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PUPILS PERCEPTION OF THE EFFECTS OF REINFORCEMENT AND RETENTION ON PERFORMANCE IN MATHEMATICS

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Abstract

This study examined pupils' perception of the effects of reinforcement and retention on pupils' performance in Mathematics. The design was a descriptive survey, and a structured questionnaire was used to collect the quantitative data. The respondents consist of 120 randomly selected pupils from 10 primary schools. It employed a 23-item questionnaire tagged Pupils' perception of the effects of reinforcement and retention on performance in Mathematics which comprised of three sections A, B and C. Section A consists of two items on school name and gender, B contains 10 items on reinforcement while C consists of 10 items on retention in mathematics. Findings revealed that pupils perceived teachers' use of reinforcement and retention as having a significant effect on academic performance in Mathematics. It implied that positive reinforcement and retention motivate pupils to retain information and apply what was taught in class to their daily activities for longer periods. It further revealed no difference in perception due to gender in the effect of reinforcement and retention on performance in mathematics. It was

recommended that school administrators should encourage teachers to acquaint themselves with positive verbal reinforcement techniques (general, ability & effort praises) which lead to learners' maintenance of repetition as a desired academic behaviour hence improving their performance in Mathematics; the Ministry of Education through curriculum developers should come up with the current teachers' reinforcement policies inclined towards improving learners' competence and performance in Mathematics.

Keywords: *Mathematics, Performance, Pupils, Reinforcement, Retention.*

Introduction

Mathematics is the most recognised subject for everyday activities in human endeavour. Mathematics is regarded as essential to accomplishing national goals and objectives. It is considered a vital component of education and one of the core disciplines in the curriculum, particularly at the primary and secondary school levels (Umameh, 2020). But, despite the significant role that mathematics plays in the education system as well as in national development, most students especially at the secondary level find it a difficult subject to pass and discontinue it after secondary education and one of the most common reasons behind this discontinue and failure in mathematics directly indicates attention of educators towards poor mathematics background at secondary school level. The country's scientific, technological, and economic advancement in education all rely on mathematics as a basic subject and vital instrument (Boldt, Goffin, & Kochanska, 2020). Mathematics makes it possible to understand many other topics and languages. It provides a broad framework for several disciplines, such as engineering, physics, astronomy, and science. Technology and science can advance because mathematics is taught to motivate the general people.

In this 21st century, the motivation of primary school pupils is often regarded as the responsibility of both parents and teachers as many educational institutions make use of the reward system in the form of bonuses or promotions to their teaching and non-teaching staff. Muhammad, Siddique, Jabeen, and Akhtar (2023) reported that Student's learning behaviours and performance in mathematics are significantly influenced by both positive and negative reinforcement. To help students learn and reach the required academic performance in mathematics, reinforcement is a powerful motivator. Tara, et al. (2019) opined that rewards are often used in schools to identify reinforcement. That reinforcement is anything

that increases the likelihood that a learning behaviour will occur again or that the behaviour will become stronger following the removal or minimization of anything or unfavourable situations, which inevitably improves students' academic performance in mathematics in the classroom. Positive reinforcement is the process that improves the probability that a reaction will recur in the future by following a desired or accepted outcome. The reward system is widely used in positive reinforcement. The idea of reward is related to how rewarding experiences are incorporated into human cognitive processes to govern and control behaviour. In education, rewards might be verbal praise, food, or a favourite item (Wang, Wu, & Xiong, 2021). This type of reinforcement increases the possibility of learning behaviour of primary school pupils that may occur repeatedly.

