

Mitigate Mobile Game Dependency and Amplify Basic Operation Skills in Polynomials Through Match and Moddax Card

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ABSTRACT

The proliferation of mobile gaming among millions of Filipinos has led to dependency on various factors, resulting in academic decline due to excessive time spent on gaming. In response, this action research examined the effectiveness of MATCH (Math Checkers) and Moddax Cards (Modified Deck of Dots and X Cards) in mitigating mobile game dependency and enhancing grade 9 learners' proficiency in basic operations on polynomials. The study involved 25 grade 9 learners selected through purposive sampling representing each section's identified learners who exhibited strong engagement or addiction to online gaming. The study employed a descriptive-correlational design using a mixed method approach,

gathering data through researcher-made perception surveys and 30-item pretest and post-test on polynomials. The learners exhibited a remarkable improvement in the test results after the intervention. Moreover, they demonstrated a notable perception toward the MATCH and Maddox cards as alternative to mobile gaming. Hence, the integration of the intervention to mathematics remediation program is strongly recommended, alongside, the provision of teacher training and adoption of the assessment tools utilized in the study to enhance instructional effectiveness and learner outcomes.

Keywords: *game-based learning, mathematics education, instructional intervention, MATCH and Maddox cards, student engagement, remediation, mobile game dependency, online game dependency, mobile games, online games*

INTRODUCTION

The World Health Organization (WHO) recognizes online game addiction as a mental health condition, highlighting its increasing prevalence among adolescents worldwide. In the Philippines, this issue has become increasingly evident, with approximately 29.9 million active gamers recorded nationwide. Recent correlational studies have explored the relationship between online game addiction and depression among Filipino adolescents, revealing that the incidence of depression continues to rise in the country (Labana et al., 2020). These findings underscore the need to examine the underlying factors that contribute to addictive gaming behaviors among Filipino learners. To address this concern, several local studies have investigated the motivations behind students' engagement in mobile and online gaming. Kapoor (2022) identified that addicted gamers often play as a coping mechanism, a means of mood regulation, or an escape from dysfunctional family relationships, while also seeking social connection, status, and belonging. Conversely, non-addicted gamers are mainly driven by personal interest, leisure, socialization, and self-esteem enhancement. Similarly, Dumrique (2018) found that Filipino adolescent

boys, particularly those aged 14–15, are more likely to engage in multiplayer online games such as *League of Legends*, *Clash of Clans*, and *Crossfire*. While some studies present positive or neutral effects of gaming, the overall impact remains complex. Dumrique (2018) noted that although online gaming can support social interaction and does not necessarily hinder academic performance, self-discipline is crucial to maintaining balance. Pajarillo-Aquino (2019) found no significant difference between the academic performance of college students who played online games and those who did not. However, she emphasized the importance of parental supervision and the need for students to engage in alternative non-digital activities. Likewise, Militante et al. (2022) concluded that mobile gaming does not automatically result in academic decline, provided students establish clear boundaries and prioritize their academic responsibilities. Despite these observations, numerous studies highlight the negative psychological and behavioral consequences of excessive gaming. Perez et al. (2024) reported a significant correlation between online game addiction and increased levels of depression, anxiety, and stress, emphasizing the dual nature of gaming as both a coping mechanism and a potential hazard. Garnada (2020) further revealed that excessive gaming diminishes students' participation in extracurricular activities, while Wang and Zhu (as cited in Garnada, 2020) identified its adverse effects on physical health, social skills, and academic performance. In addition, Cornillez et al. (2020) found that the amount of time spent on online mobile gaming negatively affects university students' academic outcomes, recommending institutional policies and health programs to monitor gaming behavior. Recognizing the growing concern, researchers have proposed various interventions to mitigate mobile gaming addiction. Chau et al. (2019) developed the WIT (Wise IT-Use) program, a gamified educational approach designed to raise awareness about Internet gaming disorder and equip students with skills for responsible technology use. Steadman (2019) identified replacement behaviors aligned with gamers' interests, while Matheus et al. (2023) explored gating systems within online games as mechanisms to limit excessive engagement. These studies emphasize the importance of proactive and educational interventions to address gaming dependency.

