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Enhancing Mixed Fraction to Decimal Conversion Through the Use of Spin-to-Learn it.

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ABSTRACT

The conversion of mixed fractions to decimals is a foundational mathematical competency that underpins learners' ability to work fluently across numerical forms and solve real-life problems involving measurement, finance, and data interpretation. Despite its curricular importance, many Grade 7 learners struggle with this skill, particularly due to weak conceptual understanding of the relationship between fractions and decimals, confusion about place value, and limited exposure to interactive instructional strategies. This action research investigated the effectiveness of the Spin-to-Learn It intervention in enhancing the mixed fraction to decimal conversion skills of Grade 7–Aquamarine learners at Cataingan National High School. The study employed a one-group pretest–posttest design involving 32 respondents during the School Year 2025–2026. The Spin-to-Learn It is a hands-on, non-digital spinning wheel consisting of three concentric layers representing mixed fractions (outer layer), improper fractions (middle layer), and decimal equivalents (inner layer), allowing students to move step-by-step through the conversion process with immediate self-checking feedback. Data were gathered through a validated 10-item multiple-choice assessment administered before and after the intervention and analyzed using the paired samples t-test. Prior to inferential analysis, the Shapiro-Wilk normality test confirmed that data were normally distributed ($W = 0.972$, $p = .569$). Results revealed a statistically significant improvement in learners' conversion skills, with the mean score increasing from 6.56 in the pretest to 8.69 in the posttest and a paired t-test yielding $t(31) = -6.07$, $p < .001$. The proportion of learners meeting the mastery level likewise increased substantially, from 31.25% (10 out of 32) in the pretest to 75.00% (24 out of 32) in the posttest. These findings affirm that the Spin-to-Learn It is an effective, learner-centered, and contextually appropriate instructional intervention for improving Grade 7 learners' ability to convert mixed fractions to decimals in Philippine public secondary classrooms.

Keywords: *Spin-to-Learn It, Mixed Fraction to Decimal Conversion, Game-Based Learning, Hands-On Instructional Materials, Action Research, Grade 7 Mathematics, Number Sense.*

1. Introduction

The ability to convert mixed fractions into decimals is an essential mathematical competency that plays a critical role in both academic learning and everyday life. In practical contexts, decimals are routinely employed in financial transactions, measurement systems, grading, and data interpretation. A strong understanding of fractions and decimals is also foundational for mastering higher-order mathematical concepts such as algebra, proportional reasoning, and geometry. Research has demonstrated that students who develop conceptual fluency with fractions and decimals tend to perform better in advanced mathematics, as these number forms help learners interpret and compare numerical values with greater accuracy and confidence (DeWolf et al., 2014; Yetim & Alkan, 2013).

Despite this importance, many Grade 7 learners experience persistent difficulty in converting mixed fractions to decimals. These challenges are typically rooted in weak understanding of the relationship between fractions and decimals, misconceptions about place value and division, and limited opportunities for hands-on, interactive practice. Anxiety toward mixed numbers and multi-step conversion processes further compounds these difficulties. Yetim and Alkan (2013) reported that such conceptual confusions significantly undermine students' confidence and overall performance in mathematics, creating gaps that persist into higher grade levels if not addressed early.

Several studies underscore the importance of multiple representations in mathematics instruction. Ainsworth (1999) demonstrated that learners achieve deeper understanding when they are able to translate across symbolic, visual, and verbal forms of mathematical ideas—for instance, converting a mixed fraction such as $2\frac{3}{4}$ into the improper fraction $\frac{11}{4}$ and subsequently into the decimal 2.75. Prediger (2008) highlighted the centrality of number sense and part-whole relationships in fraction-to-decimal conversion, while Drijvers et al. (2013) found that structured and guided approaches enable learners to develop flexible mathematical thinking. Ng and Lee (2009) further established that explicitly teaching the conceptual connections between mixed fractions, improper fractions, and decimals leads to significantly better learning outcomes than teaching each form in isolation.

Interactive and visual instructional approaches have also been shown to substantially enhance students' understanding of fractions and decimals. Strother et al. (2016) emphasized that visual and conceptual strategies improve learning outcomes in number sense, while Siegler and Braithwaite (2017) demonstrated that supporting students' understanding of numerical magnitudes accelerates arithmetic development. Hariyani et al. (2020) likewise reported that the use of multiple visual models helps learners establish coherent connections among fractions, decimals, and percentages. In the Philippine context, local studies have reinforced these findings: Santos and Ramirez (2020) found that manipulatives and visual tools outperform purely lecture-based instruction in improving mathematical performance, while Garcia (2018) observed that teacher-developed, contextually relevant instructional materials can produce significant gains in student achievement.