In a primary school setting, educators frequently utilise prizes like diplomas, trophies, and scholarships as a powerful form of positive reinforcement to help students keep moving forward in their education, which inevitably impacts how well they perform in mathematics (Pajarillo-Aquino, 2019). Additionally, giving praise regularly has a significant impact on pupils in primary schools and is positively correlated with their self-perceptions of their abilities, which makes them feel proud of themselves and anticipate greater success in the future. Liguluka and Onyango (2020) highlighted that clapping is a quick technique to acquire the desired results from students during the teaching process in a classroom setting and motivate them toward the teaching-learning process. At the same time, the clapping of the primary school teachers revitalises pupils to show good performance in Mathematics in their academic tests, homework and even examinations; besides, the more positive interpersonal relationships are, the greater the psychological health of the individuals involved through the internalisation of positive relationships, direct social support, and expressions of caring. A reward system can be employed in negative reinforcement since it removes the negative thing, which in turn rewards the person for their favoured behaviour. In the classroom, students benefit tremendously from the elimination of criticism and taunting. Nonetheless, there is no denying that reinforcement-whether positive or negative—has a big influence on primary-school pupils' academic achievement in mathematics (Lv, B., Lv, L., Wang, & Luo, 2019).

However, the technique of making a child repeat a grade is known as retention, and it is frequently thought of as a useful tool for improving students' performance in mathematics. It is frequently offered as a solution to students' behaviour or academic performance in mathematics classes. Students may be retained in a grade for several reasons, such as if it is found that they are not intellectually or socially

capable of progressing to the next grade (Kapp & Defelice, 2019). Retention is often used to raise educational standards, especially at the elementary level (Wang, Wu, & Xiong, 2021). For pupils who have not mastered basic skills, many academics believe that repeating a grade is a helpful remedy, as pupils got the same education in the same manner during their retention year. It is required of pupils to master the skills a second time in a particular grade without any changes. Nonetheless, there is a significant mismatch between the intended outcome and actual outcomes when considering something like grade retention. Retentionists logically contend that elevating a child regardless of their performance leads to sending them out into the world unprepared for their future. It was suggested that by solidifying their foundation of core skills, delaying a child's admission into the early grades can boost their sense of value and preparedness. Some claimed that poor performance in later grades can lead to retention when pupils are held accountable for their academic work (Situmorang, 2022).

Notwithstanding the broad consensus in the educational literature that retention of pupils in primary and secondary schools frequently results in the anticipated improvements in their academic performance. It has been established that holding children back is usually harmful and rarely helpful. Recent evidence shows that third pupils who are held back do no better than those who, after a year, barely make it into the next grade (Contini & Salza, 2024). Eighty-seven per cent of eighth graders who were held back dropped out of school altogether, and sixth graders who repeated the grade performed worse than those who were hardly allowed to progress. Because they are constantly learning the same material in the same way, young people are becoming disengaged from school (Konyu, Wathika & Khaemba, 2019).

The factors of retention include lower academic achievement, post-school educational attainment, and school dropout. Even if the initial benefits of retention fade over time, it seems to have fewer negative effects over the first two or three years of school. When students are kept in later grades (during puberty, for example), these detrimental consequences are more pronounced (Lopez-Agudo, Latorre, & Marcenaro-Gutierrez, 2024). Due to the 90% school dropout rate among pupils who are retained in a grade twice during their academic careers, retention has significantly more negative effects for double repeaters. Crucially, retained pupils do worse academically and are more likely to drop out of school than similarly failing pupils who move on to the next grade. Crucially, retention pupils show a larger difference as compared to younger pupils in their new grades (Motseke, 2020).

Educational intervention in retention is also ineffectual when compared to pupils who receive promotion and intervention, as pupils with low retention perform worse, meaning that promoting pupils and utilizing educational intervention is more beneficial. Retention is linked to inattentive, uneasy, and disruptive behavior in the classroom about other pupil's actions and reactions (Giano, Williams, & Becnel, 2022). Furthermore, findings from Schieltz, et al. (2020) showed that the students who were retained had lower levels of academic buoyancy, self-efficacy, mastery orientation, school value, perseverance, good intents, and school fun. They also performed worse in math and participated less in class. Students who were maintained in a grade also exhibited higher degrees of anxiety, detachment, self-handicapping, control over uncertainty, and avoidance of failure. Furthermore, follow-up research showed that the collection of dependent variables did not significantly alter as a function of the grade retained and that retention had detrimental impacts regardless of the grade at which a student was maintained. However, over time, Nigerian pupils' academic performance in mathematics has declined, which has negatively impacted pupils' academic performance in mathematics, particularly in basic schools.

