Innovations

The Influence of Reward-driven Approaches in Learning Mathematics

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Abstract: *Students' academic performance is strongly tied to their ability to participate and confidently engage in learning. Although reward systems in education have been studied, more research is needed on how these systems specifically enhance learning among education students. This study aims to fill that gap by examining the influence of a reward-driven approach (RDA) on student learning, particularly in learning mathematics, grounded in Bandura's social cognitive theory and Fishbein's expectancy-value theory. Twelve (12) sixth graders participated in this descriptive case study using purposive sampling. Data were collected through focus-group discussions and analyzed thematically. The findings showed that RDA positively influences student motivation, commitment, and participation during mathematics discussions. Key outcomes included increased classroom interaction, enhanced collaboration, and improved academic focus. Ethical concerns and a lack of learning interest in RDA were noted despite these benefits. This study offers valuable insights into how reward-driven approaches can enhance student learning in mathematics by improving academic performance. Additionally, it encourages the academic community to adopt more creative and innovative teaching strategies, fostering an environment that further boosts student engagement and academic success in mathematics. By integrating these approaches, educators can develop more effective teaching methods that motivate students and lead to measurable improvements in their overall performance in mathematics.*

Keywords: *reward-driven approaches; learning mathematics; focus-group discussion; thematic analysis; descriptive case study*

Introduction

Many countries teach mathematics worldwide, and it is frequently included as a core subject in the school curriculum [1]. However, students may need help developing their mathematical skills due to needing more motivation, limited exposure to computing numbers outside the classroom, and low confidence. Traditional methods of instruction may only sometimes be effective in addressing

these challenges; therefore, it is necessary to investigate novel approaches to improve students' ability to improve their mathematics skills. One potential strategy is a reward-driven approach, which provides students with incentives or rewards for achieving specific numeracy skill goals. Rewards can be in various forms, such as stickers, tokens, or points [2]. They can be given to complete mathematics assignments, participate in activities, or demonstrate improved mathematics skills.

A reward-driven approach can motivate students to engage actively in mathematics activities and provide them with immediate feedback and reinforcement for their efforts. According to research, a reward-driven approach has effectively enhanced students' motivation and engagement in learning activities [3]. Students can experience a boost to their sense of self-worth, an increase in their intrinsic motivation, and reinforcement of positive behaviors when rewarded for their achievements. A reward-driven approach can incentivize students to practice their mathematics skills actively and build their confidence regarding computing and numeracy in real-world situations. This strategy can encourage students to practice and actively build their mathematics skills.

Globally, math is hard to learn among most students of various countries, making a teacher's job formidable [4]. As basic mathematical skills are meant to be obtained in school, teachers have to adopt suitable teaching approaches, and a suitable one is the reward-driven approach. Grounded on Bandura's Social Cognitive Theory, the approach involves the tenets of social influences, self-efficacy, and observational learning to shape behavior [5]. The reward-driven approach positively influences students' perceptions of their ability to perform mathematics, and consequently, they should have better performance outcomes. In addition, Atkinson's Expectancy-Value Theory states that students' expectations of succeeding in a task determine their motivation and engagement [6]. In mathematics learning, the reward-driven approach can give students more confidence, motivation, and engagement to achieve better results.

As mathematics has become the dominant subject in international numeracy, students must develop solid mathematics skills early. As a result, it is necessary to determine whether the implementation of a reward-driven approach, such as providing incentives or recognition, can enhance the mathematics skills of students where it seeks to measure the influences of the reward-driven approach on various aspects of mathematics, including solving problems critically which includes basic skills such as addition, subtraction, multiplication, and division.

In the Philippines, through DepEd Order No. 284, s. In 2023, the Department of Education ensures that learners are continually assessed in mathematics, particularly at primary levels [7]. Of greater importance, under Republic Act No. 10533, or the Enhanced Basic Education Act of 2013, mathematics is indicated as one of the critical components constituting the K to 12 primary education curriculum. This law

underlines the necessity of quality mathematics instruction for preparation for higher education and better employability [8]. These steps further emphasize and entrench the value of mathematics as one of the key learning areas in the K-12 curriculum.

