Elevate Young Minds: Effectiveness of Addibox on Kindergarten Learners' Single-Digit Addition Skill

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ABSTRACT

Developing strong foundational math skills in early childhood is critical, and single-digit addition is a core competency. This study aimed to determine the effectiveness of ADDIBOX to the single-digit addition skills of kindergarten learners. A quasi-experimental design was used for 45 kindergarten students of Meycauayan West Central Integrated School that were divided into control and experimental groups. The experimental group used the ADDIBOX during the math lessons, while the control group followed the traditional instruction. The pre- and post-tests were administered to both groups to measure their prior knowledge and the progress. The results of the study showed that those who utilized the ADDIBOX demonstrated significantly higher improvement in the addition performance of the kindergarten learners compared to the learners that were taught traditionally. The study concludes that ADDIBOX is a valuable educational tool for strengthening early mathematical skills. It provides an interactive, meaningful hands-on approach that fosters active engagement and improved learning outcomes, making it a promising learning tool for developing foundational numeracy skills.

Keywords: Kindergarten, Addibox, numeracy skills, learning tool, single-digit addition

INTRODUCTION

A solid foundation in number sense during the early years of a child opens the door to success in mathematics and enhances learning in many other subjects. It establishes a strong base for future mathematical achievements, enhancing problem-solving abilities and critical thinking skills, and boosting their confidence in math. This early comprehension enables them to more easily understand concepts such as fractions and multi-step calculations in the future, while also providing them with practical skills applicable in real life. It encompasses grasping ideas such as "more" and "less," comparing values, recognizing that symbols signify amounts, and employing numbers adaptively to tackle challenges. A solid number sense is essential for honing mathematical abilities and is nurtured through practical experiences that promote counting, estimating, and identifying numerical connections. Moore and Dyson (2025) also pointed out that children who have a good sense of numbers before they start school are more mathematically successful. It is an advantage that foreshadows success in later years of schooling. This is supported by Chen (2024), who stated that there is a strong positive relationship between children's early mathematical knowledge and proficiency and their subsequent mathematical success.

Moreover, Onoshakpokaiye (2023) explains that early mathematics instruction is necessary for young children to acquire the ideas and skills necessary for success in school, a variety of careers, and even everyday life. Furthermore, according to Mindish (2021), early childhood manipulatives can be seen as a vital tool for children to learn through these hands-on learning tools, and they can also help learners develop a more positive attitude toward school in general. However, a lot of kindergarten classroom practices heavily rely on abstract, worksheet-based activities and teacher-led demonstrations. These familiar and convenient methods often do not provide a full understanding of the learners' developmental needs, as young learners best learn through play, exploration, and experiences with their senses.

This problem was also discussed by Langge (2021), stating that the learners aren't given the chance to use math manipulatives to explore and learn, which is necessary to help develop a solid foundation and comprehension of mathematical ideas. Over the past few decades, there have been substantial changes in the way mathematics is taught and learned, with a greater focus on tangible learning experiences that help learners grasp abstract ideas. According to Guillermo (2025), for children aged 5 to 6, who are typically beginning their journey in mathematics, the use of manipulatives can be especially effective. This age group is marked by a requirement for hands-on experiences to establish their basic skills in mathematics. The usage of math manipulatives, which are tangible items that learners may use to better grasp mathematical concepts, is one such creative method. Studies have indicated that using manipulatives in mathematics education improves student comprehension, engagement, and general academic achievement (Guillermo, 2025, as cited in Carbonneau et al., 2021). That is why, the researchers produce the ADDIBOX manipulatives tool created to assist kindergarten learners in learning single-digit addition in an interactive and hands-on approach. The ADDIBOX transforms abstract mathematical concepts into concrete learning experiences by enabling learners to physically explore number combinations. The study aims to show how these manipulatives can impact the academic performance of kindergarten specifically in their addition skill. According to Monte (2021), manipulatives are well-known and frequently utilized throughout the world due to the many advantages of teaching mathematical ideas using them. Using manipulatives like the ADDIBOX helps learners develop fundamental mathematical skills. The mathematical abilities that learners develop through the use of manipulatives will be advantageous for them in future situations. In an article by Atienza (2024), he pointed out that the Philippines ranked among the countries with the greatest levels of mathematics anxiety among learners, as indicated by an international learning evaluation conducted by the Organization for Economic Co-operation and Development (OECD). In a previous PISA assessment, only 16% of learners from the Philippines reached at least Level 2 proficiency in mathematics, which is notably lower than the 69% average among OECD countries.

