

Innovative Board Game towards the Basic Mathematical Skills and Social Learning of Grade 5 Learners

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ABSTRACT: This study attempted to find out the significant difference between the basic mathematical skills of grade 5 learners before and after the implementation of innovative board game and the social learning after the implementation of innovative board game in grade 5 learners. As the findings of the study, the pre-test and post-test result of grade 5 learners before and after the implementation of innovative board game. The perception of grade 5 learners on social learning after the implementation of innovative board games. The significant difference between the basic mathematical skills before and after the implementation of innovative board games. Based on the above findings, the hypothesis stating that there is no significant difference between the basic mathematical skills before and after the implementation of innovative board game is therefore not accepted. Also, the hypothesis stating there is no significant difference on the social learning of grade 5 learners after the implementation of innovative board games is therefore not accepted. Gleaned on findings and conclusions drawn from the study, it may also be recommended to provide programs and other more interventions which will enhance students' performance in mathematics and to improve quality of teaching and learning process among teachers and students.

KEYWORDS: Innovative Board Game Social Learning Basic Mathematical Skills

1. INTRODUCTION

No one can deny that Mathematics is consider to be one of the toughest subjects in elementary. It is not just a myth but a real-life fact for the current generation. As stated in the study of Capuno, et.al., (2019), among Filipino learners, Mathematics is one of the hardest subjects in high school and elementary. By this reason, educators at the elementary level must improve the basic mathematical skills for it is the foundation in mathematics that needs solid ground and widely considered to be a good way in teaching the basic skills in mathematics to construct an effective intervention to gain improvement. As discussed by Costales, et. al. (2019), the Basic mathematical Skills are the four-fundamental operation which are Addition, Subtraction, Multiplication and Division.

In accordance to DepEd Order No. 12, s.2015, the "Early Language, Literacy, and Numeracy Program" will aim to meet the numeracy standard in elementary level especially in the four-fundamental operation: Addition, Subtraction, Multiplication and Division in building a strong foundation in Mathematics. As we reviewed the spiral curriculum of the basic education, higher level lesson in mathematics applies the four-fundamental operation such as fractions and decimals in elementary level. Thereafter, the conduct of the annual numeracy assessment in Talisay Elementary School shows that the greatest number of non-numerates appears in grade 5 level. Along with this, is the identification of the least learned competencies of all lessons in grade 5 and it reveals that it is in the operations on decimals. Carrying on, it might come to worst if not resolve ahead of time and it can lead to a struggle to higher grade level if they will not improve the basic mathematical skills on Decimals. Furthermore, Wriston, (2015) expressed in his study that improving the basic mathematical skills in elementary level are highly beneficial prior to other higher-level mathematical courses. In particular, those basic mathematical skills which are the four-fundamental operations applied in decimals should also prioritize to improve for it is found in the least learned competencies.

Accordingly, Lortie-Forgues, et. Al. (2015) states in their study that decimals is one of the crucial topics in elementary level particularly in grade four and grade five learners. A lot of learners find it hard on the operations on decimals because it is quite different on operations of whole numbers. However, various interventions are crafted to lighten the weight of learning decimals. Many video lessons are found over the internet for the techniques and strategies in solving operations on decimals. After all those video-mediated instructions there still a remain of non-numerates found in grade 5 learners. Along with today's technology-oriented world, the researcher flips the intervention on direct learning wherein the learners will commit improvement in operations on

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decimals through learning by doing in a way of playing. The learners will physically and mentally experience practicing the operations on decimals in a form of a game. Moreover, Nguyen, et. al. (2020) found effectiveness of a game on practicing counting examples on the operations on decimals. It yielded a good outcome to learners who are involved in the study. Also, playing games seems enjoyable especially to elementary learners. It boosts the excitement of the learners in engagement to learning. The demand of effort to teachers and learners in complying with the struggle in the operations on decimals will lessen for they automatically invest time in playing.

Furthermore, Martins & Mota (2022), states that playing innovative board games, may be a very effective strategy, particularly in creating its designs, in developing the numerical and representational math skills necessary for the numeracy improvement of the learners in academic environment. Innovative Board Games design overlook its effect on increasing knowledge and acquiring preliminary numeracy skills. In addition, playing innovative board games improves the mathematical self-concept of the learners. It merely constructs the ideas of learners to have a self-technique in calculating numbers in a fastest and easiest way. It will give opportunity to learners on how they will discover their own strategies on improving their basic mathematical skills on decimals.

Innovative board game will be design as a resource material or tool in the study. It will be used on improving the four-fundamental operation on decimals. Its instruction will be modified based on the target goal of the researcher that purposely benefits the pupils to practice the four-fundamental operation on decimals in an enjoyable way through playing. It is the innovation of board games that will help improve the mathematical ability of grade 5 pupils in operations on decimals through counting examples. It basically focuses on improving the four-fundamental operation for it is a pre-requisite skill in mathematics that are applied in decimals. Likewise, Chen (2018) pursue in his study that integration of innovative board game engaged a multiple thought pattern behind its rules and design.