Mathematics is a fundamental skill every student must acquire during their educational journey. It serves as a means through which learners can exchange ideas and knowledge, fostering engagement with peers and teachers within the classroom's confines. Carey [9] notes that effective solving hinges on addressing foundational challenges. Therefore, it becomes imperative for teachers to play an active role in encouraging students to share their ideas and articulate their thoughts. Indeed, to thrive and adapt in our rapidly changing world, students must acquire computing skills in mathematics to convey their thoughts and answer questions effectively. Numerous researchers have underscored that mathematics is a universal tool for connecting people across the globe as it is aligned with the SGD 14, which promotes quality education.

Teaching mathematics presents a unique challenge for teachers, as they must instill confidence in students to express their ideas and knowledge by sharing how to solve problems effectively. In line with this, one of the challenges teachers encounter is a need for more motivation to develop practical mathematics skills, as identified by [10].This study aimed to examine the influence of a reward-driven approach on the mathematics learning of education students during the School Year 2023–2024. Specifically, the research sought to understand students' perceptions of the efficacy of this approach in their learning process. Additionally, it explored the positive and negative influences of using a reward-driven approach in learning mathematics. The study aimed to provide a balanced view of how these approaches can enhance motivation and engagement while identifying potential drawbacks that may hinder long-term learning outcomes.

According to a study by Miranda and Wahyudin [11], several challenges impact mathematic skills, especially when the learners need more interest. These challenges often revolve around the students' willingness to engage and the environment they are immersed in [12]. As Arini and Wahyudin [13] affirm, the ability to solve critically is pivotal for expressing thoughts and ideas and fostering interactions with diverse individuals. Consequently, learning basic skills in mathematics is vital. Additionally, Al-Eiadeh et al. [14] underscore the significance of mathematics as an essential subject area for computing, emphasizing the need for its continuous development and practice.

Several studies have shown that reward-driven approaches can positively influence students' motivation, engagement, and performance in mathematics. For instance, Vygotsky's sociocultural theory suggests that external rewards, such as praise, stickers, or tokens, can facilitate learning by creating a positive learning environment and increasing learners' motivation to participate in activities [15]. This

context can be particularly effective in students and may require additional motivation to engage in mathematics activities. Additionally, research has shown that rewards can reinforce positive behaviors and create a sense of achievement and accomplishment, boosting students' self-esteem and self-efficacy [16]. This can be important in developing mathematics skills, as students need to feel confident and competent in solving [17].

Furthermore, studies have shown that incorporating gamification elements, such as points, badges, or leaderboards, into reward systems can enhance students' motivation and engagement in language learning [18]. Gamification is particularly effective in engaging young learners, as it taps into their natural inclination towards play and competition [19]. Moreover, the literature review highlights the importance of designing a well-structured and meaningful reward-driven approach that aligns with students' particular interests and needs. For instance, rewards should be relevant and meaningful to students, such as providing opportunities to practice mathematics skills in real-life situations, receiving feedback on their progress, or engaging in meaningful interactions [20].

However, a reward-driven approach should be implemented carefully to avoid potential adverse effects, such as overreliance on external rewards, reduced intrinsic motivation, or the development of an extrinsic reward orientation. Therefore, it is essential to balance extrinsic and intrinsic motivation strategies to ensure students develop a genuine interest and intrinsic motivation toward mathematics skills [21].Reward-driven approaches are essential in capturing a student's interest in learning mathematics. When students are genuinely interested, they can more readily overcome their challenges, and their enthusiasm for learning becomes evident [22]. The reward systems' potential effect on students is an effective strategy to enhance mathematics skills. It supports using rewards to motivate and engage students, reinforce positive behaviors, and create a positive learning environment [23]. Similarly, Nazarov [24] concurs that motivation through a reward-driven approach is effective in piquing students' interest in learning a subject, especially in the case of mathematics when they are striving to calculate and share their ideas effectively.

According to Kotera et al. [25], motivating a reward-driven approach can influence academic success and foster a sense of self-fulfillment by motivating students to share and participate in their ideas in the classroom. Kotera et al. [26] noted that motivated students demonstrate enthusiasm and eagerness to complete their school requirements effectively. Kotera and Ting [27] have similarly affirmed that a reward-driven approach can be essential in encouraging students to achieve more, thus contributing to their academic success and personal fulfillment. Therefore, the teacher can further facilitate this strategy to ensure successful implementation,

capturing the students' interest and encouraging them to express and share their ideas and knowledge effectively.