The ADDIBOX aims to help children build a mathematical foundation at a young age. This is supported by Monte (2021), who states that utilizing manipulatives over an extended period is more advantageous than employing them for a brief duration. Ultimately, it's beneficial to start using manipulatives early on. Moore and Dyson (2025) also stated that children who begin school with a good sense of numbers and an ability to compute are capable of extending any higher-level topics in mathematical relationships, such as fractions, algebra, and even complex problem-solving. Since early numeracy serves as a foundation for mathematics learning, children are very capable of understanding math through the use of manipulative, hands-on materials. Learners learn best with tangible, hands-on materials that allow them to visualize relationships among numbers and understand simple math operations. Planning the ADDIBOX to be a fun and open-ended learning material, the intention is to help children grow in their number sense through thoughtful manipulation and the enjoyment of play.

The general problem of this study is: "How can ADDIBOX manipulatives effectively enhance the single-digit addition skill of kindergarten learners?"

Specifically, this study will seek answers to the following questions:

1. How may ADDIBOX be integrated in the classroom discussion?
2. What are the pre-test and post-test scores of the control and experimental group?
3. Is there a significant difference between the pre-test and post-test scores in the control and experimental group?

The study aims to determine the effectiveness of the ADDIBOX as a hands-on learning tool for helping learners build a better knowledge of addition while also making the learning process more enjoyable and engaging. It also intends to determine whether the use of ADDIBOX manipulatives may improve kindergarten learners' single-digit addition skill by having play-based activities that actively engage children in learning. Furthermore, the study seeks to show that using entertaining, engaging, and learner-centered tactics improves both mathematical performance and learners' positive attitudes toward learning addition.

METHODS

The study utilized a quantitative research approach to match the aims of this study. It involved systematic collection of data with the use of statistical analysis to understand and explain events or phenomena (Taherdoost, 2022). As the researchers focus on the effectiveness of ADDIBOX manipulatives in the single-digit addition skill of kindergarten learners . This study used a quasi-experimental where there is no random assignment. It involved both an experimental group and a control group to determine the effect used of the ADDIBOX manipulatives on kindergarten learners' addition skill. This enabled the researchers to measure and have comparisons on the performance between the two groups.

The experimental group utilized ADDIBOX as an interactive manipulative tool to facilitate understanding of single-digit addition through guided and hands-on activities. In contrast, the control group was exposed to traditional instruction, It is a teacher-centered approach wherein the teacher began the lesson with a brief review followed by direct instruction through board demonstration of sample single-digit addition problems. The ADDIBOX was not used during the lesson. Both groups were taught the same learning competencies, time allotment, and differing only in the instructional approach being used.All data needed is collected systematically before and after the intervention to assess its effectiveness.

The respondents of this study consisted of two sections from kindergarten enrolled at Meycauayan West Central Integrated School, located in Meycauayan City, Bulacan, during the Third Quarter of the Academic Year 2025–2026.

The study involved a total of 45 kindergarten pupils. Table 1 presents the distribution of respondents according to their group and section.

Table 1 Distribution of Respondents by Group and Section

Group	**Section Name**	**No. of Learners**	**Role in the Study**
Experimental Group	Masiyahin	23	Used ADDIBOX manipulatives
Control Group	Masigla	22	Used traditional teaching method
Total	—	**45**	—

Table 1 represents the two sections Masiyahin, morning session and Masigla, afternoon session. The morning session with 23 pupils served as the experimental group for the study. The one with ADDIBOX intervention, while the afternoon session with 22 pupils were the control group that used traditional teaching methods that used direct instructions.