In accordance to board game intervention, social learning will also be considered for they will interact to other learners while playing. Based on the study of Rosenthal & Zimmerman (2014), social learning reacted upon cognitive mechanism of learners. It highly affects the attitudes and study habit of learners through social interaction as well as learning through application of knowledge.

In the result of the Program for International Student Assessment (PISA) released by the Organization for Economic Cooperation and Development (OECD) last 2018, Philippines ranked in the low 70s in Mathematics with an average score of 353 points over 489 OECD average scores. The participants in this international assessment are 15-year-old students which represents the Philippines globally (Golla & Reyes 2020). Subsequently, the Trends in International Mathematics and Science Study 2019 (TIMSS) revealed that Filipinos buffered behind other countries globally during the international assessment for Mathematics and Science that placed the Philippines to be the lowest among 58 associated countries (Mullis & Martin 2017). These two-consecutive outcome on international standards in Mathematics was quite alarming in the Department of Education (DepEd) that currently implementing the new curriculum of K-12. Hence, the goal to shift to quality education remains unattainable in an international extent due to the fact that it must be based on the global standard specifically in Mathematics.

The researcher became interested in pursuing this study to improve the basic mathematical skills of the grade 5 learners on Decimals through social learning on the use of innovative board games. Four-fundamental operation (Addition, Subtraction, Multiplication and Division) is the basic mathematical skills that considered as the ground level in elementary mathematics. As the Department of education get the numeracy reports yearly in every school, Talisay Elementary school appears to have the greatest number of non-numerates in grade 5 learners. Thereafter, the least learned competencies among all the math lessons in every grade level are also reported. After seeing the results of the school report, it reveals that among all the math lessons in grade 5 level, the least learned competencies found is the operations on decimals. The numeracy reports of the school way back 2019, before the surge of the pandemic, also shows the same least learned competencies in grade 5 lessons. The fact that it's been a long time struggles in mathematics of grade 5 level, the researcher aims to provide intervention tool to helps improve the performance of the grade five learners in solving operations on decimal.

Given the modern world, wherein all of the things around are technology-oriented, video mediated instructions are the trend to extend the teaching-learning process at home. Despite of its interactive attack to learners, it does not really satisfy the learning needs of the learners for it won't engrave deeply on their mind. Instead, learners easily forgot what they listen on those video lessons for it mostly requires cognitive skills. By this reason, the learners eventually desire for learning experiences especially now that the pandemic gradually lifted. Learning by doing is still effectively deepen the understanding of learners to the concept of the particular lesson because as learner experience the learning process physically the more it will retain on their long-term memory because their mind, emotion and body will remember how they understand deeply the lesson.

In accordance, playing games are nature of elementary learners because they find the source of satisfaction on it. As it integrated to four-fundamental operations on decimals, it will possibly give the desired outcome of the researcher in the study in improving the learner's basic mathematical skills. Furthermore, innovative board game will be the learning tool to be use in the study because it will actually serve as a play exercise that consist of different counting examples for learners to enjoyably improves their basic mathematical skills on decimals. Therefore, this requires social learning that may also help the learners to practice the basic mathematical skills through their classmates. It will affect the learning behavior of the learners might shift the morning mindset of

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the learners that mathematics is a difficult subject area. It will give a learning satisfaction through the innovative board games as well as social interaction that will help learners in improving the mathematical skills in four-fundamental operation on decimals.

2. THE COMPREHENSIVE THEORETICAL BASIS

The study was based on the four theories of learning: Classical Conditioning (Pavlov), Operant Conditioning (B.F. Skinner), Cognitive Theory (Jean Piaget), Social Learning Theory (Albert Bandura). Classical conditioning is a theory of learning that happen unconsciously. Pavlov believed that the conditioned reflex had a physiological basis in the creation of new pathways in the cortex of the brain by the conditioning process. Ivan Pavlov experiment the neutral stimulus and unconditioned stimulus of a dog through the use of a bell. The study was intended to have a conditioned response to the learners to have the auto-response in improving the four-fundamental operations with the use of innovative board game on Decimals. In Operant Conditioning, the learning occurs through reward and consequences where the consequences of a response determine the probability of it being repeated that displays the law of effect. The innovative board game proposed by the researcher that will be used in the study is in form of a play that basically have the winner and loser. As a consequence, the learner will have an emotional response that will encourage them to have the eagerness to practice more on four-fundamental operation on decimals by playing the innovative board game. When it comes to Cognitive Theory of Jean Piaget, it suggests that the cognitive development had a great impact affecting their growth of intelligence. The study was purposely help to improve the basic mathematical skills of learners on decimals through playing innovative board game. The study aftereffect the Social Learning Theory of Albert Bandura by the reason that in this study there is always an opponent in playing the innovative board game. It has four components namely Attention, Retention, Reproduction and Motivation that reliably affects the learning progress of learners. It requires socialization to other learners as well as they can help each other on how to improve their basic mathematical skills on Decimals.

