and boosting mathematical achievement.

The effectiveness of the Scaf-Ins strategy was based on its connection to Vygotsky's Sociocultural Theory, especially the concept of scaffolding in the learner's Zone of Proximal Development (ZPD). The organized support offered in the initial phases of education, along with teamwork among peers and practical contextualization, allowed students to cultivate both conceptual comprehension and procedural proficiency. As students advanced, supports were slowly removed, fostering independent thought and assurance in tackling fraction issues. These results highlighted the significance of learner-centered education, where teaching is customized to align with students' existing knowledge, social environments, and cultural relevance. Educators employing comparable approaches can anticipate not just enhanced academic outcomes but also a more stimulating and empowering classroom atmosphere.

In conclusion, the research found that combining scaffolded instruction with teaching that is contextualized and culturally responsive greatly enhanced the numeracy abilities of Grade 5 learners. The Scaf-Ins technique demonstrated to be a successful teaching strategy that promoted enhanced comprehension, student independence, and ongoing educational progress.

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