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EFFECTIVENESS OF COUNTERS OR GAMIFICATION INTERVENTION IN IMPROVING THE BASIC NUMERACY SKILLS OF STRUGGLING LEARNERS OF JUNIOR HIGH SCHOOL IN BORONGAN CITY DISTRICT IV

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ABSTRACT

Mathematics plays a vital role in developing students' logical reasoning and problem-solving abilities, which are essential for both academic success and everyday decision-making. However, many Junior High School learners still struggling with the basic numeracy that leads to low performance in mathematics as a whole. Addressing this issue calls innovative and engaging teaching strategies that will help make mathematical ideas more understandable and appealing.

This study investigates the effectiveness of counters-based activities and gamification interventions in improving the basic numeracy skills of struggling learners in Junior High School within Borongan City District IV. The research aims to determine which intervention will enhance learners' understanding of fundamental mathematical concepts such as number sense, operation, and problem-solving. Using a quasi-experimental design, two groups of low-performing students were exposed to different interventions: one utilizing traditional counters and other employing gamified mathematical activities. Pre-test and post-test scores measured numeracy gains, while learners feedback provided insights on engagement and motivation. The findings aim to guide educators in adopting evidence-based, learner-centered strategies to strengthen numeracy development among struggling students in Junior High School.

The pretest results showed that learners in all groups had low numeracy proficiency. The gamification group scored 35.5 (Low Proficient), the counters group 23.3 (Non-Proficient), and the control group 28.6 (Low Proficient), indicating that all the participants struggled with basic operations in Mathematics.

After the intervention, post-test results revealed notable improvement. The gamification group achieved 68.5 (Nearly Proficient), the counters group 62.8 (Nearly Proficient), and the control group 58.6 (Nearly Proficient). Statistical analysis confirmed that these improvements were significant for all groups: gamification ($t = -8.51$, $df = 29$, $p < .001$), counters ($t = -9.07$, $df = 29$, $p < .001$), and control ($t = -7.48$, $df = 29$, $p < .001$). the null hypothesis was rejected in all cases, indicating that the interventions had a measurable effect on learners' numeracy skills.

KEY WORDS: *Numeracy Skills, Counters, Gamification, Intervention, Struggling Learners, Mathematics Education.*

INTRODUCTION

Foundational skills in Mathematics are crucial of every learner in their learning journey, specifically from primary years to high school years. "The Department of Education imposed an order to strengthen the reading program through the implementation of the Early Language, Literacy and Numeracy Program (DepEd Order No. 12, s. 2015) that will develop every Filipino learner's literacy and numeracy skills and attitudes which will contribute to lifelong learning, and to improve reading and numeracy skills of Kinder to Grade 3, following the K to 12 Basic Education Curriculum". Despite of so many interventions implemented still it continues to show low achievement in basic numeracy. Many of the studies local and abroad always persists the learning gaps of the learners in basic operational skills ad what will be the suited remediation programs that applies to the learning needs of struggling learners. (Mirabueno et. al,2023 and Aguhayon, et al, 2023).

Counters mostly used in building skills in mathematics for primary learners in mathematics learning process. It's a hands-on experience that the learners make an abstract numerical concept. According to Larbi & Okyere, 2016, using manipulatives materials or counters, it helps the learners to improve their understanding and procedural fluency in basic operational tasks, slowly from concrete to abstract thinking. In the Philippines, there is an action research and quasi-experimental studies (Vendicacion et.al, 2025; Mendez et. al, 2025), shows that after remediation process using counters it increases mathematical learning skills in basic operations. That these results recommend counters to be used as a remediation tool not only for early and basic numeracy skills but for struggling learners in high school (Larbi et. al., 2016).

On the other hand of giving remediation to struggling learners, gamification is another approach to get the excitement of learning process for struggling learners in junior high school. Diaz, 2024; Alt, 2023, state that "meta-analysis and systematic

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reviews indicate that gamification has a generally positive effect on students' engagement and can yield small-to-moderate improvements in learning outcomes", even the implementation depends on age group an study quality. All the review shows that gamification's main strong point lies in supporting drives and providing adaptive feedback, both valuable in remediation for struggling junior high school learners.

With so many positive feedbacks or evidences for both counters and gamification distinctly, always had a gap in the literature regarding on comparative effectiveness especially for struggling junior high school learners in Borongan City District IV. Plenty of existing Philippine studies focuses on elementary level. Leaving behind to junior high school aspect, the evidences always address to lack of physical facility including teacher training, resources, class size and class program for remediation. Additionally, according to LL Abrahan, 2025 "there is limited research comparing low-tech pertain to counters versus higher – engagement strategies like gamification as a tool for remediation interventions with the same study design, most specifically for learners who identified as struggling".

