
PLAY-AND-LEARN: A CARTON PLACE VALUE PLAYBOARD FOR ENHANCING DECIMAL SKILLS OF GRADE 5 LEARNERS

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ABSTRACT

The purpose of the study was to assess how well Grade 5 students' decimal skills were improved by the Play-and-Learn: A Carton Place Value Playboard. Through a practical, manipulative approach, it was aimed to improve students' comprehension of place value, decimal addition and subtraction, and decimal comparison. A one-group pretest-posttest method was used in a quantitative action research design. Based on their challenges with decimals, fifteen students in Grade 5 were purposefully chosen. Before and after the intervention, abilities were measured using teacher-made exams that were in line with the K–12 curriculum. During educational sessions, the recycled-material playboard was utilized. Mean, standard deviation, and a paired samples t-test with a significance threshold of 0.05 were used to evaluate the data. The learners' mean scores showed a significant improvement in performance, rising from 8.533 (pretest) to 16.200 (post-test). Students' results became more consistent as the standard deviation dropped. The improvement was not the result of chance, as the paired t-test showed a statistically significant difference ($t = -11.50$, $p < 0.001$). The Play-and-Learn playboard turned out to be an efficient and affordable teaching instrument for improving decimal skills. The value of experiential, student-centered learning in mathematics instruction was supported by the use of manipulatives, which increased comprehension, engagement, and performance consistency.

KEYWORDS: Decimals, Place Value, Manipulative-Based Learning, Merit System, Action Research.

INTRODUCTION

Many elementary students around the world find it hard to understand decimal concepts. Decimals are important for both higher-level math and everyday situations, but students often have trouble with place value, comparing decimals, and regrouping in calculations. Studies show that these problems usually come from how abstract decimals are and from teaching methods that focus too much on procedures instead of understanding. Because of this, students may lose confidence in math and struggle with problem-solving.

In the Philippines, Grade 5 students still struggle with decimal skills, as shown by their classroom work and tests. Although the K to 12 Mathematics Curriculum focuses on understanding decimals, many public schools have limited teaching materials and few hands-on tools. While studies show that learning with hands-on materials works well, there is little local research on using cheap, teacher-made, and recycled materials together with motivation methods like reward systems. This shows the need for practical and lasting classroom solutions.

In the researcher's local area, most Grade 5 students struggled with decimal concepts, as shown by low quiz scores, frequent mistakes, and little participation in class. To help solve this issue, the study tested whether the Play-and-Learn: A Carton Place Value Playboard could improve students' decimal skills. This study matters because it gives students valuable hands-on learning, gives teachers a low-cost and easy-to-use teaching tool, and offers useful ideas for school leaders and future researchers looking for ways to boost math achievement in schools with limited resources.

MATERIALS AND METHODS

Research Design

The quantitative action research design uses a one-group pretest-posttest design in determining the effectiveness of Play-and-Learn: A Carton Place Value Playboard in increasing the decimal skills of Grade 5 learners. The design enabled the evaluation of learning gains by comparing students' performance before and after the intervention, fitting for the evaluation of a hands-on teaching tool in a practical classroom context.

Locale and Participants

The study was conducted in a public elementary school, a typical context with limited instructional materials and the need for low-cost, teacher-made tools. A purposeful sample of fifteen Grade 5 learners was selected based on their scores in the quiz and the teacher's

assessment of their challenges with decimals. This sample size was appropriate for action research. Participants were told they may withdraw without academic penalty.

Instruments

The study included exams designed by the teacher to assess students' decimal skills such as place value, reading and writing decimals, comparing decimals, and decimal operations before and after the courses. The assessments aligned to Grade 5 K to 12 Mathematics standards and reviewed by veteran math educators. A checklist was also utilized to record the students' engagement and involvement during the lessons. The tests were made reliable by standardizing the manner they were administered and scored.

Data Gathering Procedure

Data collection was done after obtaining permission from the school administration. First, a pretest was administered to find out the learners' initial decimal skills. The Carton Place Value Playboard was then utilized in regular arithmetic sessions with guided exercises, observing and noting learner engagement. The same instrument was used in the posttest after the exercises to measure the improvement of decimal abilities.

Data Analysis

The pretest and posttest scores of the Grade 5 learners were analyzed using both descriptive and inferential statistics. In order to assess learners' performance before and after the implementation of Play-and-Learn: A Carton Place Value Playboard, mean and standard deviation values were computed for each of the data sets. The two statistical approaches were used to determine the differences in the mean performance of the learners and the scores' variability.