In the Nigerian education system, learners' academic performance in Mathematics is regarded as key to its growth and national development as improved performance in Mathematics of pupils often leads to the production of quality graduates who are expected to contribute significantly to the growth of the nation. But unfortunately, the academic performance in Mathematics of learners, especially at the primary school level in recent years is said to be discouraging and this has become a burden to the education stakeholders within and outside the country. Studies carried out by many educational scholars in Nigeria and abroad have observed that the poor academic performance in Mathematics of primary school pupils is attributed to several factors such as school factors, teachers' factors, learners' factors, and parents' factors among others (Emenike, Godwin, & Okezie, 2022). As a result, school owners and their management consistently search for ways to improve the academic performance in Mathematics of pupils improving the management of the teaching and learning process is seen as a priority; and the use of reinforcement and retention processes is seen as an option. Unfortunately, there is little research on the effect of reinforcement and retention on the academic performance in Mathematics of primary school pupils especially in Nigeria and inconclusive as well. Hence, this study sought to investigate the effects of reinforcement and retention on primary school pupils' performance in Mathematics in Lagos State, Nigeria.

Purpose of the Study

The main purpose of this study was to investigate the effects of reinforcement and retention on primary school pupils' performance in mathematics in Lagos State, Nigeria. The specific purpose of this study is to investigate the effect of reinforcement on pupils' performance in mathematics concerning gender, reinforcement and retention at primary school concerning gender.

Research Questions

The following research questions guided the study:

1. How do pupils perceive the effect of reinforcement on performance in mathematics?
2. What are the perceptions of male and female pupils' of the effect of reinforcement on performance in mathematics?
3. How does reinforcement affect pupils' retention in mathematics?
4. What are the perceptions of male and female pupils of the effect of retention on performance in mathematics?

Method

The study employed a descriptive survey research design with the use of a questionnaire tagged Pupils' perception of the effects of reinforcement and retention on performance in Mathematics which comprised three sections A, B and C. Section A consists of three items on student's name, school name and gender, B contains 10 items on reinforcement, while C consists of 10 items on retention in mathematics. The population was all primary five pupils in Alimosho Local Government Area of Lagos State, Nigeria. Simple random sampling was used in selecting ten primary schools that participated in the study, out of which 120 pupils emerged. To ensure content validity, the researchers subjected the instrument to face and content validity through specialists in mathematics education. To enhance the reliability of the instruments, a pilot study was conducted in 3 schools in a different Local Government Area which share the same factors as the schools under study. The Cronbach's Alpha reliability coefficient of 0.73 was obtained. Simple percentage (%), Bar-chart and mean scores were used to analyse and interpret the data collected.

Results

Research Question 1: What effect does reinforcement have on pupils' performance in Mathematics?

