

# Creativity in Learning Mathematics for Elementary School Students Who Are Taught by Using Number Guessing Games in Story Problems

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## Abstract

The objective of this study was to examine the effects of incorporating number guessing games into mathematics instruction at the elementary school level. The main aims of this study were to evaluate the impact of these games on student engagement, problem-solving abilities, creativity, and the perception of mathematics as a practical and pertinent discipline. The study utilized a qualitative methodology. The collection of qualitative data was conducted by means of interviews with both students and teachers in order to gain insight into the influence on creativity and the perception of mathematics. The findings of this study revealed a noteworthy and constructive influence on student engagement, problem-solving abilities, creativity, and the perception of mathematics as a pragmatic and pertinent discipline. The incorporation of number guessing games has not only resulted in an augmentation of student engagement and enthusiasm, but has also served to bolster their aptitude for problem-solving and fostered the cultivation of creative thinking skills. The students demonstrated an awareness of the pragmatic significance of mathematics, thereby enhancing its accessibility and applicability in their everyday experiences. The results indicate that the integration of gamification into elementary mathematics education holds promise for fostering a more captivating and efficacious learning atmosphere, thereby carrying significant implications for pedagogical practices and policy considerations.

**Keywords:** Creativity in Learning, Mathematics, Elementary School.

## INTRODUCTION

Within the domain of education, mathematics education occupies a crucial and central role, serving as the fundamental basis for students' academic progression. At the elementary school level, mathematics plays a fundamental role in the development of students' mathematical comprehension, problem-solving proficiencies, and critical thinking aptitudes. The importance of mathematics education at this particular stage cannot be emphasized enough, as it not only provides students with practical skills applicable to their everyday

lives, but also promotes cognitive growth, logical thinking, and creative abilities. Within this initial section, we shall explore the intricate importance of mathematics education within the elementary level, emphasizing its profound influence on personal growth, societal advancement, and forthcoming academic and professional opportunities.

The field of mathematics education in primary schools establishes the fundamental knowledge and comprehension of numerical concepts, geometric shapes, and patterns. This serves as a crucial basis for the development of more

advanced mathematical principles in subsequent stages of education (Gray et al., 1999). The principles and proficiencies obtained during this formative period serve as the foundational elements for more advanced mathematical disciplines, including algebra, geometry, and calculus (Cohen, 1995). These fundamental skills go beyond simple numerical manipulation; they play a crucial role in the cultivation of problem-solving capabilities, logical reasoning, and the ability to think analytically. By acquiring proficiency in these fundamental skills, students are equipped with enhanced readiness to confront the intricacies of advanced mathematical concepts that they will inevitably encounter in subsequent academic pursuits.

Mathematics is not merely an abstract and isolated discipline, but rather a practical and essential component of our everyday existence (Atallah, 2003). Mathematics plays a crucial role in various aspects of our daily lives, ranging from the management of personal finances to the adjustment of recipes in the kitchen or the calculation of travel distances. The provision of mathematics education at the elementary school level equips students with fundamental skills that are crucial for their effective navigation of the real world.

Fundamental mathematical operations, namely addition, subtraction, multiplication, and division, are essential for various practical applications such as budgeting and financial planning. Having a solid understanding of percentages and ratios enables individuals to make well-informed decisions pertaining to their purchases, investments, and savings. Moreover, the proficiency to analyze and interpret data and statistics plays a crucial role in assisting individuals in comprehending information encountered in the media, thereby empowering them to make well-informed decisions and actively engage in a society that relies on data (Loukissas, 2019). Another crucial aspect of mathematics education at the elementary level pertains to its role in cultivating problem-solving abilities. As stated by Yerushalmy (2000), the process of mathematical problem-solving entails the examination of intricate scenarios,

deconstructing them into more manageable elements, and employing mathematical principles in order to derive solutions. These skills have a broader application beyond the confines of the mathematics classroom and are essential in tackling intricate challenges across various domains of life.