Although certain studies acknowledge potential benefits of gaming, the negative social, psychological, and academic implications remain a pressing issue, particularly among Filipino youth. This concern is further compounded by the country's low performance in international large-scale assessments such as the Programme for International Student Assessment (PISA). The Philippines' results in PISA 2022 mirrored those of PISA 2018, revealing continuing deficiencies in mathematics, reading, and science (Philstar, 2023; OECD, 2023). These outcomes expose systemic challenges in equipping learners with critical thinking and problem-solving skills necessary for real-world applications.

In response, the Department of Education (DepEd) has initiated various programs to strengthen mathematical literacy and address learning gaps. Among these are partnerships with Sprix Inc. for the *Test of Fundamental Skills (TOFAS)*, the introduction of the National Math Program (NMP) under the *Matatag Curriculum*, and preparations for PISA 2025 (DepEd, 2024). These initiatives aim to enhance learners' foundational numeracy skills through diagnostic assessment, remediation, and differentiated instruction. Despite these efforts, disparities in Philippine mathematics education persist. Luzano (2024) identified eight major factors affecting student performance in PISA, including socioeconomic conditions, teacher quality, curriculum alignment, technological access, language barriers, and governance issues. Addressing these disparities requires targeted, innovative, and engaging interventions that make mathematics both accessible and meaningful to learners. In this context, a school-based perception survey was conducted among 766 Grade 9 students of Pasay City West High School (PCWHS). Results revealed that:

Variables	Number of Learners	Percentage
Own mobile devices	702	92%
Bring mobile devices in school	656	86%
Play mobile/online games	567	74%
Play mobile/online games during class hours	106	14%
Play mobile/online games at home	623	81%

Moreover, 39% acknowledged that gaming negatively affects their studies, while 33% admitted they cannot go through the day without playing. Notably, 83% agreed that excessive gaming is not beneficial, yet 34% could not identify an alternative hobby to replace it. On average, students spend 3.61 hours daily playing popular mobile games such as *Mobile Legends*, *Call of Duty*, *Roblox*, and *Minecraft*.

Parallel to this, academic performance data revealed alarming trends. This is shown as follows:

First quarterly test results

School Year	Mean	MPS
2024-2025	22.73	45.50
2023-2024	29.11	58.2
2022-2023	27.64	55.30

Furthermore:

Learners' quarter 1 proficiency results for three school years

Highly Proficient		Proficient		Low Proficient		Not Proficient	
Periodic Test Scores	Math Grade	Periodic Test Scores	Math Grade	Periodic Test Scores	Math Grade	Periodic Test Scores	Math Grade
33-50	90% & above	25-32	85%-89%	15-8	75%-79%	0-7	74% & below
12%	11%	29%	29%	19%	24%	0.03%	0%
23%	13%	36%	25%	11%	33%	0.08%	0%
17%	15%	34%	22%	20%	27%	0.23%	0%

The Mean Percentage Scores (MPS) in mathematics over three school years ranged between 45.46% and 58.22%, with a majority of learners classified as nearly proficient or below proficiency. Results from the National Math Program (NMP) diagnostic test showed that 98.22% of Grade 9 students required intervention in basic operations with polynomials. These findings highlight a pressing need for innovative, engaging, and behaviorally relevant strategies that can both reduce mobile gaming dependency and improve mathematical proficiency. Thus, this study proposes the use of MATCH (Math Checkers) and Moddax Cards (Modified Deck of Dots and X Cards) as alternative, game-based learning tools designed to redirect learners' attention from mobile games toward interactive and educational gameplay. By integrating competitive and recreational elements familiar to students, these tools aim to amplify skills in addition, subtraction, multiplication, and division of polynomials, addressing identified Least Mastered Skills (LMS) and supporting the objectives of the National Math Program. In today's digital age, mobile gaming has become one of the most accessible and engaging forms of leisure among adolescents. While it provides entertainment and opportunities for social interaction, excessive engagement in mobile games can lead to dependency or addiction, affecting learners' academic focus, study habits, and overall performance. This growing concern among Grade 9 learners has become evident through classroom observations and survey results showing declining academic interest and proficiency in mathematics. The researcher is interested to find out the students' perception about mobile gaming versus playing MATCH and Moddax cards. Recognizing the need to address this issue, the researcher explored a possible intervention to redirect learners' gaming interest toward educationally meaningful experiences. Specifically, the study introduced two alternative educational games—MATCH (Math Checkers) and Moddax Cards (Modified Deck of Dots and X Cards)—designed to develop learners' skills in performing basic operations on polynomials.