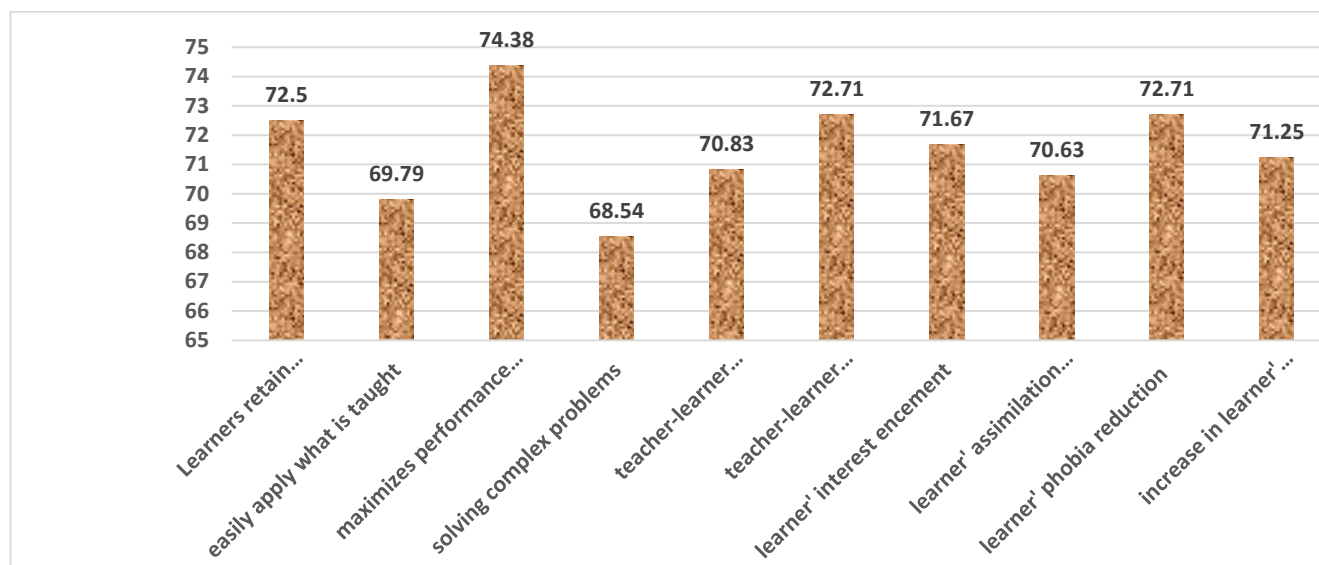


Fig 1. Pupils' perception of the effects of reinforcement on Mathematics performance

Source: Field Survey 2024

The outcome in Fig. 1 showed that the participants have 72.5% perception that reinforcement helps learners to retain information for longer periods with 69.79% belief it helps learners to easily apply what is taught in class to daily experience and 74.38% belief it maximizes learners' performance in mathematics and sustains behavioural changes for a long period. There is 68.54% believe it helps learners to resolve complex problems that cannot be solved conventionally; 70.83% belief that it improves communication between teachers and learners in class during the teaching process; 72.71% belief that it enhances the relationship between the teacher & learners; 71.67% belief it enhances learner's interest in learning; 70.63% belief it enhances learners' assimilation rate during the teaching process; 72.71% belief it reduces learners' phobia for academic learning; and 71.25% belief it increases learners' attendance in class during the teaching process. It implies that reinforcement is an excellent hand tool for raising pupils' performance in mathematics.

Research Question 2: What are the perceptions of male and female pupils about the effect of reinforcement on performance in mathematics?