However, it also emphasizes the need to design a well-structured and meaningful reward-driven approach that aligns with student's specific needs and interests and balances extrinsic and intrinsic motivation strategies. Further research and empirical studies are needed to explore reward systems' effectiveness and long-term influence on learning mathematics skills among students.

Method

2.1. Research design

A single descriptive case study [28] is a research technique used to thoroughly examine a specific person or unusual circumstance. The research design is among other data collection techniques; detailed information about the investigated case is gathered through interviews, observations, and document analysis. The objective is to offer a thorough case analysis, frequently concentrating on a particular issue or problem.

2.2. Research participants

Twelve (12) sixth graders participated in this research study, selected through purposive sampling based on specific criteria, such as officially enrolling in the School Year 2022–2023. To ensure meaningful engagement, participants were provided encouragement and motivational support during their Mathematics classes. Participation was voluntary, with students willingly joining the case study and demonstrating their interest and commitment to the research process.

2.3. Research instrument

In-depth interviews were used in this study because they allow for in-depth exploration of a participant's experiences, attitudes, and perspectives through focus group discussion between the researcher and the participant. Researchers conduct interviews with smaller groups to better understand a topic or problem. The researcher takes on the facilitator's role, steering the conversation and prodding people to share their experiences. Participant observation in their everyday settings (home, school, community) is another crucial component of observational notes. Researchers can record notes, audio, or video during planned or impromptu observations. These research tools are used in qualitative research to collect in-depth information that can be dissected for recurring patterns and themes.

2.4. Data Analysis

Thematic analysis [29] is a qualitative method utilized to identify and analyze patterns and themes within data. It systematically codes and categorizes data to

identify common themes, patterns, and trends. The process of thematic analysis typically involves the following steps: 1) familiarization with the data: researchers become familiar with the data by reading and re-reading it to understand the content. 2) generating initial codes: Researchers identify meaningful and relevant sections of the data and assign codes to them to capture the essence of the information. 3) searching for themes: Researchers review the codes and group them into potential themes based on their similarities. 4) reviewing themes: Researchers review and refine the themes to ensure they are meaningful and coherent. 5) defining and naming themes: Researchers define and name the themes based on their content. 6) producing the report: Researchers present the themes and supporting evidence in a report, which may include quotes or examples from the data. Thematic analysis is used in the study to gain insights into people's experiences, attitudes, and beliefs.

2.5. Ethical considerations

Qualitative research involves human subjects, so ethical considerations must be considered throughout the research process. The participants were given informed consent by their parents to voluntarily participate in the study and assent consent to willingly participate in the said study. Participants were fully informed about the study's purpose, procedures, potential risks, and benefits. They were allowed to ask questions and decide whether they wanted to participate or not. Participants' privacy was respected, and their personal information was kept confidential.

O'Connor and Joffe [30] stress the importance of ensuring trustworthiness in a study, which is achieved through maintaining high credibility and confidence in the interpretation and methods employed to guarantee the study's quality. Therefore, the researcher should ensure that their data is stored securely and only accessible by authorized personnel. Also, participants should have the option to remain anonymous if they wish, and their personal information should not be revealed in any publication or presentation. Researchers should respect participants' autonomy, culture, and beliefs. They should avoid coercion or undue influence and maintain a professional and respectful relationship with participants. After the study, participants should be debriefed about the purpose and findings of the research. They should also be provided with resources and support if they have concerns or negative feelings about participating. Data management ensures that their data is managed appropriately and by relevant regulations. They should also be transparent about their data-sharing practices and seek participants' permission before sharing their data.

Results and Discussion

Theme 1: catalyst of reinforcement

In this digital age, one challenge teachers face is maintaining focus and motivation among their students in the classroom. This generation is naturally inclined towards a more motivated learning environment. According to the study by Muhammad Fuad et al. [31], rewards can motivate and reinforce students. Consequently, educators often employ motivational tactics, including reward-driven approaches like ribbons, small tokens, and words of praise. These initiatives inspire students to remain engaged and dedicated to their studies, ultimately fostering academic success. Ahmad, Bibi, and Imran [32] emphasized that strong reinforcement significantly affects learners' academic performance.