These games aim not only to enhance cognitive engagement and learning motivation but also to mitigate mobile game dependency by providing structured, academic, yet enjoyable alternatives within the school setting. With this, the researcher finds out the learners' perception about the proposed

intervention when it comes to cognitive benefits, emotional effects, academic impact and social interaction. Together with how do the learners perform in the researcher-made test before and after the intervention using the test instrument. The study seeks to uncover how the activity can serve as both an instructional and behavioral remedy—enhancing mathematical proficiency while reducing learners' reliance on non-academic mobile games. Ultimately, the findings are expected to contribute to developing sustainable classroom strategies that balance learners' natural interest in games with academic growth and responsible technology use.

Research Questions

This action research examined the effectiveness of MATCH (Math Checkers) and Moddax Cards (Modified Deck of Dots and X Cards) as alternative educational games in mitigating mobile game dependency and enhancing Grade 9 learners' proficiency in the basic operations of polynomials. Specifically, it sought to answer the following questions:

1. What is the proficiency level of Grade 9 learners in performing basic operations on polynomials before and after the implementation of MATCH & Moddax cards?
2. How significant is the difference between the pretest and posttest mean scores of the learners?
3. Is there a significant relationship between the learners' perception of playing mobile games and their perception in playing MATCH & Moddax cards?
4. How do the learners perceive playing MATCH & Moddax cards as alternative educational games based on cognitive benefits, emotional effects, academic impact, and social interaction?

Action Research Method

Participants and/ or Other Sources of Data and Information

The participants of the study were grade 9 learners of Pasay City West High School during the School Year 2024–2025 since the researcher is a grade 9 teacher of the same school. Using both cluster and purposive sampling each respondent represents the different sections who are heavy mobile/online gamer. They form the 25 respondents who belong to the different sections who spend more than the mean average of 3.61 hours of playing mobile/online games a day (as a result of the survey conducted before the experiment begins).

In addition, the researcher gathered supporting data of the selected participants that includes their first-quarter grades, first periodic test scores, Numeracy Monitoring Program (NMP) test results, and inventory test results to establish a comprehensive profile of their academic performance prior to the implementation of the intervention.

Data Gathering Methods

During the proposal drafting phase, the researcher conducted a preliminary survey to assess the level of mobile or online game addiction and dependency among grade 9 learners using a teacher-made survey instrument. This initial data served as the baseline information for identifying the extent of the learners' gaming habits and their potential impact on academic engagement. To further contextualize the study, the researcher collected secondary data such as the learners' first periodic test scores, first-quarter grades, and proficiency levels over three consecutive academic years. Additionally, the National Mathematics Program (NMP) test results for SY 2024–2025 and the Inventory Test results for SY 2023–2024 were obtained. For the main data collection, the researcher administered a Likert-scale survey questionnaire to determine learners' perceptions toward playing mobile or online games and their perceptions of the MATCH and Moddax cards as alternative, educational gaming tools. Moreover, the respondents completed a 30-item researcher-made multiple-choice test designed to measure their skills in performing basic operations with polynomials—including addition, subtraction, multiplication, and

division. This test was administered as both pre-test and post-test to evaluate learning gains after the intervention. In constructing the test, the researcher aligned the items with the least mastered competencies in Grade 9 mathematics, as identified from the department’s performance records over the past three academic years. These competencies were directly related to lessons on quadratic equations and functions, ensuring content validity and curriculum relevance.