In relation to this, Andika, et. Al. (2019) identify the effectiveness of board game in teaching mathematics. It helps to improve the intellectual ability of the learners to cope up with the counting examples not feeling the difficulty of doing it. Moreover, Tobias, et. Al., (2014) game-based learning should have a good instructional design to build a strong foundation especially in improving the mathematical skills. Moreover, Kang et. al. (2014), identify the effectiveness of innovative board games as part of the learning progress. The concept and designs of the innovative board game should be based on the learning needs of the learners (Martins & Mota 2022) to innovate and ensure the effectiveness of the intervention tool in improving the four-fundamental operations on decimals of grade 5 learners.

Innovative board games are likewise effectual for objectives other than expanding information. As per Charlier and De Fraine (2014), board games can be a charming and persuasive strategy for learning content and improving gathering connections, rivalry, and fun to express its uniqueness and innovative characteristics. Martins et al. (2022) announced that board games give instructive substance in a social interaction include connections with other people; in this way, they favor information obtaining by empowering trades of encounters and learning. Besides, Wanyama et al. (2016) showed that, as a technique for wellbeing schooling, board games increment the obtaining of information just as result in more certain encounters than do wellbeing talks among other members. Moreover, Karbownik et al. (2011) showed that a board game was energetically invited by the learners; as they would see it innovatively, it worked with logical reasoning and friend correspondence. Accordingly, Elofsson et. al. (2016), proves that playing innovative number board games can benefits the development of the learner's basic mathematical skills. In reference, as discussed by Costales et. al. (2019), the Basic mathematical Skills are the four-fundamental operation which are Addition, Subtraction, Multiplication and Division. It also considered as the solid ground of the elementary mathematics which needs to have a strong foundation.

Moroever, Noda et. al. (2019) conclude in their study that innovative board game was effective and one of the major factors it has is the social interaction it requires in order to played it. However, Rosenthal & Zimmerman (2014) emphasized in their study that social learning affects learning behavior and to the highest manifestation of human intellect. This means that the way the learner behave in the learning process are developed through social interaction to their co-learners. In line with the Social learning, Apriliyanto & Saputro (2018) expressed in their study that math learning accomplishment is affected by the interior and outer element of the learners. One of the impacting outer elements is social interaction with companions in learning exercises. In support with this, playing innovative board game will allow the learners to extend the social interaction that is a part of social learning. According to the theory of Albert Bandura, there are four components of Social Learning theory. These are Attention, Retention, Reproduction and Motivation. Most of the learners are attention seeker but on the other way around they have also a limited span of time in paying attention. Their ability to pay attention depends on their accessibility to what is being observed. During the learning process, the learners find it hard to have retention on what they learned. In this case, through social learning they have the possibility to have a long-term retention of information through the behavior and consequences they experience because the learning progress are not only engraved on their mind but rather on their whole body. In reproduction, as an outcome, they tend to repeat the learning behavior in different social context and let other learners adapt it. As a result, it can be a motivation to other learners as they will repeat the learning behavior adapt on what you have learned.

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3. METHOD

This study used quasi-experimental method of research to assess and determine the difference between the pre-test and post test results in Math specifically in the four-fundamental operation of selected Grade 5 learners of Talisay Elementary School, Talisay, Tiaong, Quezon after using the innovative board game.

The study was considered to have the quasi-experimental research design by the reason that it involves only the manipulation of the independent variable. It is a one group design in which the same variable is measured in one group of respondents before (pretest) and after (posttest) is administered. It is generally higher in internal validity in applying this design in the implementation of Innovative Board Game intervention.

The respondents in this study are the selected 30 Grade 5 learners of Talisay Elementary School, Tiaong II district, school year 2022 – 2023, who identified as having struggling performance in the four-fundamental operation on decimals as well as with available gadgets can be used for the open communication in the implementation of the intervention. The respondents are the low performer based on the numeracy assessment during the first quarter of the school year 2022-2023.

The researchers utilized purposive sampling technique wherein the respondents will be chosen on the basis of the result of numeracy test that identifies the non-numerates grade 5 learners. The 40-item test will be given to the learners.

The instrument used in this study is a 40-item test about Addition on decimals, Subtraction on decimals, Multiplication on decimals and Division on decimals and the innovative board games for each Operation (ROPE and RACE, Math Scrabble, Monopoly X and Game of D' Generals) that serve as an intervention tool in improving the four-fundamental operations on decimals. Along with this, are the survey questionnaires for the validation of the innovative board games and social learning survey to measure the learning level of the learner while interacting to other learners.