This study utilized a researcher-made test to assess the single-digit addition skill of kindergarten pupils in both the control and experimental groups. Two different sets of tests were developed, one for pre-test and post-test, ensuring that while the questions varied, they measured the same mathematical competencies aligned with the kindergarten curriculum. The researchers considered the use of Table of Specification (TOS) in creating the pre and post-test. It focuses on single-digit addition.The tests were checked by the experts in this field. It was validated by kindergarten teachers and a master teacher. This is to ensure that the content of the tests is appropriate and reliable for kindergarten learners' abilities. However, due to the heterogeneous composition of the selected class and time constraints, pilot testing and item analysis were not conducted prior to implementation. This limitation is recognized, and future studies are encouraged to conduct pilot testing and establish reliability indices to further strengthen the instrument.

The data collection for this study has been carried out in a systematic and ethical manner during the Third Quarter, using a variety of meticulously planned steps to maintain the processes integrity and the participants' confidentiality. The procedure has been administered at Meycauayan West Central Integrated School. Upon

approval, the pre-test and post-test, consisting of 15 items about single-digit addition that target kindergarten competencies are ready for administration. The instrument works as both a pre-test and a post-test. Following the completion of the intervention period, the participants had been given the new set of questions as the post-test.

To systematically analyze the effectiveness of ADDIBOX manipulatives on the single-digit addition skills of kindergarten learners, upon the successful collected data that the researchers gathered, it undergoes careful processing and statistical treatment.

To address the first research question regarding the integration of ADDIBOX manipulatives into classroom discussion, the intervention is guided by a set timeline scheduled. This is being presented by a narrative form that shows about the lesson plan for each session, the specific manipulatives to be utilized, the allocated time for the session and the expected learning outcomes. The information has been presented in a clear and organized manner, highlighting the planned structured sequence of instruction as it primarily serves to describe the step-by-step implementation of the intervention.

For the research question about the pre-test and post test scores of the control and experimental groups. First participants' pre-test scores are collected and organized systematically according to its section. The use of mean, median, mode, standard deviation, minimum and maximum scores, the use of descriptive statistics are calculated to provide an overview of the baseline performance of both groups.

Furthermore, a t-test for two independent samples is being used to have comparison for pre and post-test scores between the control and experimental groups along with Cohen's d to determine the magnitude of the effect. A significance level of 0.05 is being used, where the p-value below 0.05 has an interpretation that indicates rejection of the null hypothesis, confirming a statistically significant effect of the ADDIBOX manipulatives in their single-digit addition skill.

RESULTS AND DISCUSSION

Table 2. Matrix of Implementation of ADDIBOX

Week Nos.	Day Nos.	Activities
Week 1	**Day 1**	● Flashcards with numbers from 1 to 10 were shown. The learners responded by clapping their hands based on the number that was shown. ● The ADDIBOX: Busy Bee was introduced, including its parts and how it was used. ● When two sets of pictures were combined, it indicated adding. ● Learners worked individually to use the ADDIBOX: Busy Bee. The learner picked two flashcards. And counted and selected the flashcard with the appropriate amount of pictures and placed it in the holder for an answer.
	Day 2	● The ADDIBOX: Busy Bee was introduced once more. ● The learners were asked to count all of the pictures on the flashcards that were placed in the ADDIBOX: Busy Bee. ● The class was divided into three groups, with each group using the ADDIBOX: Busy Bee. Learners took turns being the "Bee Helper," placing flashcards in the holder and counting out loud before placing the correct answer on the bee antennae.
Week 2	**Day 3**	● The teacher showed flashcards containing sets of pictures. The pupils counted each set and then combined them. ● The ADDIBOX: Shoot Into Rings was introduced, including how it was used