Data Analysis

This action research employed a mixed-method approach, as both quantitative and qualitative data were gathered and analyzed to assess the effectiveness of the intervention. Quantitative data obtained from the tests results were analyzed using the mean and standard deviation to describe the learners’ overall performance and score distribution. To determine whether there was a significant difference between the pretest and posttest mean scores, a paired t-test was utilized.

Likewise, to analyze the relationship between learners’ perceptions of playing mobile games and their engagement with the MATCH and MODAX card activities, a survey questionnaire was developed. The quantitative data from the questionnaire were gathered through a five-point Likert scale, with responses to positive statements assigned values: 5 for strongly agree; 4 for agree; 3 for neutral; 2 for disagree, and; 1 for strongly disagree. Reverse scoring applied to negative statements :5 for strongly disagree; 4 for disagree; 3 for neutral; 2 for agree, and; 1 for strongly agree. The mean perception scores of each learner were computed and analyzed. Pearson-r correlation coefficient was used to find the correlation between the two sets of data (mean score of perception on playing mobile games and mean score of perception on playing the MATCH and Moddax cards).

The weighted mean for each category was computed based on the frequency of responses and the Likert-scale, and results were interpreted according to established perception levels: very positive, positive, uncertain, negative, and very negative. Moreover, the qualitative data from the learners’ survey responses, written and oral feedback, and observation notes were analyzed thematically according to four identified factors: cognitive benefits, emotional effects, academic impact, and social interaction. The integration of both quantitative statistical analyses and qualitative interpretation provided a holistic understanding of the learners’ academic performance and perceptions toward the intervention.

RESULTS AND DISCUSSION

Table 1. Learners’ Proficiency Level Based on the Pretest and Posttest Results

	Pre-Test	Post Test
Mean	12.68	26.60
Standard Deviation	2.94	2.47
Paired t-test results:		
• $t = 33.46$	$(\alpha=0.05)$	
• $p = 1.19 \times 10^{-21}$	$(p < 0.001)$	

The table represents the pretest mean score of 12.68 which suggests that learners initially demonstrated low mastery of the subject. The posttest mean score of 26.60 indicates a substantial improvement in performance. In terms of score consistency, the standard deviation decreased from 2.94 to 2.47, showing that the posttest scores were more clustered around the mean. This implies a more uniform level of learning among the learners after the intervention. The paired t-test yielded a value of $t(24) = 33.46$, $p < 0.001$, which is highly significant. This means there is a significant difference between the pre-test and post-test results. The p-value strongly supports the conclusion that the increase in scores did not occur by chance but was due to the intervention or learning activity implemented.

Table 2. Learners' Perception on Mobile Gaming versus Playing Match and Moddax Cards

Perception	Mean Score	SD	Interpretation
Mobile/Online Gaming	2.52	0.18	Negative Perception
MATCH and Moddax Cards	3.26	0.36	Neutral

SD=Standard Deviation

Each learner's mean score was computed based on the numerical value of their responses in the Likert-scale. Learners' views mobile/online gaming negatively and there was a neutral/uncertain perception for MATCH and Moddax cards. It also shows that the learners' perception on playing MATCH and Moddax cards are more varied than their perception on playing mobile/online games.

Table 3. Significant Relationship Between Learners' Perception on Playing mobile/online Games and Playing MATCH and Moddax Cards

Variables Compared	Pearson r	p-value	Interpretation
Mobile Gaming Perception vs. MATCH and Moddax Perception	-0.672	0.00023	There is a strong negative correlation, which is significant ($p < 0.05$). Hence, there is a significant inverse relationship between learner's perception of mobile gaming and their perception of MATCH and Moddax Cards.