Innovative board game was designed as a resource material or tool in the study. It will be used on improving the four-fundamental operation on decimals. Its instruction will be modified based on the target goal of the researcher that purposely benefits the pupils to practice the four-fundamental operation on decimals in an enjoyable way through playing. It is the innovation of board games that will help improve the mathematical ability of grade 5 pupils in operations on decimals through counting examples. The mechanics of every board game differs depending on the operation integrated and the kind of innovative board game associated on it. Each innovative board game has mechanics that are simple and easy to understand. It is conveniently made for the respondents to ease their struggles in learning the four-fundamental operations on decimals. It basically focuses on improving the four-fundamental operation for it is a pre-requisite skill in mathematics that are applied in decimals. Likewise, Chen (2018) pursue in his study that integration of innovative board game engaged a multiple thought pattern behind its rules and design.

The Innovative board game together with the pre-test and post-test will be validated through the assistance of the research adviser, district master teachers in Mathematics of Tiaong II District.

The researchers of this study identified the result of numeracy test that reveals the non-numerates grade 5 learners. Another thing is the identification of the least learned competencies acquired. It is found that the struggling learners in grade 5 were identified to be challenged on the four-fundamental operations in decimals. Next step is the conduct a pre-test to determine the status of learning performance of grade 5 learners in the four-fundamental operations on Decimals. Thereafter, the innovative board games will be disseminated and utilized to the learners.

As the lesson started, there were a game to played for every respondent as an application of the particular lesson in Decimal or one of the four-fundamental operation. A quick report of accomplishment of score sheets of the innovative board games of the Grade 5 learners for ensuring the daily games they have done. Regular monitoring on learners' performance will be done to assures their participation and engagement to the intervention. Every week there will be one innovative board game to be played by the respondents depending on the operations and weekly topic. The duration of the utilization will last for 6 consecutive weeks. After the period of time allotted for the program, the respondents will be given posttest, to see if there is an improvement to their performance in the four-fundamental operations on decimals.

All the data gathered were subjected to statistical treatment for valid result and interpretation. The mean percentage score will be computed to determine the increase between the pretest and posttest. The significant difference on the basic mathematical skills of grade 5 learners before and after the implementation of innovative board games will be computed and interpreted using t-test. The significant relationship on social learning in improving the four fundamental operations on Decimals of grade 5 learners will be computed and interpreted using Pearson correlation for the reliable result.

The data to be gathered and collected using different statistical treatment. The pretest and posttest scores were interpreted and analyzed using the frequency distribution and simple mean percentage to determine the average score of the respondents before and after employing the innovative board games. In determining the significant difference on the basic mathematical skills of grade 5 learners before and after the implementation of innovative board games, it will be computed using one-paired t-test. And the significant relationship on social learning in improving the four fundamental operations on Decimals of grade 5 learners were computed and interpreted using Pearson correlation for the reliable result.

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4. RESULTS AND DISCUSSION

This presents the findings of the study in tabular forms with corresponding analyses and interpretations so as to draw relevant conclusion and set forth recommendations.

Table 1. Pre-test and post-test scores of the respondents on the basic mathematical skills in terms of Addition on Decimals.

Scores	Pre-test		Post		Interpretation
	f	%	f	%	
9-10	6	20.0	27	90	Outstanding
7-8	6	20.0	3	10	Very Satisfactory
5-6	11	36.7	-	-	Satisfactory
3-4	4	13.3	-	-	Fairly Satisfactory
0-2	3	10.0	-	-	Did not meet expectation

The table flash the results of the pre-test and post-test scores of the grade 5 learners on the basic mathematical skills in terms of Addition on Decimals. It clearly shows that from the pre-test result, almost 60% of the respondents that ranks satisfactory and below upsurge to higher level. From 20% of learners in outstanding level, it goes up to 90% after the implementation of innovative board game that has enhancement game in Addition on Decimals. In the level of did not meet expectation, learners can add 1-2 digit decimals but are limited to a high-level competency like addition with regrouping. Learners in fairly satisfactory can only add decimals without regrouping and cannot easily comprehend word problems. Also, the learners in this level, can only add 1-digit decimal by 1-digit. In very satisfactory levels, learners can add 2-digit by 3-digit decimal number but limited to comprehend word problems. In outstanding level, they can easily add 2-3-digit by 3-4-digit decimal number and able to analyze word problems comprehensively.

Table 2. Pre-test and post-test scores of the respondents on the basic mathematical skills in terms of Subtraction on Decimals.