		and how the parts worked. The objects that the learners placed in the rings were also shown. ● The teacher drew the total sum of the two given sets on the provided whiteboard. She discussed that when they combined two sets, they were adding. ● The learners used the ADDIBOX: Shoot Into Rings with the first object. They worked in pairs. The first student placed the given number of objects in the first ring while the second student placed the given objects in the other ring. Together, they counted and drew the total sum using their given whiteboard and pen.
	Day 4	● The ADDIBOX: Shoot Into Rings was introduced once more. ● The learners were asked to count every object that was put in the ring to help them visualize addition using objects. ● The class was divided into three groups. Each group utilized ADDIBOX: Shoot Into Rings which had their own objects. The teacher assigned sets, and the groups placed them on the rings. The learners drew the total sum on their group whiteboards that were provided to them.
Week 3	**Day 5**	● The teacher showed addition problems with pictures. The students drew the combined pictures. ● The ADDIBOX: Crab Scoop is introduced, along with how to use it and how parts work. ● The teacher called a learner who wanted to use the ADDIBOX: Crab Scoop, then repeated the activity with other pictures to teach the learners how to solve a set of pictures using the ADDIBOX: Crab Scoop. This explained to them that they were performing addition. ● The learners worked individually to use the ADDIBOX: Crab Scoop to solve a single-digit addition problem. The student placed the flashcard and stated how many they wanted. Afterwards, the student added the sum of the two sets of pictures.
	Day 6	● The ADDIBOX: Crab Scoop was introduced once more. ● The teacher wrote the problem on the board and the learner answered it using the ADDIBOX: Crab Scoop. The student concluded that ‘adding’ meant putting two groups together to make a larger group (the sum). ● The learners were divided into groups. Each group had a chance to use the ADDIBOX: Crab Scoop along with a set of picture flashcards. Together, they counted the total and shouted the number aloud.
Week 4	**Day 7**	● The teacher showed flashcards with picture sets. The students counted and combined each pair to visually identify the total. ● The ADDIBOX: Count a Pillar was introduced, along with directions on how to use and assemble the parts. Combining two single-digit numbers gave the total needed to repair the caterpillar’s body. ● The teacher presented the Caterpillar, whose body segments were jumbled. The teacher explained that the only way to arrange his body was to feed him the ‘Number Meals’ (e.g., 3 + 2 = 5). ● The teacher called students to work individually. The student used the ADDIBOX: Count a Pillar.

	Day 8	● The ADDIBOX: Count a Pillar was introduced once more. ● The learners were called to participate by counting the total sum and helping put the caterpillar's body back together. ● The teacher divided the class into three groups. Each group utilized the ADDIBOX: Count a Pillar. The groups fixed their caterpillar and solved the numbers assigned by the teacher. Together, they counted the caterpillar's body and showed the correct total sum based on the flashcards they picked.

The table explains how the teacher guided the class through a series of manipulative-based activities using a variety of ADDIBOX manipulatives such as Busy Bee, Shoot into Rings, Crab Scoop, and Count a Pillar to help young learners understand and practice addition. Learners were shown flashcards with numbers and picture sets and responded by clapping, counting, combining, and drawing totals. Learners worked independently, in pairs, and in groups, taking turns as helpers to insert flashcards, objects, or caterpillar segments and then counting aloud to determine its sums. Each manipulative was explained, illustrated, and reintroduced, with learners actively constructing parts, fixing caterpillars' bodies, or inserting things into holders and rings. Across every activity, the learners came to an understanding that addition required combining two groups to form a bigger set, which they reinforced through hands-on, collaborative, and visual activities.

The use of manipulatives in early childhood education allows learners to actively engage with mathematical concepts, which improves retention and comprehension (Cox, 2021). It actually helps kindergarten learners' learning since it gives learners a concrete and enjoyable way to represent single digit addition, making the mathematical concepts easier to understand. A thematic study conducted by Angco and Angco (2024) found that carefully incorporating manipulatives into classroom education positively affects learners' motivation, engagement, confidence, and mathematical proficiency. Teachers may create inclusive, and engaging learning environments that promote deeper knowledge by integrating manipulatives into mathematics instruction. According to Gnawali (2025), manipulative materials improve problem-solving skills, boost confidence, accommodate varied learning styles, and assist teachers in efficiently explaining complicated topics, making lessons more enjoyable and interactive. As an instance, it enhances the idea that studying numbers can be fun, allowing learners to better recall numbers and apply them in both classroom and at home.