Elementary school education fosters the development of critical and creative thinking skills by exposing students to a wide range of mathematical problems. It fosters a mindset among students that promotes the adoption of open-mindedness, the exploration of various problem-solving strategies, and the cultivation of perseverance in the face of challenges. The practice of problem-solving in mathematics not only offers a systematic method for tackling challenges but also imparts students with versatile skills that can be applied to various real-world scenarios (Szabo et al., 2020). The field of mathematics education involves the active engagement of students in cognitive processes that serve to stimulate the development of the brain. The act of solving mathematical problems engages various cognitive processes, including working memory, attention, and executive functions. These cognitive processes play a significant role in cognitive development and academic performance across different subjects (Titz & Karbach, 2014).

The utilization of mathematical reasoning in education fosters the development of logical thinking, the establishment of connections between various concepts, and the formulation of conclusions that are grounded in empirical evidence. These cognitive abilities transcend the realm of mathematics, yielding significant consequences for overall scholastic accomplishment and problem-solving proficiencies across diverse disciplines.

Furthermore, mathematics, notwithstanding its renowned reputation for its rigorous rules and precision, offers abundant opportunities for creative expression and intellectual investigation. The provision of mathematics education at the elementary school level facilitates the opportunity for students to engage in the exploration of patterns, shapes,

and numerical relationships, thereby cultivating a mindset conducive to innovative thinking.

Creativity within the realm of mathematics encompasses the exploration and identification of inventive methodologies to address problems, establishing connections between seemingly disparate concepts, and engaging in non-conventional modes of thinking. Elementary school mathematics education cultivates creative thinking in order to equip students with the necessary skills to navigate the complexities of a dynamic society, characterized by a constant state of change. In this context, the ability to generate innovative solutions and adopt fresh perspectives holds significant importance.

The importance of mathematics education in elementary schools has far-reaching implications for future academic and career opportunities (Ma, 2010). Possessing a robust mathematical basis provides individuals with access to advanced educational prospects and a diverse array of professional trajectories. A profound comprehension of mathematics is required in various disciplines, encompassing science, technology, engineering, and mathematics (STEM). Individuals who demonstrate exceptional aptitude in the field of mathematics during their early educational years are more inclined to pursue advanced coursework in secondary school and higher education, subsequently paving the way for professional endeavors in engineering, computer science, finance, and other highly remunerative and intellectually stimulating domains. The field of mathematics education not only serves to enhance students' academic abilities, but also serves to expand their perspectives and increase their range of career opportunities.

In an era characterized by rapid societal transformations, wherein technology, data, and scientific progress assume critical significance, possessing a strong basis in mathematics becomes indispensable. The proficiency in comprehending and manipulating numerical data, making well-informed decisions, and resolving intricate problems is of utmost importance in tackling worldwide challenges,

ranging from climate change to matters concerning public health.

The field of mathematics education at the elementary level serves as the foundation for cultivating essential skills such as critical thinking, data literacy, and problem-solving. It equips students with the necessary knowledge and skills to become well-informed and engaged members of society, capable of making meaningful contributions towards addressing the urgent challenges of our era.

In addition, mathematics education assumes a crucial role in mitigating educational disparities and bridging the achievement gaps. Ensuring the provision of high-quality mathematics education at the elementary level is imperative in order to guarantee equitable access to essential knowledge and skills for all students, irrespective of their socio-economic background. By placing emphasis on the implementation of effective pedagogical approaches, individualized instruction, and timely interventions, the domain of mathematics education in elementary schools has the potential to mitigate disparities and foster equal opportunities for students from various socio-cultural backgrounds to achieve excellence in mathematics.

The significance of mathematics education in elementary schools cannot be overstated, as it plays a crucial role in the development of individuals, acquisition of practical life skills, enhancement of cognitive abilities, fostering creativity, shaping future academic and career opportunities, addressing global challenges, and mitigating educational disparities. It functions as the fundamental basis upon which the structure of mathematical comprehension and problem-solving abilities is built. By acknowledging the importance of mathematics education during this pivotal phase, we can empower students to achieve academic excellence, engage in critical thinking, and make meaningful contributions to society. The objective of this research endeavor is to investigate the influence of number guessing games on the improvement of mathematics education. This study acknowledges the significant role that mathematics education

plays in fostering the intellectual development of young individuals and shaping their future prospects.