Scores	Pre-test		Post		Interpretation
	f	%	f	%	
9-10	0	0	10	33.33	Outstanding
7-8	2	6.67	7	23.33	Very Satisfactory
5-6	4	13.33	12	40.00	Satisfactory
3-4	12	40	1	3.33	Fairly Satisfactory
0-2	12	40	-	-	Did not meet expectation

The tabular data above shows the pre-test and post-test score of grade 5 learners on the basic mathematical skills in terms of Subtraction on Decimals. It transparently tabulated the improvement of the basic mathematical skills of grade 5 learners in terms of Subtraction using the innovative board game (Math Scrabble). From pre-test that has almost 80% or 24 learners in the level of fairly satisfactory and did not meet expectation, it strives up in upper level of satisfactory and above. In the level of did not meet expectation, learners can subtract 1-2 digit decimals but are limited to a high-level competency like subtraction with regrouping. Learners in fairly satisfactory can only subtract decimals without regrouping and cannot easily comprehend word problems. Also, the learners in this level, can only add 1-digit decimal by 1-digit. In very satisfactory levels, learners can subtract 2-digit by 3-digit decimal number but limited to comprehend word problems. In outstanding level, they can easily subtract 2-3-digit by 3-4-digit decimal number and able to analyze word problems accurately.

Table 3. Pre-test and post-test scores of the respondents on the basic mathematical skills in terms of Multiplication on Decimals.

Scores	Pre-test		Post		Interpretation
	f	%	f	%	
9-10	-	-	4	13.33	Outstanding
7-8	1	3.33	10	33.33	Very Satisfactory
5-6	3	10.00	8	26.67	Satisfactory
3-4	8	26.67	8	26.67	Fairly Satisfactory
0-2	18	60	-	-	Did not meet expectation

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Table 3 show off the results of pre-test and post-test result of grade 5 learners on the basic mathematical skills in terms of Multiplication on Decimals. By the result shown in the table, innovative board game (Monopoly X) affects the basic mathematical skills of grade 5 learners as it is seen that from the range of scores 0-8 in pre-test, it gradually increases in the post test scores that now ranges 3-10. In the level of did not meet expectation, learners can multiply 1-2 digit decimals but are limited to a high-level competency like multiplication with regrouping. The 60% of learners in this range of scores can only multiply decimals without regrouping and cannot easily comprehend word problems. Also, the learners in this level, can only multiply decimals with 1-digit multiplier. In satisfactory level, it describes that the learners in this level can multiply decimals with regrouping but only limited to 1-digit multiplier. In very satisfactory level, learners can multiply decimal numbers with regrouping and can multiply decimals with decimal point on multiplier and limited to 1-2 digit. Aside from its concept, multiplication is one of the hardest operation in four-fundamental in basic mathematics (Larsson 2016). However, it doesn't block the chance of improvement through the use of innovative board game (Monopoly X) that practiced the counting skills of the learners in terms of multiplication on decimals.

Table 4. Pre-test and post-test scores of the respondents on the basic mathematical skills in terms of Division on Decimals.

Scores	Pre-test		Post		Interpretation
	f	%	f	%	
9-10	-	-	-	-	Outstanding
7-8	-	-	-	-	Very Satisfactory
5-6	1	3.33	17	56.67	Satisfactory
3-4	17	56.67	12	40.00	Fairly Satisfactory
0-2	12	40	1	3.33	Did not meet expectation

Table 4 presents the pre-test and post-test score of grade 5 learners on the basic mathematical skills in terms of Division on Decimals. It evidently conveys the improvement of the basic mathematical skills of grade 5 learners in terms of Division on decimals using the innovative board game (Game of D' General). In this case, in the level of did not meet expectation, learners can divide 1-2 digit decimals but are limited to a high-level competency like division with regrouping. In fairly satisfactory level, it describes that the learners in this level can divide decimals with regrouping but only limited to 1-digit divisor. In satisfactory level, the learners can divide decimals with 1-2-digit divisor with regrouping but limited to multiplying decimals with decimal point on multiplier due to some cases like misplacement of decimal point on the quotient and adding zeros. Both results of pre-test and post-test ranges in the score of 0-6, but it can visibly notice the increased number of learners in satisfactory level. This means that even if no learners reach the very satisfactory and outstanding level, it still reveals the difference happen after the implementation of the innovative board game as intervention in enhancing the basic mathematical skills of grade 5 learners in terms of Division on Decimals.

Table 5. Perception on Social Learning of Grade 5 learners after the implementation of innovative board games in terms of Attention.

Indicators	Mean	SD	Verbal Interpretation
1. My ability to pay attention on details and mechanics of the innovative board game depends on my accessibility of what I observed.	3.57	0.63	Much Evident
2. When I realized that my classmates perform well in playing, I pay attention on how I will adapt it.	3.70	0.47	Much Evident
3. I pay attention to perceived the value of behavior I need in my learning progress	3.87	0.43	Much Evident
4. I observe and adapt learning behaviors of my classmates that helps me in gaining strategies and counting techniques.	3.43	0.57	Fairly Evident
5. I pay attention on the relevance of behaviors as well as my own cognitive and preconceptions.	3.50	0.57	Fairly Evident
Overall	3.61	0.31	Much Evident

The table above displays the perception of grade 5 learners on Social learning after the implementation of innovative board game in terms of Attention. In this component, the researcher desires to gather the data about the insight of the respondents on social learning in terms of how it affects their attention as they use the innovative board game in learning the basic mathematical skills or