To ensure fidelity of implementation, the classroom teacher was responsible for carrying out the intervention according to the prepared lesson plan. The teacher maintained that activities were conducted, the duration of each activity, and any deviations from the intended procedures.

Table 3 Descriptive Statistics for Pretest and Posttest Scores of Control and Experimental Group

Group	Test-Type	Mean	Median	Mode	SD	Minimum	Maximum
Control Group	Pre-test	5.45	5.5	5	1.41	2	8
	Post-test	7.27	8	8	1.96	3	10
Experimental Group	Pre-test	5.30	5	5	2.20	2	10
	Post-test	13.7	13	13	1.56	10	15

Table 3 shows the pre-test and post-test scores of the control and experimental group. The control group obtained the mean score of 5.45 with a SD of 1.41, a median of 5.5 and had a mode of 5 in their pre-test. On the other hand, the experimental group has a mean score of 5.30 with a SD of 2.20, a median of 5 and a mode of 5. Both groups are comparable. The small difference in their mean is 0.15 only indicates they have a good baseline equivalence hence that the experimental group was a little bit more spread out. In terms of the ranges of scores, the control group were 2-8 and the experimental group were 2-10 shows some variation with regards to the initial performance of kindergarten learners. Furthermore, for the posttest, the control group improved to a mean of 7.27 (SD = 1.96), with a value of 8 to both median and mode. The score range widened to 3–10, indicating that some kindergarten learners gained more than, compared to others. Meanwhile, the experimental group showed a mean of 13.7 (SD = 1.56), with both median and mode at 13 with a narrower range of 10–15. This demonstrates that learners in the experimental group not only got higher scores overall but also had scores clustered near the top.

The results reveal two distinct patterns. In the control group, scores increased modestly from pre-test to post-test, with the mean rising from 5.45 to 7.27 and the median and mode shifting to 8. However, the standard deviation also grew from 1.41 to 1.96, indicating that improvement was uneven, with some kindergartens progressing while others remained at their lower performance levels in solving single-digit addition. The increase in invariability demonstrates that while traditional instruction led also to improvement however it lacked consistency, resulting in a broader spread of outcomes across learners. By contrast, the experimental group exhibited both substantial improvement and greater uniformity. The mean score rose sharply from 5.30 to 13.7, while the median and mode stabilized at 13, reflecting strong central tendency. Importantly, the standard deviation decreased from 2.20 to 1.56, and the range narrowed to 10–15, showing that all pupils achieved consistently high scores after the ADDIBOX intervention. These findings underscore the effectiveness of the ADDIBOX intervention in promoting equitable and consistent learning gains. The improvement can be attributed to constructivist principles, which emphasize that children learn most effectively through active engagement and hands-on experiences (Garcia, et.al, 2025). Manipulatives can provide concrete representations that enhance comprehension and reduce disparities among learners (McLeod, 2025; Erawati, 2024). The broader idea is that incorporating manipulatives into kindergarten instruction not only elevates overall achievement but also fosters inclusivity by ensuring that all pupils benefit from the learning process.

Table 4 Pretest-Posttest Differences in Control and Experimental Group

Test-Type	n (Control)	Mean (Control)	SD (Control)	N (Experimental)	Mean (Experimental)	SD (Experimental)	Mean Difference	t-value	df	p-value	Cohen's d	Decision	Interpretation
Pre-test	22	5.45	1.41	23	5.30	2.20	0.15	0.27	43	0.394	0.08	fail to reject the H0.	No significant effect. The group started equal
Post-Test	22	7.27	1.96	23	13.7	1.56	6.43	-11.22	43	0.00	3.63	Reject Ho	There is a significant effect.