Within the domain of mathematics education, the integration of number guessing games into narrative-based problems presents a multitude of benefits. These educational games enhance enthusiasm and involvement in the process of learning, thereby converting mathematics into a pleasurable and stimulating endeavor for students. The interactive and gamified characteristics of these activities effectively engage students, fostering their intrinsic motivation to actively engage in the learning process.

The engagement in number guessing games fosters the cultivation of essential problem-solving abilities within a framework that encourages creativity. Students are encouraged to engage in the analysis, strategic planning, and application of mathematical concepts, thereby cultivating a more profound comprehension of the subject matter. This approach not only enhances individuals' problem-solving abilities but also equips them with practical skills that can be applied to real-life situations.

Furthermore, these games facilitate the development of creativity and divergent thinking, in addition to enhancing problem-solving abilities. Students are strongly encouraged to engage in the exploration of diverse methodologies, conduct experiments utilizing a range of strategies, and employ innovative thinking in order to arrive at solutions. The prioritization of creative thinking is crucial for fostering innovative and adaptable approaches to problem-solving, a skill set that transcends the boundaries of the mathematics classroom. Participating in number guessing games also contributes to the improvement of cognitive development. These activities serve to stimulate cognitive processes, thereby engaging and enhancing working memory, attention, and executive functions. Consequently, students undergo enhancements in their comprehensive cognitive development, thereby potentially yielding

superior academic achievements not only in mathematics but also in diverse disciplines.

The engagement in number guessing games can exert a substantial influence on the self-assurance of students. Effectively maneuvering through these educational activities cultivates a feeling of achievement and enhances students' self-confidence in their mathematical aptitude. The newfound confidence exhibited by individuals can have a broader impact beyond the realm of mathematics, as it can significantly influence their inclination to actively engage in their educational pursuits and confront various other challenges. Moreover, these games frequently replicate real-world situations, thereby illustrating the pragmatic implications of mathematical principles. Through the integration of mathematical principles into practical scenarios, number guessing games serve as a valuable tool for fostering students' comprehension of the subject's applicability in their everyday experiences. This pedagogical approach effectively tackles a prominent obstacle encountered in the realm of mathematics education.

The nature of number guessing games is inherently motivational due to the presence of clearly defined objectives, challenging tasks, and potential rewards. Students are motivated to dedicate their time and effort to their mathematics education as they strive to attain success within the educational games. This motivation has the potential to result in a higher level of consistent and enthusiastic involvement with the subject matter. Participating in pleasurable and interactive activities, such as games involving the guessing of numbers, has the potential to enhance the retention of mathematical concepts. Engaging in active participation during the learning process and employing mathematical principles within a gaming framework serves to reinforce comprehension and enhance memory retention. These games have the potential to be modified for group activities, thereby promoting social interaction and fostering collaboration among students. Collaborating on mathematical endeavors not only enhances comprehension, but also fosters the development of effective communication and teamwork abilities. The

incorporation of number guessing games is in accordance with the overarching pattern of educational innovation. Through the utilization of technology and the implementation of gamification strategies, these educational games exemplify a paradigm for forthcoming pedagogical approaches, with the potential to significantly influence the field of education as a whole.

## METHODS

The research design employed in this study adhered to a qualitative methodology, with the objective of investigating and comprehending the experiences, perceptions, and attitudes of elementary school students and teachers in relation to the incorporation of number guessing games within mathematics education. The study utilized qualitative research methods to gather and analyze data in a comprehensive and contextualized manner. The utilization of data collection In order to obtain a comprehensive understanding of the role of number guessing games in mathematics education, a series of in-depth interviews and semi-structured interviews were conducted with elementary school students and teachers. These interviews aimed to gather valuable insights into their personal experiences and perspectives regarding the utilization of number guessing games as a pedagogical tool in the context of mathematics learning. The utilization of open-ended questions was employed as a means to facilitate the participants in freely articulating their thoughts and perspectives. The following observations were made. The study involved conducting classroom observations to examine the dynamics and interactions that occurred during mathematics lessons that incorporated number guessing games. This facilitated a direct comprehension of the manner in which students interacted with the games and the manner in which teachers facilitated the activities. The research design employed in this study adhered to a qualitative methodology, with the objective of investigating and comprehending the experiences, perceptions, and attitudes of both elementary school students and teachers in