It shows that learners who negatively perceive playing mobile/online games positively perceive playing MATCH and Moddax cards and vice-versa. This explains Cariaga et. al study (2024) on the rise and impact of online gaming on academic performance. They described that learners encounter psychosocial experiences: enjoyment; social bonding; time loss, and; academic distraction. The current study provided evidence that learners' motives for gaming are mixed. When learners are presented with alternatives that provided the same positive experiences, they tend to get away with experiences that gives negative outcome.

Table 4. Learners' Perception on Playing MATCH and Moddax Cards Based on Cognitive Benefits

No.	Statement	WM	SD	Interpretation
1	Playing the MATCH and Moddax cards helps me understand mathematics better.	4.00	0.82	Agree
2	I learn a lot about basic operations on polynomials through playing the MATCH and Moddax cards.	4.28	0.68	Strongly Agree
3	The MATCH and Moddax cards improve my quick thinking and problem-solving skills.	4.40	0.71	Strongly Agree
4	Playing the MATCH and Moddax cards helps me develop strategies, logical thinking, and quick wit.	4.24	0.97	Strongly Agree
5	The rules of the MATCH and Moddax cards are easy to understand.	3.96	1.27	Agree

WM-Weighted Mean; SD-Standard Deviation; I-Interpretation

The weighted mean shows either a strongly agree or agree responses among the learners. The low standard deviation that is near zero but less than one indicates that the responses group around the mean. This shows that learners believed that MATCH and Moddax cards help cognition, enhanced thinking and problem-solving skills. It supports Scalise et.al (2019) on benefits of playing numerical card games on head start children. Numerical card games benefited early numeracy and executive functioning and strengthen these cognitive mechanisms (attention, working memory).

Table 5. Learners' Perception on Playing MATCH and Moddax Cards Based on Emotional Effects

No.	Statement	WM	SD	Interpretation
1	I find playing the MATCH and Moddax cards enjoyable and entertaining.	4.36	0.57	Strongly Agree
2	I still feel happy even when I lose because I gain new learnings in mathematics.	3.96	0.84	Agree
3	Playing the MATCH and Moddax cards helps me build self-confidence.	4.28	0.68	Strongly Agree
4	I find playing the MATCH and Moddax cards more enjoyable than playing mobile or online games.	4.36	0.70	Strongly Agree
5	Playing the MATCH and Moddax cards is more beneficial to my mental health and overall well-being than mobile or online games.	4.40	0.58	Strongly Agree

Learners either strongly agree or agree that playing MATCH and Moddax cards are enjoyable, fun, engaging and motivating. The responses are almost uniform as indicated by a low standard deviation. It corroborates Li et. al (2024) on the impact of digital educational games on student motivation and engagement. Digital educational games increase motivation and engagement and learning games are stronger when games are well-designed and aligned with curriculum. Though the MATCH and Moddax cards are nondigital, both are game-based learning tools that can provide similar benefits while avoiding negative aspects of recreational mobile gaming.

Table 6. Learners' Perception on Playing MATCH and Moddax Cards Based on Academic Impact

No.	Statement	WM	SD	Interpretation
1	Playing the MATCH and Moddax cards helps me in studying mathematics.	4.00	0.82	Agree
2	Playing the MATCH and Moddax cards can help me achieve higher grades in mathematics.	4.68	0.48	Strongly Agree
3	The MATCH and Moddax cards are good recreational activities during school breaks to reinforce math learning.	4.28	0.54	Strongly Agree
4	I can use the MATCH and Moddax cards to teach or assist classmates who struggle with basic polynomial operations.	4.64	0.49	Strongly Agree

Learners either strongly agree or agree that playing MATCH and Moddax cards reinforced mathematical learning and achievement. The low standard deviation indicates a uniform response around the mean. It supports Singh (2021) in card game as a pedagogical tool for numeracy skills. Card games like the Moddax cards improve primary learners' numeracy skills and positively influence attitudes toward mathematics. Moreover, card-based, low-tech games can strengthen computation and procedural fluency.