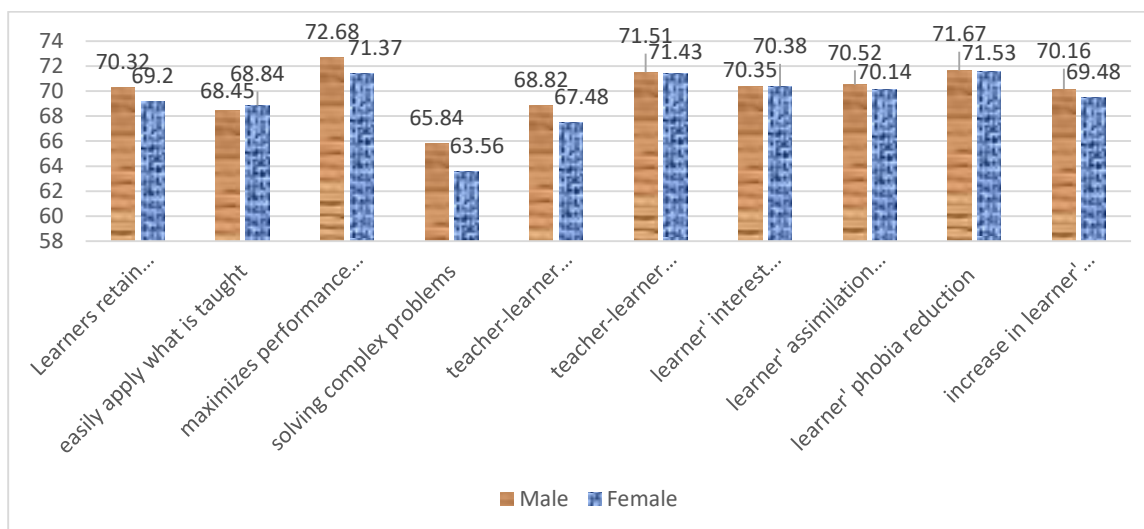


Fig 2. Perception of male and female pupils about the effect of reinforcement on mathematics performance.

Fig 2 depicted that the male and female pupils respectively have 70.32% and 69.2% perception of reinforcement as helpful to learners' retention of information for longer periods, 68.45% and 68.84% belief it helps learners to easily apply what is taught in class, 72.68% and 71.37% belief it maximizes learners' performance in mathematics and sustains behavioural changes. There is 65.84% and 63.56% belief it helps learners in solving complex problems that cannot be solved conventionally; 68.82% and 67.48% belief that it improves communication between teachers and learners in class during the teaching process; 71.51% and 71.43% belief that it enhances the relationship between the teacher & learners; 70.35% and 70.38% belief it enhances learner's interest in learning; 70.52% and 70.14% belief it enhances learners' assimilation rate during the teaching process; 71.67% and 71.53% belief it reduces learners' phobia for academic learning; and 70.16% and 69.48% belief that it increases learners' attendance in class during the teaching process. It clearly showed that the male and female pupils are alike in their perception of the effect of reinforcement on performance in mathematics.

Research Question 3: How do pupils perceive the effect of retention on performance in mathematics?