To address the gaps, it is very significant for policy and practice. Showing the effectiveness of using counters or the gamified interventions in improving the basic numeracy skills, schools with limited resources could adopt counters-based remediation with confidence. On the contrary, if the gamification reveals much improvements in motivations and retention, teacher, teacher professional development could prioritize gamified lesson designs or mixed approaches. Furthermore, this study comparing interventions modes in Borongan City District IV will provide appropriate suggestion to guide remediation program decisions and instructional practices for junior high school struggling learners.

Objectives

1. To determine the level of proficiency on the pretest of the following:
    - 1.1 Counters
    - 1.2 Gamification
    - 1.3 Control
2. To determine the level of proficiency on the post-test of the following:
    - 1.1 Counters
    - 1.2 Gamification
    - 1.3 Control
3. To determine the significant difference on the proficiency level on the pretest and post-test of the following:
    - 1.1 Counters
    - 1.2 Gamification
    - 1.3 Control
4. To determine the experiences of the learners in their Mathematics class.

METHODOLOGY

This study employed a quasi-experimental design to investigate the effectiveness of either counters or gamification intervention in improving the basic numeracy skills of struggling learners in junior high school within Borongan City District IV. This mixed method design with a pretest-post-test control group structure. In this setup, participants are separated into three distinct groups. One interacts with manipulatives (the counters), another is exposed to a gamified numeracy experience, and the last group continues with traditional numeracy instruction as a control. This structure enables a clear comparison between the effects of the two interventions and the traditional method, facilitating a more precise evaluation of their relative effectiveness.

Sampling Design

In selecting the population size of the study will used the purposive sampling technique. The participants were the ninety (90) bona fide Grade 7 students of Borongan City District IV who are identified struggling junior high school learners. The sample size of this study was purposively selected from 18 sections of all grade 7, to represent the entire population of this study.

Statistical Design

The study determined the pretest and post-test scores to examined using a t-test to determine whether there is a statistically significant difference in performance between the instructional and control groups. For the interview data, thematic analysis were used to identify recurring themes and provide deeper insight into how the intervention influenced learners engagement and learning experiences.

Geographical Area

This study was conducted at Borongan City District IV, Brgy. Alang-Alang, Borongan City, Eastern Samar, 8.5 kilometer (17 minutes travel time) away from Eastern Samar State University, Borongan Eastern Samar. This educational district offers both junior and senior high school education and do practice school-based management. The selection of this locale was based on the accessibility and convenience of the researchers.

RESULTS

During the last week of the 30-day experimentation, post-test and interview was given to 90 struggling junior high school learners which are the gamification group, control group, and counters group. The basic operation of Math of this test was used as a post-test for the study. The difference of the pretest and post-test scores was completed to all the 90 struggling junior high school learners.

This study was conducted to determine the effectiveness of counters or gamification intervention in improving the basic numeracy skills of struggling learners of junior high school in Borongan City District IV. A pair sample T-test was utilized since the researchers utilized between-subjects design. Results revealed that the score obtained during post-test of gamification, counters, and control group.

Table 1 shows the pretest results of the learners on gamification group, counters group, and control group. Based from the result, it revealed that the mean for gamification group (M-35.5) was interpreted as low proficient, the mean for counters

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group (M-23.3) was interpreted as non-proficient, and the mean for control group (M-28.6) was interpreted as low proficient. This result implies that the learners are struggling in answering the basic operation of mathematics as addition, subtraction, multiplication, and division.

Table 2 shows the post-test results of the learners on gamification group, counters group, and control group. Based from the result, it revealed that the mean for gamification group (M-68.5) was interpreted as nearly proficient, the mean for counters group (M-62.8) was interpreted as nearly proficient, and the mean for control group (M-58.6) was interpreted as nearly proficient. Comparing the results from the pretest and post-test, the descriptive result from the table shows an increase of mean percentage compared to the previous one. Furthermore, the counters group got the highest result compared to the other group. This result also implies that there is an increased of mean percentage score after conducting the intervention not only counters group but with the other two groups also.

Table 3 shows during the post-test of gamification, counters, and control group significantly higher compared to the score obtained during pretest $t(29)=-8.51$, $p<0.001$, $t(29)=-9.07$, $p<0.001$, and $t(29)=-7.48$, $p<0.001$ respectively. With this result, it can be agreed that gamification, counters, and control group was effective in intervention in improving the basic numeracy skills of struggling learners of Junior High School in Borongan City District IV.