Whenever I give her the correct answer, my teacher gives me a ribbon, so I always feel motivated to participate in our class. (P3)

My classmates and I love the prizes our teacher gives us because we ensure that we always participate and be active in our subjects. (P10)

This account emphasizes that teachers' reward-driven approaches significantly enhance student engagement, leading to academic success. These approaches' influence on learning mathematics fosters an interactive classroom environment where students are encouraged to participate, resulting in increased motivation. Moreover, the catalyst of reinforcement provided by reward-driven methods can transform students' perceptions, demonstrating that learning mathematics can be fun.

Theme 2: maneuver of academic success

Teachers find it gratifying to play an essential role in guiding their students through their academic journeys, employing many effective strategies. Among these strategies, one that stands out is offering reward-driven approaches to students. When executed thoughtfully, reward-driven approaches can yield positive outcomes and catalyze students' success. It motivates learners and instills a sense of eagerness and determination to complete their school tasks efficiently and effectively [33]. Implementing a well-structured rewards-drive strategy can significantly influence the student's learning experience in the educational landscape. It creates an environment where learners are not just passively participating but actively engaging in the educational process. As students are acknowledged and rewarded for their efforts, they develop a strong commitment and enthusiasm towards their studies. Armani et al. [34] agreed that it leads to a more vibrant and dedicated learning community where academic success becomes an achievable and celebrated goal.

I always study our lessons because our teacher will give us something, especially when we get a passing score. (P7)

I always listen to our teacher since I am happy when I can get a reward from our teacher. It makes us happy and also makes our scores high. (P2)

The participants' statements illustrate how reward-driven approaches influence their academic performance in learning mathematical concepts. These approaches help students become more academically prepared and attentive during discussions, leading to better retention and higher scores in mathematics assessments. Consequently, implementing reward-driven strategies contributes to an overall increase in academic success.

Theme 3. intensive classroom engagement

When a teacher strives to create an engaging classroom environment, she devises a strategy that encourages her students to become more active and productive participants, leveraging the power of rewards and recognition. These thoughtful initiatives inspire students to give their utmost effort during classroom activities, enabling them to attain outstanding results in pursuit of the rewards or recognition they desire within the classroom setting. This approach fosters positive feedback loops, enhancing student engagement with classroom tasks and resulting in excellent scores upon completion. Thus, the level of engagement exhibited by learners is contingent upon their individual goals, as articulated by Hickey et al. [35]. Learners may become more productive or choose a different path depending on their objectives.

My classmates and I love the prizes our teacher gives us because we ensure that we always participate and be active in our mathematics subjects. (P1)

I always share my ideas with our classmates during our discussion because when I share my ideas,

our teacher says, very good to me. (P12)

This suggests that reward-driven approaches encourage students to share their ideas and participate actively in classroom activities. These strategies promote student engagement and attentiveness, fostering a more dynamic and interactive learning environment. Although mathematics is often challenging, this approach enhances students' performance by motivating them to engage more deeply and participate in ways that suit their learning styles, ultimately creating a more engaging and practical classroom experience.

Theme 4: enhance productive collaboration

A reward system can also foster stronger rapport among students during group activities. This approach encourages students to actively contribute their ideas and share the knowledge they acquire, all to achieve favorable outcomes in their group presentations. This reward system empowers individuals to set goals, clearly communicating their desired recognition based on their efforts. As this strategy

significantly influences student participation, it ensures that each individual has valuable contributions to make in order to excel in their school tasks. Yu et al. [36] concurred that collaboration involves knowledge sharing and significantly boosts active participation among diverse learners.

I always share my ideas with my classmates during our discussions because when I share my ideas,
our teacher says perfect things to me. (P12)
During our group activities, we saw that everyone gave his opinion to prepare our presentation well to get the best group or to have a number output for the grade and reward. (P5)

Reward-driven approaches foster camaraderie among students by encouraging collaboration and the sharing of ideas. This strategy not only motivates students to engage with one another but also promotes mutual support in the pursuit of academic excellence. By working together towards a common goal, students are inspired to achieve their best, knowing their efforts will be recognized and rewarded. This approach boosts productivity, as students are motivated by peer encouragement and the tangible incentive of rewards. As a result, they are more likely to excel academically, earning good grades while benefiting from the positive reinforcement of rewards.