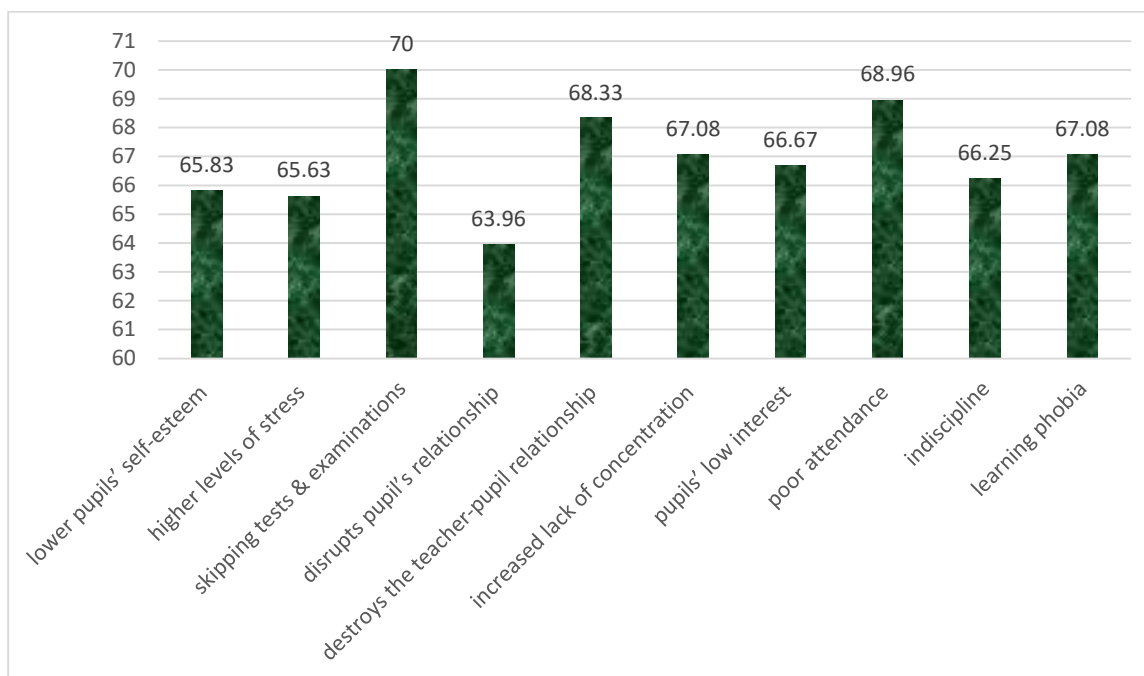


Fig 3. Pupils' perception of the effect of retention on performance in mathematics

It is obvious from Fig 3 that the pupils have 65.83% perception that retention contributes to lowering self-esteem which invariably affects academic performance in Mathematics, 65.63% perception that it contributes to higher levels of stress, 70% belief that it makes pupils skip tests and examinations, 63.96% perception that it disrupts relationship among pupils, 68.33% belief that it destroys the teacher-pupil relationship, 67.08% perception that it leads to increased lack of concentration in class, 66.67% belief that it lowers pupils' interest in learning, 68.96% belief that it contributes to pupils' poor attendance in class, 66.25% belief that it contributes to indiscipline in class during teaching, 67.08% belief that it contributes to learning phobia.

Research Question 4: What are the perceptions of male and female pupils about the effect of retention on performance in mathematics?

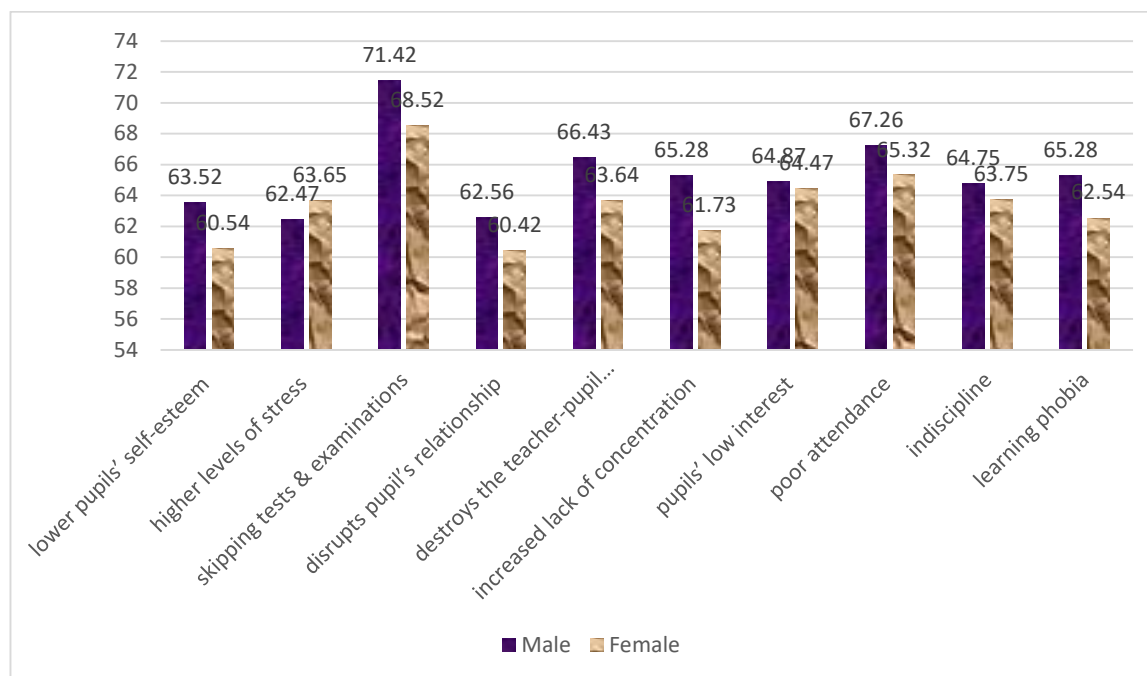


Fig 4. Perceptions of male and female pupils about the effect of retention on performance in mathematics