A paired samples t-test was performed in order to determine if the difference between the means of the learners' performances was statistically significant. The test compared the mean scores of the same participants before and after the intervention. The significance of the improvement made by the learners in their decimal skills was ascertained on the basis of t-value and p-value obtained. It is worth mentioning that the analysis of the results was carried out at the significance level of 0.05.

RESULTS AND DISCUSSION

Result

This section presents the outcomes of the study based on the learners' pre-test and post-test scores. Tables are used to present the data to make evident that learners' decimal skills altered after utilizing the Play-and-Learn: A Carton Place Value Playboard.

Table 1: Pretest and Posttest Performance of Learners.

: Pretest and Posttest Performance of Learners.	N	Mean	StDev
Pre-test	15	8.533	2.748
Post-test	15	16.200	2.366
Difference	15	-7.667	2.582

The table clearly illustrates that learners performed better after the adoption of Play and Learn: A Carton Place Value Playboard. The mean score of 8.533 in the pre-test increased to 16.200 in the post-test which indicated significant gains in decimal skills. The reduction in standard deviation from 2.748 to 2.366 indicates a more consistent performance of the learner's post-intervention. The mean difference of - 7.667 supports the usefulness of the instructional tool in bringing about improvement.

Table 2: Paired T for Pre-test - Post-test.

Comparison	t- value	p-value	Interpretation
Pre-test vs. post-test	-11.50	<0.000	Highly Significant

The paired t-test showed a significant difference between pre-test and post-test scores ($t = -11.50$, $p < 0.001$). This finding indicates that the intervention was very effective in improving learners' performance in decimal skills. The negative t-value indicates that the post-test results were significantly higher than the pre-test levels. This confirms that the observed increase is not due to chance but represents the success of the instructional technique adopted.

DISCUSSION

Based on the data above, there is a significant increase in learners' competency in handling decimal numbers after using Play-and-Learn: A Carton Place Value Playboard. Pre-test mean score was 8.533 (SD=2.748) while post-test mean score was 16.200 (SD=2.366). The statistical test used to validate the hypothesis above was the paired-samples t-test, which gave a t-value of -11.50 and p-value of < 0.001 . From these values, we can conclude that the learners' proficiency in handling decimal numbers was enhanced by the instructional strategy used.

Student feedback suggested that the intervention assisted them in understanding decimals better. Student 1 claimed he got better at the skills because the counters made the solutions obvious. Student 2 liked learning about the decimal system because she could visualize the answers and this kept her interested and awake in class. Student 3 found it easier to understand the issue, due to the fact that he did not have to memorize. The intervention made

it easier and more meaningful to learn. The teacher discourse was reduced and the learner talk increased; games and group activities were employed more and greater active engagement was achieved.

These results support Constructivist Learning Theory, which advocates for learning through meaningful and engaging experiences. Bruner's Theory of Representation states that learning is best effective when instruction proceeds from enactive (hands-on manipulation) to iconic (visual representation) and then to symbolic (abstract numerical comprehension). This evolution was visible in the use of the playboard, where learners used counters to perceive decimal place values and to carry out numerical operations. Piaget's Cognitive Development Theory also supports the use of tangible resources as learners in the concrete operational stage are better able to grasp abstract concepts such as decimals through concrete experiences. Playboard-based activities were characterized by guided instruction and peer participation, as highlighted by Vygotsky's Social Constructivist Theory. Moreover, the Behaviorist Theory supports the merit system utilized in the study as the rewards improved the motivation and engagement of the learners. These findings are consistent with prior research showing that manipulation-based training can considerably improve young learners' mathematical knowledge.

CONCLUSION

The study revealed that Play-and-Learn: A Carton Place Value Playboard is an effective instructional technique in enhancing the decimal skills of Grade 5 learners. Learners' performance was improved as reflected by increased means and significance of paired t-test results. This implies that the learners' understanding of decimal place values, comparisons and decimals improved after the use of the playboard. More importantly, the smaller standard deviation also indicates that learners were more consistent in their performance once the intervention was applied. The study clearly illustrates the effectiveness of using manipulatives to build abstract mathematical ideas through hands-on learning experiences in instructionally under-resourced classroom settings.

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