National educational policy in the Philippines further supports the development of innovative instructional strategies targeting foundational mathematical skills. The K to 12 Mathematics Curriculum identifies fractions and decimals as key Grade 7 competencies (Department of Education, 2016), while Republic Act No. 10533, the Enhanced Basic Education Act of 2013, mandates the use of varied instructional approaches to improve learning outcomes. The MATATAG Curriculum Framework additionally advocates for the use of practical, contextually meaningful strategies to address least mastered competencies (Department of Education, 2023). Together, these policy directions highlight the need for creative, learner-centered interventions that make foundational number concepts accessible and engaging for all students.

In response to these challenges, this action research introduces the Spin-to-Learn It intervention: a non-digital, hands-on spinning wheel that guides Grade 7 learners through the three-stage conversion process from mixed fraction to improper fraction to decimal, using a three-layered concentric wheel design with self-checking functionality. Unlike conventional instructional approaches, Spin-to-Learn It promotes active participation, visual learning, and immediate feedback without requiring digital resources, making it suitable for resource-limited classroom settings. This study aimed to determine the effectiveness of the Spin-to-Learn It in enhancing the mixed fraction to decimal conversion skills of Grade 7–Aquamarine learners at Cataingan National High School. Specifically, it sought to: (1) determine learners' conversion skill levels before and after the intervention; (2) examine whether a statistically significant difference existed between pretest and posttest performance; and (3) describe learners' perceptions of the usability and acceptability of the intervention.

2. Innovation, Intervention, and Strategy

2.1 Innovation

The Tri'Escape Gameboard includes the following key game materials: the gameboard itself, player tokens (one per group or individual), one standard dice, challenge and question cards, and escape key tokens. The game accommodates both group play (1 group of 3–6 members sharing one token) and individual play (2–3 players with one token each), making it adaptable to different classroom configurations and instructional goals. The Spin-to-Learn It is a teacher-made, hands-on instructional innovation designed to help Grade 7–Aquamarine learners at Cataingan National High School develop fluency in converting mixed fractions to decimals. The tool is a large circular spinning wheel divided into three concentric, color-coded layers: an outer red ring presenting mixed fractions, a middle blue ring displaying corresponding improper fractions, and an inner yellow circle showing decimal equivalents. Each layer is partitioned into eight triangular sections, each capable of holding up to three removable equation "pies," for a maximum of 24 equations per layer. The removable and replaceable pieces allow the tool to be reused across multiple sessions and adapted to varying levels of difficulty.

The wheel is constructed from durable, locally accessible materials including plywood, lightweight wood, scrap steel bars, paint, and yarn, making it cost-effective and suitable for sustained classroom use. A rotating pointer at the center enables random selection of problems through spinning, introducing an element of unpredictability that heightens student engagement. Proper alignment markings on the back of each piece ensure accuracy of answers across layers. Table 1 summarizes the key features of the Spin-to-Learn It and their corresponding instructional purposes.

2.2 Intervention

The Spin-to-Learn It served as a structured, learner-centered instructional intervention targeting Grade 7–Aquamarine learners' difficulty in converting mixed fractions to decimals. The intervention activity followed a consistent procedure: the researcher first demonstrated how to spin the wheel and solve a sample item, modeling the step-by-step conversion process from mixed fraction to improper fraction to decimal. Students were then given the opportunity to spin the wheel themselves, solve the selected problem, and verify their answer by removing the corresponding pieces in the middle and inner layers. This active-checking format promoted self-reflection, immediate feedback, and repeated engagement with the conversion procedure. The intervention was implemented with 32 Grade 7–Aquamarine learners of Cataingan National High School who were identified as having difficulty in converting mixed fractions to decimals. Implementation took place during regular Mathematics sessions, conducted over two days (Monday and Tuesday), from 8:30 to 9:30 in the morning during the second period. The one-hour sessions accommodated both the instructional activity and, on the second day, the administration of the posttest. Despite the constrained schedule—the school was simultaneously preparing for the fourth quarterly examination—learners demonstrated high levels of engagement and cooperation throughout the activity, enabling the intervention and assessments to be completed effectively within the allotted time.

2.3 Strategy

The implementation of the Spin-to-Learn It followed a structured four-phase strategy designed to establish baseline data, deliver the intervention, and measure its impact systematically.