From Fig. 4, it can be seen that the male and female pupils respectively have 63.52% and 60.54% perception that retention contributes to lowering self-esteem, 62.47% and 65.63% perception that it contributes to higher levels of stress, 71.42% and 68.52% belief that it makes pupils to skip tests and examinations, 62.56% and 60.42% perception that it disrupts relationship among pupils, 66.43% and 63.64% belief that it destroys the teacher-pupil relationship 65.28% and 61.73% perception that it leads to increased lack of concentration in class, 64.87% and 64.47% belief that it lowers pupils' interest in learning, 67.26% and 65.32% belief that it contributes to pupils' poor attendance in class, 64.75% and 63.75% belief that it contributes to indiscipline in class during teaching, 65.28% and 62.54% belief that it contributes to learning phobia. It equally revealed no difference in the perception of male and female pupils about the effect of retention on performance in mathematics.

Discussions

Research question 1 stated what are the effects of reinforcement on pupils' performance in mathematics at the primary school level? It was revealed that 15.1% of the respondents strongly agreed, 62.3% agreed, 16.5% disagreed & 6.6% of the respondents strongly disagreed. The analysis using the high positive response 77.3% concluded that reinforcement use by teachers during the teaching process significantly affects pupils' performance in Mathematics in primary schools. Subsequently, the analysis observed that reinforcement helps learners retain information for longer periods and helps learners

easily apply what is being taught in class to their daily activities. It maximizes learners' performance in Mathematics and sustains change for an extended period. Also, it helps learners in solving complex problems that cannot be solved by conventional techniques. It improves communication between teachers and learners in class during the teaching process. It enhances the relationship between teachers and learners. It enhances learner's interest in learning in class. It enhances learners' assimilation rate during the teaching process. It reduces learners' phobia of academic learning. Furthermore, it increases learners' attendance in class during the teaching process. Based on findings from previous literature, Situmorang (2022) submitted that reinforcement use by teachers during the teaching process significantly affects pupils' performance in mathematics in primary school. Still, they opined that an effective education process depends on the learning behaviour of pupils in a classroom environment. They added that pupils' learning behaviour is a grave concern to all stakeholders in the education sector, especially teachers as it has a tremendous influence on the academic performance in mathematics of pupils. Also, Pajarillo-Aquino (2019) concurred that reinforcement use by teachers during the teaching process significantly affects pupils' academic performance in mathematics. It added that teachers recognize the effects of reinforcement used by teachers as a learning motivation for children which makes it an essential condition upon which learning is dependent. That is why teachers employ different strategies to deal with the problems in pupils' learning behaviour directly with the use of reinforcement.

Research question 2 asked what the effect of retention on pupils' performance in mathematics at the primary school level is. It was revealed that 68.8% of the respondents strongly believed it has a positive effect while 31.2% had disbelief. The analysis using the low response of 68.8%, concluded that retention significantly affects pupils' academic performance in mathematics in primary schools. The analysis further observed that retention contributes to lower pupils' self-esteem which invariably affects academic performance in mathematics. It also contributes to higher levels of stress among pupils which invariably affects academic performance in mathematics. It contributes to pupils skipping tests and examinations which invariably affect academic performance in mathematics. It disrupts pupil's relationship with other pupils which invariably affects academic performance in mathematics. In the same light, it negatively affects the teacher-pupil relationship which invariably affects academic performance in mathematics. Equally, there is an increased lack of concentration in class during teaching. It contributes to pupils' low interest in learning. Furthermore, it contributes to pupils' poor attendance in class. Based on findings from previous literature, Muhammad Fuad, Edi Suyanto, and Ulul, (2021) indicated that

students' academic achievement in mathematics in primary school is significantly impacted by retention. It was also stated that using punishment in the classroom to get students to pay attention is a bad idea and inhumane. However, praise and other acts of recognition for students are better options and likely healthy indicators that give students a sense of security and belonging and inspire them to learn more. In addition, Mary et al. (2022) pointed out that spaced learning had a significant positive effect on pupils' interest and retention in mathematics. Equally, Muhammad Fuad, Edi Suyanto, and Ulul, (2021) submitted that retention often negatively influences the learning interest and academic performance in mathematics of primary school pupils. It was further added that the use of retention in a school environment is a negative approach to getting children to focus on class.