Based on the interview conducted, these are the results:
I. Before Intervention: Learners struggling in Math often exhibit range of experiences. There can be categorized into academic, emotional, and social aspects. Academically, learners showed poor foundational skills, difficulties with problem-solving, inconsistent effort and engagement, and limited study skills. Emotionally, learners experienced low-esteem and lack of confidence, Math anxiety, frustration and negativity. Socially, learners might avoid seeking help, negative peer interaction, isolation and withdrawal.
II. During Intervention: Learners who struggled often experienced a range of emotions and challenges such like frustration and discouragement, anxiety and fear, loss of confidence, learning challenges like difficulty with concepts, procedural errors, lack of motivation, and for positive experiences like progress, increased confidence, and positive teacher-learner relationship.
III. After Intervention: Learners struggling in math can experiences a range of positive changes, both academically and emotionally. It helped them improved conceptual understanding, increased procedural fluency, enhanced problem-solving skills, greater fluency with basic facts, and increased confidence in math. It also reduced math anxiety, increased self-efficacy, improved motivation and engagement, positive emotional experiences. It also helped them improved peer interactions and developed stronger relationships with their teachers and classmates, leading to more support and encouragement.

SUGGESTIONS

For suggestions to the department of education and teachers should further conduct similar research to this study for longer period of time and involves smaller number of struggling learners. Investigate the long-term effects of these interventions on learner's attitudes towards mathematics, including motivation, confidence, and engagement. Lastly, further study how the effectiveness of these interventions varies across different learning styles (visual, auditory, kinesthetic).

CONCLUSION

The overall effect of counters, gamification, and control as intervention on learners learning outcomes holds significant potential for improving numeracy skills, further research is needed to address the specific needs and context of struggling learners in Borongan City District IV. By conducting rigorous research and developing tailored interventions, we can harness the power of gamification to enhance learning outcomes and support the success of all students. It's important to acknowledge that these changes might not happen overnight. Learners may need time and consistent support to fully reap the benefits of intervention. But with patience, persistence, and encouragement, learners can overcome their math struggles and achieve success.
1. The pretest results indicate a relatively consistent baseline level of numeracy skills across the three groups; gamification, counters, and control. Based on the result, the level proficiency of gamification was low proficient likewise the control group and for the counters was non-proficient.
2. The post-test results revealed significant differences in numeracy skills across the three groups. The level of proficiency for the three groups were closely revealed to nearly proficiency. These findings suggest that all the intervention such as gamification, counter-based, and control were effective in enhancing the numeracy skills of struggling junior high school learners. Further analysis is warranted to investigate the specific factors contributing to the differential effectiveness of these interventions.
3. The result of pretest/post-test makes a difference using the counters or gamification as intervention materials clearly states the findings that the intervention (counters or gamification) had a positive impact. It emphasizes that there was a significant difference between the pretest and post-test, suggesting a meaningful improvement in learners learning. It directly links the positive results to improved numeracy skills.
4. This intervention led to positive outcomes to be the main source to eliminate struggling learners in basic numeracy that the findings suggest that this intervention utilizing counters or gamification holds significant promise as a key strategy in "addressing and potentially eliminating struggling learners in basic numeracy. Highlights the intervention's potential to be a significant solution". It connects the positive outcomes to the larger goal of eliminating struggling learners.

It's crucial to remember that while these interventions show promise, they are not a guaranteed solution to eliminate all struggling learners. A multi-faceted approach, including effective teaching methods, individualized support, and addressing socio-economic factors is likely necessary for a more comprehensive solution.

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FIGURES AND TABLES

Table 1. Pretest Results of the Learners on Gamification, Control and Counters

Areas	Mean	Interpretation
Gamification Pre-test	35.5	Low Proficient
Counters Pre-test	23.3	Non-Proficient
Control Pre-test	28.6	Low Proficient

High Proficiency=90-100, Proficient=75-89, Nearly Proficient=50-74,
Low Proficient=25-49, Non-Proficient=0-24

Table 2. Post-test Results of the Learners on Gamification, Control and Counters

Areas	Mean	Interpretation
Gamification Post-test	68.5	Nearly Proficient
Counters Post-test	62.8	Nearly Proficient
Control Post-test	58.6	Nearly Proficient

High Proficiency=90-100, Proficient=75-89, Nearly Proficient=50-74,
Low Proficient=25-49, Non-Proficient=0-24

Table 3. Difference Analysis on the Pretest and Post-test of Gamification, Control and Counters

Areas		Statistics	df	p	Interpretation	Conclusion
Gamification Pre-test	Gamification Post-Test	-8.51	29	< .001	Significant	Reject H_o
Counters Pre-test	Counters Post Test	-9.07	29	< .001	Significant	Reject H_o
Control Pre-test	Control Post Test	-7.48	29	< .001	Significant	Reject H_o

Note. H_a $\mu_{\text{Measure 1 - Measure 2}} \neq 0$

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