Table 7. Learners' Perception on Playing MATCH and Moddax Cards Based on Social Interaction

No.	Statement	WM	SD	I
1	Playing the MATCH and Moddax cards helps me bond with my classmates.	4.48	0.51	Strongly Agree
2	Playing the MATCH and Moddax cards helps build better relationships with others compared to mobile or online games.	4.76	0.44	Strongly Agree

3	Playing the MATCH and Moddax cards can serve as an alternative to mobile or online games for entertainment.	4.08	0.81	Agree
4	Playing the MATCH and Moddax cards helps me build closer relationships with friends and loved ones.	4.24	0.72	Strongly Agree
5	I would like to teach other students, especially those struggling in math, how to play the MATCH and Moddax cards.	4.52	0.51	Strongly Agree

The learners either strongly agree or agree that playing MATCH and Moddax cards helped build relations, collaboration and healthy competition and the low standard deviation indicates that responses do not deviate from the means. It aligns with Sayeed et. al's (2021) implications by addressing the negative social consequences of mobile game dependency and offering a structured, educational, and socially engaging substitute that promotes both learning and interpersonal connection. As learners increasingly turn to mobile games to cope with emotional stress or boredom, their reliance on virtual engagement gradually diminishes opportunities for meaningful interpersonal communication. MATCH and Moddax cards as alternative educational games not only stimulate cognitive engagement but also foster face-to-face social interaction among learners.

For qualitative treatment, learners' responses to interviews are gathered, observation notes are used, and grouped according to themes based on the four factors.

1. On Cognitive Benefits

Theme: Enhanced Thinking, Strategy, and Problem-Solving Skills

Learners demonstrated strong awareness of the cognitive value of playing the MATCH and Moddax cards. They agreed that these games strengthened their analytical and strategic thinking abilities, improved their quickness in problem-solving, and helped them understand mathematical concepts more effectively. The following are sample responses from the learners gathered by the researcher from the observation notes and feedback and interviews during and after the conduct of the intervention:

Question: How does playing MATCH and Moddax cards help you in learning math?

Responses:

"Playing MATCH and Moddax makes me think faster when solving math problems. It feels like my brain is practicing while I play."

"I learned how to calculate faster because every move or card needs me to add or multiply polynomials correctly."

"The games helped me remember the rules in solving equations. Before, I always forgot the signs, but now it's easier."

"When I play, I have to plan my next move carefully, so it taught me to strategize, just like in problem-solving."

"It's not only fun — it's like doing math drills without realizing it. I improved in computing because I enjoyed the challenge."

2. On Emotional Effects

Theme: Motivation, Enjoyment, and Self-Confidence in Learning

Learners expressed positive emotions toward the games, describing them as enjoyable, motivating, and self-confidence-building. Despite minor mentions of boredom or sleepiness, most students perceived the games as emotionally uplifting and encouraging. The following are sample responses from the learners gathered by the researcher from the observation notes and feedback and interviews during and after the conduct of the intervention:

Question: How do you feel while playing the MATCH and Moddax cards

Responses:

"I feel excited every time we play because it's different from the usual lessons."

"Even when I lose, I still feel happy because I know I learned something from it."

"Before, I was nervous answering in math class, but now I feel more confident because I practiced through the games."

"Playing the cards helps me relax while learning — it's not boring like quizzes."

"Sometimes, I feel sleepy during long discussions, but with Moddax, I'm always alert and enjoying it."

3. On Academic Impact

Theme: Reinforcement of Mathematical Learning and Academic Achievement

Learners strongly associated the MATCH and Moddax cards with academic enhancement. The activities were perceived as effective instructional tools that supported mastery of mathematical operations, improved comprehension of polynomial concepts, and contributed to better grades. The following are sample responses from the learners gathered by the researcher from the observation notes and feedback and interviews during and after the conduct of the intervention:

Question: What are the advantages you gained in playing the MATCH and Moddax cards?