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the four-fundamental operation on decimals. It appears that the highest mean among the five indicators is indicator 3 with a mean result of 3.87 and a standard deviation of 0.43 that states “I pay attention to perceived the value of behavior I need in my learning progress” with a verbal interpretation of much evident. In this case, it describes that based on the learning experience of the respondents during the implementation of innovative board game in terms of attention, they highly perceived that in order to have a learning progress it is important to always pay attention in details particularly in the mechanics of the innovative board game. Indicator 3 is highly and always observed in the social learning of the respondents in terms of their attention showed during the implementation of the innovative board game. On the other hand, the lowest mean seen on the table is indicator 3 stating “I observe and adapt learning behaviors of my classmates that helps me in gaining strategies and counting techniques” having a mean of 3.43 and a standard deviation of 0.57 with a verbal interpretation of fairly evident. It indicates that the respondents least perception in the implementation of innovative board game is the adaptation of strategies and counting techniques adapted and observed to their co-learners. This indicator brings out to be often observed among the five indicators in terms of attention. Overall, the perception of the respondents in social learning after the implementation of innovative board game in terms of attention have a mean score of 3.61 and a standard deviation of 0.31. It means that social learning in terms of attention is always observed or much evident based on the learning experience of the learners.

Table 6. Perception on Social Learning of Grade 5 learners after the implementation of innovative board games in terms of Retention.

Indicators	Mean	SD	Verbal Interpretation
1. Whenever I adapt a good learning behavior, I imitate it.	3.73	0.45	Much Evident
2. The sequence of behaviors and consequences during the game helps me in retaining information on my mind.	3.60	0.62	Much Evident
3. My peers and friends help me to practice my mathematical skills with retention	3.43	0.63	Fairly Evident
4. Imitation deepen my learned behavior in my long-term memory	3.53	0.63	Much Evident
5. Staying on task, participating, or showing up prepared me to learn on a consistent basis	3.73	0.45	Much Evident
Overall	3.61	0.28	Much Evident

The table above displays the perception of grade 5 learners on Social learning after the implementation of innovative board game in terms of Retention. In this component, the researcher desires to gather the data about the insight of the respondents on social learning in terms of how it affects the retention of information to learners as they use the innovative board game in learning the basic mathematical skills or the four-fundamental operation on decimals. It appears that the highest mean among the five indicators is indicator 1 that tells “Whenever I adapt a good learning behavior, I imitate it” and indicator 5 that states “Staying on task, participating, or showing up prepared me to learn on a consistent basis” with a mean result of 3.73 and a standard deviation of 0.45 with a verbal interpretation of much evident. In this matter, it describes that based on the learning experience of the respondents after the implementation of innovative board game in terms of retention is clearly seen on the respondents as they interact to other learners in order to learn in a consistent basis. Respondents highly perceived that staying on task makes them to have a solid retention of information as proven by their learning experience after the implementation of the innovative board game. Indicator 1 and 5 is highly and always observed to the respondents on how they comply with the intervention. Accordingly, the lowest mean score is indicator 3 with a mean of 3.43 and a standard deviation of 0.63 that states “My peers and friends help me to practice my mathematical skills with retention” with a verbal interpretation of fairly evident. It means that seeking of help and assistance in order to have retention in practicing the mathematical skills is often observed. It might be due to self-discovery of every learners on how they can easily master the counting techniques independently. Learners have different learning mood, that is why they have a lot of learning differences and this might affect the retention ability of the respondents. Generally, the table shown above present a mean of 3.61 and a standard deviation of 0.28 with a verbal interpretation of much evident or always observed to the respondents as they undergo in the implementation of the innovative board game in learning the basic mathematical skills in terms of retention through social learning. As stated to the study of (Rumjaun & Narod 2020), retention of information on social learning is the ability to retain information without feeling of any pressure

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Table 7. Perception on Social Learning of Grade 5 learners after the implementation of innovative board games in terms of Reproduction.

Indicators	Mean	SD	Verbal Interpretation
1. I have enough time to practice and learn the operations on decimals with diverse students in playing innovative board game.	3.40	0.81	Fairly Evident
2. Through reinforcement, I can apply my observations in my own learning	3.40	0.62	Fairly Evident
3. I am connected to other learners in creating ecosystem in learning	3.60	0.62	Much Evident
4. I inspire other learning and reinforce them to have learning reproduction	3.47	0.68	Fairly Evident
5. Social learning through playing the innovative board game helps us to improve our basic mathematical skills on decimals	3.80	0.41	Much Evident
Overall	3.53	0.37	Much Evident