Table 1

Implementation Strategy by Phase

Phase	Activities	Goal / Purpose
Phase 1: Planning and Preparation	Spin-to-Learn It wheel constructed; 10-item assessment instrument developed and validated by the research adviser for alignment with Grade 7 competencies on fraction-to-decimal conversion.	Ensure curricular alignment, content validity, and readiness of materials prior to implementation.
Phase 2: Pretest (Day 1 – 45 min.)	10-item multiple-choice pretest administered to establish learners' baseline conversion skill level before the intervention.	Determine initial skill levels to enable pre-post comparison and identify specific learning gaps.
Phase 3: Intervention (Day 1 – 15 min. orientation; Day 2 – 40 min. implementation)	Researcher demonstrated wheel mechanics and modeled the conversion process; students took turns spinning, solving, and self-checking their answers; immediate corrective feedback provided throughout.	Deliver guided, interactive practice in mixed fraction to decimal conversion using a visual, self-checking tool.
Phase 4: Posttest and Reflection (Day 2 – 20 min.)	Same 10-item posttest administered after the intervention; data analyzed using paired samples t-test to determine significance of improvement.	Measure learning gains and evaluate the effectiveness of the Spin-to-Learn It as an instructional intervention.

3. Methodology

3.1 Research Design

This study employed a one-group pretest–posttest action research design, comparing the problem-solving performance of the same cohort of learners before and after the implementation of the Spin-to-Learn It intervention. While this pre-experimental design does not include a control group and cannot fully isolate the intervention's effects from other concurrent classroom influences, it was appropriate for the purposes of this action research, where the primary objective was to determine whether the intervention produced meaningful and statistically significant improvement in learners' conversion skills within a specific classroom context.

3.2 Participants

The participants of this study were 32 Grade 7–Aquamarine learners of Cataingan National High School during the School Year 2025–2026. Participants were purposively selected based on identified difficulty in converting mixed fractions to decimals, as confirmed through classroom assessments and teacher observation prior to the study. The study ensured the confidentiality of all participants' identities and data, which were handled and stored in a secure and ethical manner throughout. Table 2 presents the composition of the study sample.

Table 2

Profile of Participants

Year & Section	Male	Female	Total
Grade 7–Aquamarine	14	18	32

3.3 Data Gathering Methods

Data were collected using a validated 10-item multiple-choice assessment instrument covering equations involving the conversion of mixed fractions to decimals and simple word problems requiring the application of the conversion process. The instrument was reviewed and approved by the research adviser prior to administration. A pretest using this instrument was administered on Day 1 before the implementation of the Spin-to-Learn It to establish learners' baseline skill level, and a posttest using the same instrument was administered on Day 2 after the intervention to measure improvement. All participants' parents or guardians provided free and prior informed consent before any data collection or intervention activities were conducted, consistent with ethical standards for educational research involving minors.

3.4 Data Analysis

Pretest and posttest scores were first analyzed using descriptive statistics, including mean scores and proportion of learners meeting the mastery level. Prior to inferential analysis, the Shapiro-Wilk test was conducted on the difference scores between pretest and posttest to assess the normality assumption. Because the normality assumption was satisfied ($p > .05$), the parametric paired samples t-test was employed to determine whether a statistically significant difference existed between pretest and posttest scores at the .05 level of significance.

4. Results and Discussion

4.1 Normality Test of Gathered Data

Prior to conducting the paired samples t-test, the Shapiro-Wilk normality test was applied to the difference scores between the pretest and posttest to verify the parametric assumption of normality. As presented in Table 3, the test yielded a W-statistic of 0.972 with a p-value of .569. Since the p-value exceeded the .05 threshold, the null hypothesis of normality was not rejected, confirming that the data satisfied the normality assumption. The paired samples t-test was therefore the appropriate statistical tool for comparing pretest and posttest scores.

Table 3

Normality Test of Data

Test	W-Statistic	p-Value	Interpretation
Shapiro-Wilk (Pretest–Posttest Difference)	0.972	.569	Normally Distributed

4.2 Conversion Skill Levels of Grade 7 Aquamarine Learners Before and After the Spin-to-Learn It Intervention

The analysis of pretest and posttest scores revealed a statistically significant improvement in learners' ability to convert mixed fractions to decimals following the implementation of the Spin-to-Learn It intervention. As shown in Table 4, the paired samples t-test yielded $t(31) = -6.07$, $p < .001$, confirming that the improvement in performance was highly significant and unlikely to have occurred by chance. The mean score increased from 6.56 in the pretest to 8.69 in the posttest, representing a mean gain of 2.13 points on the 10-item instrument. The proportion of learners meeting the mastery level increased substantially from 31.25% (10 out of 32 students) in the pretest to 75.00% (24 out of 32 students) in the posttest, indicating that the intervention was effective in moving the majority of learners toward competency mastery. These findings are consistent with the research of Ainsworth (1999), who demonstrated that learners develop stronger conceptual understanding when they work across multiple representations of mathematical ideas. In the present study, the Spin-to-Learn It required students to actively move from mixed fraction to improper fraction to decimal, operationalizing this translational approach in a hands-on, tactile format. The improvement observed also aligns with the findings of Tokac et al. (2019), whose meta-analysis established that game-based mathematics instruction produces significant achievement gains compared to traditional methods, particularly when the activity is tightly connected to the target skill. The self-checking mechanism of the wheel further mirrors the "immediate feedback" feature identified in digital game-based learning research as a critical driver of learning improvement (Siegler & Braithwaite, 2017).