Responses:

"My grades in math improved after we started using the board and the cards. I understand polynomials better now."

"It's easier to remember rules because we use them during the games."

"Playing MATCH feels like reviewing, but more exciting. It helps me master addition and subtraction of polynomials."

"The games helped me realize that math can be fun and easy if you practice often."

"I also help my classmates understand by explaining the moves and answers during the game."

4. On Social Interaction

Theme: Collaboration, Relationship Building, and Healthy Competition

A key dimension of the learners' responses highlights the role of the MATCH and Moddax cards in fostering collaboration, bonding, and interpersonal communication. Learners appreciated the games' ability to create enjoyable social experiences, build friendships, and offer alternatives to digital gaming for positive interaction. The following are sample responses from the learners gathered by the researcher from the observation notes and feedback and interviews during and after the conduct of the intervention:

Question: How did playing the MATCH and Moddax cards help you with social interaction?

Responses:

"We become closer with my classmates because we play as a team or compete in a friendly way."

"It feels good to interact with others and not just use gadgets."

"I met new friends because of the games. We help each other understand how to play and solve."

"When I lose, my classmates teach me where I went wrong — that helps me learn more."

"We laugh and learn together. It's more fun than playing mobile games alone."

It can be deduced that from the learners' responses, they viewed playing the MATCH and Moddax cards positively. The insights provided that the intervention is beneficial to cognition, emotional aspects, academic achievement and social interaction.

CONCLUSION

The results and findings inferred that MATCH and Moddax cards helped learners remember and apply concepts about operations in polynomials. It significantly enhanced computational skills of the learners. The learners' perception about mobile/online games tends to decline as they perceive playing the MATCH and Moddax cards positively. It corroborates with Pajarillo-Aquino's (2019) study that learners need to be engaged in alternative non-digital activities to lessen mobile gaming hours, thus spending more time for academic activities. The more learners enjoy or value playing MATCH and Moddax cards, the less they tend to appreciate or prefer playing mobile/online games. The learners unanimously agreed that playing MATCH and Moddax cards enhanced thinking and problem-solving skills, gives motivation and enjoyment, reinforce learning and academic achievement, and build good relations among peers.

Recommendation

Based on the findings, the following specific recommendations are proposed:

- *Integration into Mathematics Remediation Programs*
Schools should formally adopt MATCH and Moddax Cards as part of remediation and enhancement sessions, particularly in topics involving polynomial operations.
- *Teacher Training and Capacity Building*
Mathematics teachers should undergo professional development on designing and implementing gamified learning tools that promote engagement and academic rigor to sway learners from depending on mobile/online gaming.
- *Incorporate Educational Game Tournaments*
Schools may organize "Math Play Days" or tournaments featuring MATCH and Moddax to reinforce skills while sustaining motivation and healthy competition.
- *Develop a Digital Version*
Future iterations may include a mobile or web-based version of MATCH and Moddax Cards, integrating technology responsibly while addressing the appeal of digital gaming among students.
- *Parent and Learner Orientation on Responsible Gaming*
Conduct awareness programs highlighting the effects of mobile game addiction and the benefits of educational alternatives such as MATCH and Moddax.
- *Continuous Monitoring and Research*
Implement ongoing evaluation and classroom-based research to refine the mechanics of the games and assess their long-term effects on mathematical proficiency and learner behavior.

Reflection

The conduct of this action research deepened the researcher's understanding of how learners' engagement in mobile gaming can both hinder and inspire innovative instructional design. Observing how learners shifted their enthusiasm from mobile games to academic ones was both rewarding and enlightening. It reaffirmed the belief that effective teaching does not only rely on conventional lectures but also on creative, learner-centered strategies that make abstract concepts tangible and enjoyable. The process of developing, implementing, and analyzing the outcomes of MATCH and Moddax also strengthened the researcher's pedagogical and research competencies, highlighting the value of continuous innovation in education.

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