Research question 3 asked how pupils perceive the effect of retention on performance in mathematics. Pupils' perception revealed that retention contributes to lowering self-esteem which invariably affects academic performance in Mathematics. This conforms with the study of Mary et al. (2022) and Muhammad Fuad, Edi Suyanto, and Ulul, (2021) that retention affects the academic performance of pupils in mathematics.

Research question 4 focused on the perceptions of male and female pupils about the effect of retention on performance in mathematics. Findings revealed that no difference in the perception of male and female pupils about the effect of retention on performance in mathematics which authenticates the fact that there is a positive effect of retention on mathematics achievement. This contradicts the findings of Emenike, Godwin and Okezie (2022) which showed that male students have higher mathematics retention abilities than female students, this also manifested in their higher achievement in mathematics than female senior secondary school students.

Conclusion

From the discussion above, it was concluded that reinforcement used by teachers during the teaching process significantly affects pupils' performance in mathematics in primary schools. Subsequently, it was also observed that reinforcement helps pupils retain information for longer periods and apply what is being taught in class to their daily activities. It maximizes learners' performance in mathematics and sustains change for a lengthy period. Also, it helps learners solve complex problems that cannot be solved by conventional techniques. It improves communication between the teacher and the pupils in class during the teaching process. It enhances the relationship between

teachers and learners. It enhances learner's interest in learning in class. It enhances learners' assimilation rate during the teaching process. It reduces learners' phobia of academic learning. Furthermore, it increases learners' attendance in class during the teaching process. Retention significantly affects pupils' performance in mathematics in primary schools. Also, it was observed from the analysis that retention contributes to lower pupils' self-esteem which invariably affects performance in mathematics. It also contributes to a higher level of stress among pupils which eventually affects performance in Mathematics. It contributes to pupils skipping tests and examinations which invariably affect academic performance in mathematics. It disrupts a pupil's relationship with other pupils which invariably affects academic performance in Mathematics. In the same light, it negatively affects the teacher-pupil relationship which invariably affects academic performance in mathematics. Equally, there is an increased lack of concentration in class during teaching. It contributes to pupils' low interest in learning. Furthermore, it contributes to pupils' poor attendance in class. The study finally found that pupils have an excellent perception of the effect of reinforcement on performance in Mathematics in primary school; while believing that retention has a great effect on pupils' academic performance in Mathematics, it was also concluded that male and female pupils do not differ in their belief that reinforcement and retention exact positive effects on performance in Mathematics.

Recommendations

From the results of the study, the following recommendations were made:

1. Administrators should encourage teachers to acquaint themselves with positive verbal reinforcement techniques (general praise, ability praise & effort praise) which lead to learners' maintenance or repetition of the desired academic behaviours hence improving their academic performance in Mathematics.
2. The Ministry of Education, through curriculum developers should come up with the current teachers' reinforcement policies inclined to the improvement of learners' competence and performance in Mathematics.
3. Schools should practice positive reinforcement as much as possible because it causes desirable and quick changes in students' behaviour and avoid negative reinforcement because it causes unrest among students.

4. Teachers are advised to use humour, gestures, applaud and offer gifts to reward pupils who perform well academically. Apply retention by redesigning schools to give students more intensive learning opportunities through cross-grade grouping, give struggling students support and services as soon as they are needed, and apply retention to students' assessment to monitor and adjust teaching content and strategies to improve learners' performance in Mathematics.

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