relation to the incorporation of number guessing games within the context of mathematics education. The utilization of qualitative research methods facilitated the collection and analysis of data in a comprehensive and contextualized manner. Semi-structured interviews were undertaken with elementary school students and teachers in order to acquire valuable insights pertaining to their encounters with number guessing games within the context of mathematics education. The utilization of open-ended questions was employed to facilitate the participants in freely articulating their thoughts and perspectives. A series of classroom observations were conducted in order to examine the dynamics and interactions that occurred during mathematics lessons featuring the integration of number guessing games.

## RESULTS AND DISCUSSION

### Enhanced Engagement

"I actually look forward to math class now because of the games. It's not boring anymore."

"Their enthusiasm during the games is palpable. They're excited about math."

The data reflects a strong theme of enhanced student engagement. Students expressed anticipation and enthusiasm for mathematics classes that incorporated number guessing games. Teachers observed a noticeable increase in student excitement during these activities, indicating that the games successfully engaged students in the learning process.

### Improved Problem-Solving Skills

"The games make us think differently. We have to try different ways to guess the number, so it's like a puzzle."

"Students are becoming more strategic in their thinking. They're applying problem-solving techniques."

The data suggests that number guessing games stimulate improved problem-solving skills among students. Participants noted that the games encouraged students to approach

mathematical challenges differently and employ various problem-solving strategies. Teachers observed a shift in students' thinking patterns toward more strategic and analytical problem-solving.

#### Fostering Creativity

"Sometimes I come up with really creative ways to guess the number, like using patterns and logic."

"They surprise me with their creative approaches. It's not just about numbers; it's about how they think."

The data highlights the role of number guessing games in fostering creativity in mathematics. Students reported using creative approaches, such as pattern recognition and logical thinking, to guess numbers. Teachers emphasized that students' creativity extended beyond numerical aspects, demonstrating innovative ways of thinking.

#### Overall Impact on Mathematics Learning

"I used to find math hard, but now I feel more confident. The games make it easier to understand."

"Mathematics has become more accessible to everyone. It's not just for the 'math kids' anymore."

The data indicates an overall positive impact on mathematics learning. Students reported increased confidence and reduced difficulty in understanding math, while teachers emphasized the inclusive nature of number guessing games, making mathematics accessible to a broader range of students.

#### Integrating Real-World Relevance

"We use math in the games, but it's like real life, you know? It's not just numbers; it's like solving problems."

"The games help students see math as a practical tool. They realize it's not just a school subject."

The data indicates that number guessing games serve to underscore the practical significance of mathematics. The students acknowledged that

the games exhibited a resemblance to real-life problem-solving scenarios, thereby offering them a concrete framework within which to grasp mathematical concepts. Educators emphasized the change in students' perspectives regarding the significance and applicability of mathematics.

The aforementioned data and explanations serve to illustrate the primary themes that have arisen from the qualitative data analysis. The incorporation of number guessing games within the realm of mathematics education has yielded favorable outcomes in terms of student engagement, problem-solving aptitude, creativity, overall mathematical comprehension, and the perception of mathematics as a pragmatic and pertinent discipline. The qualitative findings offer significant insights regarding the potential advantages of incorporating these games within the educational setting.

The findings of this research, which explored the impact of incorporating number guessing games in mathematics education at the elementary school level, align with previous research on gamification in education and its effects on student engagement and learning outcomes.

#### Discussion

The results of this study provide evidence to support the perspective that the incorporation of number guessing games within the context of mathematics instruction can effectively increase student involvement, which is consistent with the research conducted by Anderson et al. (2010). Educators have the potential to perceive this as a valuable occasion to investigate inventive pedagogical approaches that leverage students' inherent motivation and enthusiasm. The present study demonstrates that number guessing games have a beneficial effect on problem-solving abilities and creativity. These findings align with the outcomes of a meta-analysis conducted by Johnson and Johnson (2002). Educators ought to contemplate the integration of gamified components into their pedagogical approaches

in order to cultivate creativity and enhance students' problem-solving proficiencies.