The table above displays the perception of grade 5 learners on Social learning after the implementation of innovative board game in terms of Reproduction. In this component, the researcher desires to gather the data about the insight of the respondents on social learning in terms of how it affects the reproduction of their learnings as they use the innovative board game in learning the basic mathematical skills or the four-fundamental operation on decimals. It reveals that the highest mean among the five indicators is indicator 5 that tells “Social learning through playing the innovative board game helps us to improve our basic mathematical skills on decimals” with a mean result of 3.80 and a standard deviation of 0.81 with a verbal interpretation of much evident. In this part, it indicates that based on the learning experience of the respondents after the implementation of innovative board game in terms of reproduction is clearly seen on the respondents pass through the information in order to reproduce learning outcomes and strategies as they interact to other learners in order to learn on each other. Respondents highly perceived that reproduction of learning strategies and techniques might be seen on social learning through the use of innovative board game to help them improve the basic mathematical skills they need in order to acquire furtherance. Meanwhile, indicator 2 that states “Through reinforcement, I can apply my observations in my own learning” got the lowest mean of 3.40 and a standard deviation of 0.62 with a verbal interpretation of fairly evident. It means that the reinforcement gets by the respondents to their peer group that is applied on oneself in the learning process is often observed. All in all, the tabular representation above have a mean of 3.53 and a standard deviation of 0.37 with a verbal interpretation of much evident. This denotes that the perception of the respondents on social learning in the basic mathematical skills in term of reproduction is always observed.

Table 8. Perception on Social Learning of Grade 5 learners after the implementation of innovative board games in terms of Motivation.

Indicators	Mean	SD	Verbal Interpretation
1. I receive positive and negative reinforcement in playing innovative board game that motivate me to perform certain behaviors	3.60	0.62	Much Evident
2. I use my points earned in every game to motivate other learners.	3.63	0.67	Much Evident
3. Reinforcement help me develop my self-efficacy and confidence and love for learning	3.67	0.48	Much Evident
4. Rewards motivate me to improve my mathematical skills	3.70	0.60	Much Evident
5. I take every actions and consequences in a positive way.	3.63	0.67	Much Evident
Overall	3.65	0.39	Much Evident

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The table above displays the perception of grade 5 learners on Social learning after the implementation of innovative board game in terms of Motivation. In this component, the researcher desires to gather the data about the insight of the respondents on social learning in terms of how it affects the motivation as they use the innovative board game in learning the basic mathematical skills or the four-fundamental operation on decimals. It conveys that the highest mean among the five indicators is indicator that states “Rewards motivate me to improve my mathematical skills” with a mean result of 3.70 and a standard deviation of 0.60 with a verbal interpretation of much evident. In this part, it indicates that based on the learning experience of the respondents after the implementation of innovative board game in terms of motivation is transparently seen on the learning outcome of the respondents with regards to reinforcement that will contribute their learning progress. In accordance, rewards will always be motivational especially to learners, even if it is abstract or concrete. This is the reason why it is highly perceived and always observed to the respondents in social learning in the implementation of innovative board game in terms of motivation. On the other way around, the indicator with least mean is the indicator 1 with a mean of 3.60 and a standard deviation of 0.62 that states “I receive positive and negative reinforcement in playing innovative board game that motivate me to perform certain behaviors”, with a verbal interpretation of much evident or always observed to the respondents after the utilization of the innovative board game in the basic mathematical skills. Overall, social learning on basic mathematical skills using the innovative board game in terms of motivation is always observed and highly incorporate to the respondents.

Table 9. Test of difference between the Pre-test and Post test scores of the Respondents in Basic Mathematical Skills.

**Correlation is significant at the 0.05 level (2-tailed).

The table portrays the test of difference between the result of the pre-test and post-test scores of grade 5 learners on the basic mathematical skills through the use of innovative board game. There are four variables indicated on the table that represent the basic mathematical skills of the respondents or the four-fundamental operation.

Basic Mathematical Skills	Pre-test		Post test		t	df	Sig. (2-tailed)	Interpretation
	mean	SD	mean	SD				
Addition	5.87	2.32	9.63	0.67	-9.344**	29	0.000	Significant
Subtraction	3.13	1.70	7.20	1.75	-9.733**	29	0.000	Significant
Multiplication	2.47	1.87	6.13	1.78	-9.928**	29	0.000	Significant
Division	2.53	1.28	4.47	1.17	-7.250**	29	0.000	Significant

By the result presented on the table, it is significant at 0.005 level of significance. It clearly implicates that the test of difference between the result of the pre-test and post-test scores of grade 5 learners on the basic mathematical skills through the use of innovative board game conveys significance. It is significant for it positively change the learning pathway of the respondents as shown on the statistical data above. Based on the mathematical skills of the respondents before the implementation of the innovative board game, it is observed that they struggle to execute the application of the basic mathematical skills or the four-fundamental operation in decimals. But as it goes along, in the utilization of the innovative board game which contains different counting examples integrated in every board game, their struggles were replaced by fun learning journey with satisfaction. It is firmly proven by the learning outcome possess by the respondents. In relation to this, Sonnenschein, et al., (2016) identify the effectiveness of board game in teaching mathematics for it develops the intellectual ability of the learners to cope up with the counting examples not feeling the difficulty of doing it.