The results are additionally consistent with Philippine curriculum goals. The K to 12 Mathematics Curriculum Guide identifies fraction-to-decimal conversion as a key Grade 7 competency requiring mastery of number relationships and representations (Department of Education, 2016), while the MATATAG Curriculum Framework advocates for mathematically rich, representation-based learning experiences (Department of Education, 2023). The improvement observed in this study suggests that the Spin-to-Learn It successfully operationalized these curricular principles through a practical, classroom-ready instructional tool.

Table 4**Pretest and Posttest Results of Grade 7 Aquamarine Learners**

Grade 7–Aquamarine	N	t-value	p-value	Interpretation
Pretest & Posttest	32	–6.07	< .001	Statistically Significant

4.3 Significant Improvement in Conversion Skills After the Intervention

Based on the results of the paired samples t-test, the computed t-value of -6.07 and p-value of less than $.001$ confirmed that the difference in conversion skill performance between the pretest and posttest was statistically significant. Consequently, the research hypothesis stating that there is a significant difference in the ability of Grade 7–Aquamarine learners to convert mixed fractions to decimals before and after the implementation of the Spin-to-Learn It is accepted, while the null hypothesis of no significant difference is rejected. This outcome validates the effectiveness of the Spin-to-Learn It as a classroom instructional intervention capable of producing meaningful gains in learners' mathematical conversion skills.

Several design characteristics of the Spin-to-Learn It appear to have contributed to this significant improvement. The three-layer wheel structure provided a clear visual scaffold for the two-step conversion process, enabling learners to see the relationship between mixed fractions, improper fractions, and decimals rather than treating these representations as unrelated procedures. The spinning mechanism introduced an element of excitement and unpredictability that sustained learner motivation throughout the activity, while the self-checking function—revealing the correct answer after each attempt—supported error recognition and immediate conceptual adjustment without requiring constant teacher mediation. These features align with established principles of effective mathematics instruction, including the use of multiple representations, immediate formative feedback, and active learner engagement (Ainsworth, 1999; Siegler & Braithwaite, 2017).

The findings further reinforce the value of non-digital, hands-on instructional materials in Philippine public school classrooms, where access to technology and reliable internet connectivity cannot always be assumed. Unlike web-based or application-driven tools, the Spin-to-Learn It requires only physical materials, is reusable across multiple class sessions, and is adaptable to varying levels of difficulty through its replaceable equation pieces. This positions it as a practical and scalable instructional tool for teachers in resource-limited settings who wish to incorporate interactive, student-centered approaches into their mathematics instruction without incurring significant costs or technical requirements.

5. Conclusion

This study concluded that the Spin-to-Learn It, a teacher-made, non-digital spinning wheel designed to scaffold the three-step process of converting mixed fractions to improper fractions to decimals, was effective in improving the conversion skills of Grade 7–Aquamarine learners at Cataingan National High School. The paired samples t-test confirmed a statistically significant difference between pretest and posttest scores, $t(31) = -6.07$, $p < .001$, leading to the rejection of the null hypothesis. The mean score improved from 6.56 to 8.69, and the proportion of learners meeting the mastery threshold increased from 31.25% to 75.00% following the intervention. These results affirm that structured, interactive, and visually engaging instructional tools can produce meaningful gains in foundational mathematical competencies even within constrained classroom schedules and resource-limited environments. The success of the Spin-to-Learn It can be attributed to several mutually reinforcing design features: the three-layer concentric structure that visually and kinesthetically scaffolded the conversion process; the spinning mechanism that introduced engagement-sustaining interactivity; and the self-checking function that provided immediate feedback without teacher dependency. Together, these features created a learner-centered environment that promoted active participation, self-reflection, and conceptual understanding rather than rote procedural memorization. On the basis of these findings, the researchers recommend: (1) extending the implementation period of the Spin-to-Learn It across additional sessions to allow for deeper consolidation of conversion skills and higher mastery rates among all learners, particularly those with the lowest pretest scores; (2) developing a broader repertoire of equation sets across all three difficulty levels to sustain student engagement and prevent repetition across multiple sessions; (3) adapting the Spin-to-Learn It format to other challenging Grade 7 numeracy competencies, such as percentage conversion and fraction operations, to expand its utility within the mathematics curriculum; and (4) documenting and disseminating the tool's design specifications through local teacher-practitioner networks to support its adoption in other public secondary classrooms across the region.

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