The acknowledgment of mathematics as a pragmatic and pertinent instrument, as observed by the participants in this research, highlights the significance of incorporating real-life situations into the teaching of mathematics. This discovery provides support for the notion that the incorporation of practical applications can enhance the accessibility and significance of mathematics for students. The research presented herein highlights a notable change in students' attitudes towards mathematics, which holds the potential to exert a substantial influence on the promotion of inclusivity. Educators should strive to establish a conducive learning environment wherein every student, irrespective of their conventional mathematical aptitude, can develop a sense of self-assurance and competence in the subject matter.

The study highlights the necessity of pedagogical innovation. Educators ought to persist in the exploration of innovative pedagogical approaches and the integration of technology in order to foster captivating and efficacious learning encounters. The incorporation of number guessing games serves as an exemplification of the application of innovation within the realm of mathematics education. The favorable results of this study provide impetus for further investigation into the incorporation of gamification in the field of education. Further research can be conducted to explore the enduring effects of number guessing games on students' mathematical proficiency and their attitudes towards the discipline.

This study presents empirical evidence regarding the potential advantages of incorporating number guessing games into mathematics instruction, which is consistent with previous research on the implementation of gamification strategies in educational settings. The results emphasize the importance of improving student engagement, problem-solving abilities, creativity, and the practical applicability of mathematics. The implications for educators encompass the adoption of

innovative pedagogical approaches, the cultivation of inclusivity within the learning environment, and the fostering of students' self-assurance in the realm of mathematics. Furthermore, this study advocates for the need to conduct additional research in the field of gamification in education in order to advance the enhancement of teaching and learning methodologies.

The research findings have significant implications across multiple facets of the field of education. The incorporation of gamified elements, such as the inclusion of number guessing games, has the potential to greatly augment student engagement. This discovery serves as an impetus for educators to embrace inventive pedagogical approaches that leverage students' inherent motivation and eagerness. Furthermore, these gamified activities enhance learning outcomes by promoting problem-solving skills and stimulating creative thinking. Educators possess the potential to utilize these games as a means to augment problem-solving abilities and foster the development of creative thinking in students.

Acknowledging the practical significance of mathematics implies that mathematics education ought to incorporate practical applications and contextual elements. This approach enhances the accessibility and significance of mathematics for students, thereby illustrating its pertinence in their everyday experiences. The change in students' perspective on mathematics underscores the significance of inclusiveness within the realm of education. Establishing an inclusive educational setting that fosters a sense of confidence and competence among all students is of utmost importance.

The study further emphasizes the necessity for pedagogical innovation. Educators ought to investigate innovative pedagogical approaches and harness technological advancements in order to cultivate captivating and efficacious learning encounters, thereby enhancing the field of mathematics education. Further investigation is warranted to examine the enduring effects of gamified learning on students' mathematical proficiency and

attitudes towards the discipline in the long run. This statement underscores the significance of conducting continuous research in order to further enhance teaching and learning methodologies.

Furthermore, it is imperative for policymakers and educational authorities to carefully deliberate upon the advantages associated with the incorporation of gamification within the curriculum. The potential benefits in terms of student engagement, problem-solving abilities, and creativity may justify the integration of these methods into wider educational policies and practices. Furthermore, teacher professional development holds significant importance. Educators may require assistance and instruction in order to proficiently incorporate gamification and technology into their pedagogy, thereby guaranteeing a prosperous execution. The study highlights the imperative of fostering 21st-century competencies, including critical thinking, creativity, and problem-solving. This is in accordance with the changing demands of the labor market and society, thus highlighting the crucial importance for education to adequately equip students with the necessary skills and knowledge to effectively navigate the complexities of the contemporary global landscape.

## CONCLUSION

The incorporation of number guessing games within the context of elementary school mathematics education presents notable advantages. It serves to enhance student engagement, cultivate problem-solving skills and creativity, underscore the practical relevance of mathematics, foster inclusivity, and promote pedagogical innovation. The aforementioned findings highlight the necessity of implementing inventive pedagogical methods that address students' motivation and practical relevance, thereby equipping them to tackle the complexities of the contemporary era.

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