Table 4 presents a substantial difference in the progress of the control and experimental groups after the intervention. At the beginning, pre-test of groups had closely clustered average ratings, with the control group mean at 5.45 (SD = 1.41) and the experimental group mean at 5.30 (SD = 2.20). The resulting t-value of 0.27, p-value of 0.394 and d= 0.08 indicate that there was no significant difference between the groups at the start, showing a solid background that both groups are comparable in terms of prior knowledge about addition. In the post-test phase, both the results ranged significantly. However, the experimental group had a significantly higher mean score of 13.7 (SD = 1.56), but the control group showed just a small increase to 7.27 (SD = 1.96).

The experimental group t-value of -11.22 and p-value of 0.00 are clearly less than the 0.05 level of significance. Moreover, the effect size d= 3.63 shows a large magnitude of difference between the two groups. As a result, null hypothesis Ho for the experimental group is being rejected, showing that there is significant effect that ADDIBOX can build to kindergarten single-digit addition skill.

The results indicate that both had an improvement after the intervention period, but the extent of their progress is totally different. The results indicate that both had an improvement after the intervention period, the extent of their progress is totally different. The control group shows a slight significant increase in terms of their mean from pre-test which is 5.45 to their post-test mean that is 7.27. The mean difference is 1.82. It emphasized that traditional instruction can also have a significant effect on learners' learning, though its impact on progress was limited. Traditional ways of teaching can have improvements to the performance of learners but its broader impact may be limited. (Kozanitis & Nenciovici, 2023).On the other hand, the experimental group demonstrates having a firm foundation in early mathematical learning, particularly through the use of manipulatives. The experimental group p-value of 0.00 statistically significant confirms that the implementation of ADDIBOX was successful, resulting in the null hypothesis being rejected. These findings imply that when teachers purposefully integrate manipulatives it creates a more salient learning environment that directly improves pupils' academic outcomes.

The study has several limitations that should be acknowledged. It relied solely on quantitative measures and did not incorporate qualitative evidence, such as teacher interviews or learners' work samples, which could have provided a more comprehensive understanding of how ADDIBOX facilitated learning. Despite the study's positive findings, the study did not involve a longitudinal follow-up, making it difficult to assess whether the improvements in learners' addition skills achieved with the ADDIBOX are sustained over time. The study was conducted at a single school, which may limit the applicability of the findings to other schools or learning environments with varied contexts and resources. There is also the risk of experimenter bias, which occurs when a researcher's involvement in the implementation and observation of an intervention influences the results.

In addition, a limitation of the study is the possible influence of a novelty effect. The ADDIBOX being new and engaging, may have increased learners' motivation and contributed to improved performance. The control group did not receive a comparable novel activity, which may have influenced the results. Future studies may include an equally novel but unrelated activity for the control group to ensure that the observed effects are due to the intervention. These limitations indicate that more research is needed to validate and broaden the findings of this study.

CONCLUSION

The study found that the 4-week use of ADDIBOX manipulatives was effectively integrated into classroom instruction, promoting active participation and engagement among kindergarten learners in solving single-digit addition problems. While both the control and experimental groups began with similar prior knowledge, the experimental group demonstrated significantly higher post-test scores after the intervention, compared to the moderate improvement of the control group. This indicates that ADDIBOX is an effective tool for enhancing both classroom discussions and early mathematical skills.

Furthermore, the findings support theories of active, hands-on learning in early childhood education, showing that manipulatives help learners better understand mathematical concepts. The significant improvement in the experimental group confirms that ADDIBOX enhances learners' single-digit addition skill and is more effective than traditional instruction. Overall, integrating manipulatives like ADDIBOX not only increases engagement but also addresses learning gaps and strengthens foundational numeracy skills in young learners. Teachers may consistently integrate ADDIBOX manipulatives into their everyday lessons for kindergarten learners especially in mathematics. The use of concrete materials plays a big role in helping young learners to master specific mathematical concepts, particularly single-digit addition, one of the basic operations they need to fully understand.

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