Theme 5: ethical dilemmas

Every teacher aspires to create an engaging and productive classroom environment throughout their teaching career. However, the absence of control over classroom attitudes can distract other students from concentrating on listening and collaborating. While rewards and recognition are valuable strategies, if not managed effectively, they can inadvertently foster uncontrollable behavior among students, ultimately undermining the positive classroom atmosphere. As Ross [37] clarified, rewards and praise do not guarantee that students will persist in exhibiting positive behavior without ongoing incentives, nor do they necessarily instill lifelong learning in their behavior and manners. This may result in some students becoming disengaged and uncooperative due to the disruptive conduct of their peers.

I wouldn't say I like it when my classmates shout during class discussions because they want the prize
from our teacher. (P6)
My other classmates only do our activities because they want the ballpen and candies our teacher
gives those answering. They are not waiting for their turns. (P9)

This type of behavior, where some students become overly aggressive in pursuit of rewards, can create an uncontrollable classroom environment and negatively influence the behavior of others. It highlights that some students may only

participate for the reward, leading to a lack of consistent, genuine engagement. This can be a detrimental effect of the reward-driven approach, as it may shift students' focus from meaningful learning to aggressive competition. Instead of patiently waiting their turn and engaging thoughtfully during mathematics lessons, students may prioritize winning rewards over proper classroom conduct, undermining the learning process.

Theme 6: lack of learning interest

Students are inspired to listen and study their lessons once the teacher gives them additional points or recognition and reward. Nevertheless, it is no good if students do it only for the rewards without being willing to do it. The absence of voluntarism and willingness due to not rewarding them is not a manifestation of the positive effect on the student's performance. This leads the student to be dependent only on the rewards they receive from their teachers. Inconsistency of behavior during the absence of rewards must be given attention by the teachers so that they can handle it properly and maintain the willingness of students to study. Baker [38] concurred that rewards cannot guarantee students' sustained good behavior, and one cannot insist on their willingness to exhibit such behavior.

I only show perfect behavior if I can receive a reward. (P11)

When the teacher forgot the prices at home, I did not feel like participating well during our discussion; sometimes, it was boring and not challenging. (P4)

This implies that students focus and show interest in learning mathematics primarily when a reward is offered. In this reward-driven approach, the true essence of learning takes a backseat, as students prioritize the reward over the knowledge itself. While the intention behind offering rewards is to enhance learning skills, especially in mathematics, over-reliance on this method can diminish its effectiveness. Excessive use of rewards can undermine their value, shifting the focus away from mastering mathematical concepts and toward simply earning rewards. This can ultimately weaken students' intrinsic motivation and the long-term benefits of learning.

Conclusion

This study focused on the influence of a reward-driven approach in learning mathematics of 6th graders. The methodology involved assessing students' perspectives and identifying the positive and negative influences of the rewards system in this context. The results revealed that students generally view the rewards system as a source of motivation and commitment, particularly in pursuing academic success. Positive influences were observed regarding active classroom engagement and effective collaboration with peers and teachers. However, negative influences were also apparent, particularly in students' behavior when rewards were not in play.

It became evident that more than the rewards system is needed to guarantee sustained behavior change in the classroom. Indeed, while the rewards system can contribute to creating a positive classroom atmosphere, it should be seen as something other than a solution that yields lifelong results. Consequently, teachers must monitor the implementation of the reward-driven approach effectively and ensure it is not abused. Instead, it should be utilized to encourage and cultivate positive behavior and attitudes in students throughout their academic journey.

Furthermore, researchers are encouraged to explore the various motivation types, specifically intrinsic and extrinsic, and their potential influence on students' academic performance and behavior. Additionally, it is recommended to investigate the impact of school-wide motivation on students' behavior and academic achievements, as educators can play an essential role in facilitating such research endeavors. Lastly, future researchers should consider examining how the reward-driven approach can affect the teaching processes employed by educators.

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