5. CONCLUSION

After the clear and comprehensive interpretation and tabulation of the data gathered, the researcher inferred with the conclusion based on the hypothesis that there is no significant difference between the social learning before and after the implementation of innovative board game and there is no significant difference in social learning after the implementation of innovative board game is REJECTED.

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REFERENCES

- 1) Andika, et. Al. (2019). "Playing board games with mathematical self-concept to support early numeracy skill of 5-6 years old children"
- 2) Apriliyanto, B., & Saputro, D. R. S. (2018, March). "Student's social interaction in mathematics Learning". In Journal of Physics: Conference Series (Vol. 983, No. 1, p. 012130). IOP Publishing.
- 3) Capuno, R., Necesario, R., Etcuban, J. O., Espina, R., Padillo, G., & Manguilimotan, R. (2019). *Attitudes, Study Habits, and Academic Performance of Junior High School Students in Mathematics*. International Electronic Journal of Mathematics Education, 14(3), 547-561.
- 4) Charlier, N., & De Fraigne, B. (2012). *Game-based learning in teacher education: A strategy to integrate digital games into secondary schools*. International Journal of Game-Based Learning (IJGBL), 2(2), 1-12.
- 5) Chen, C. W. (2018). *An Innovative Board Game Design Based on Cross-Cultural Communication*. Design and Culture, 10(2), 209-217.
- 6) Chen, N. S., & Hwang, G. J. (2014). *Transforming the classrooms: innovative digital game-based learning designs and applications*. Educational Technology Research and Development, 62(2), 125-128.
- 7) Costales, A. R., Fermalan, A. A., Maraño, A. P., Dorado, J., & Contreras, M. R. (2019). *CUBE (Creating well-equipped students in Understanding Basic mathematical operation to achieve Excellent Mathematical Skills)-Project MDAS*. Ascendens Asia Journal of Multidisciplinary Research Abstracts, 3(2B).
- 8) Deliyianni, E., Gagatsis, A., Elia, I., & Panaoura, A. (2016). *Representational flexibility and problem-solving ability in fraction and decimal number addition: A structural model*. International Journal of Science and Mathematics Education, 14, 397-417.
- 9) Elofsson, J., Gustafson, S., Samuelsson, J., & Träff, U. (2016). *Playing number board games supports 5-year-old children's early mathematical development*. The Journal of Mathematical Behavior, 43, 134-14.
- 10) Golla, E. F., & Reyes, A. G. (2020). *PISA Mathematics Literacy Framework vis-à-vis the Philippine Kto12 Mathematics Curriculum*. Challenges of PISA: The PNU report, 57.
- 11) Kang, Y. P., Liang, J. C., & Chai, Y. C. (2014). *An Innovative Design of Board Game Device*. International Journal of Kansei Information, 5(4), 125-130.
- 12) Karbownik, M. S., Wiktorowska-Owczarek, A., Kowalczyk, E., Kwarta, P., Mokros, Ł., & Pietras, T. (2016). *Board game versus lecture-based seminar in the teaching of pharmacology of antimicrobial drugs—a randomized controlled trial*. FEMS microbiology letters, 363(7).
- 13) Larsson, K. (2016). *Students' understandings of multiplication (Doctoral dissertation, Department of Mathematics and Science Education, Stockholm University)*.
- 14) Lortie-Forgues, H., Tian, J., & Siegler, R. S. (2015). *Why is learning fraction and decimal arithmetic so difficult?*. Developmental Review, 38, 201-221.
- 15) Martins, J., & Mota, L. (2022). "INNOVATIVE BOARD GAME DESIGN IN AN ACADEMIC ENVIRONMENT DURING THE COVID-19 PANDEMIC". In DS 117: Proceedings of the 24th International Conference on Engineering and Product Design Education (E&PDE 2022), London South Bank University in London, UK. 8th-9th September 2022.
- 16) Mullis, I. V., & Martin, M. O. (2017). *TIMSS 2019 Assessment Frameworks*. International Association for the Evaluation of Educational Achievement. Herengracht 487, Amsterdam, 1017 BT, The Netherlands.

Innovative Board Game towards the Basic Mathematical Skills and Social Learning of Grade 5 Learners

- 17) Noda, S., Shirotaki, K., & Nakao, M. (2019). *The effectiveness of intervention with board games: a systematic review*. BioPsychoSocial medicine, 13(1), 1-21.
- 18) Rumjaun, A., & Narod, F. (2020). *Social Learning Theory—Albert Bandura*. Science education in theory and practice: An introductory guide to learning theory, 85-99.
- 19) Rosenthal, T. L., & Zimmerman, B. J. (2014). *Social learning and cognition*. Academic Press.
- 20) Sardone, N. B., & Devlin-Scherer, R. (2016). *Let the (board) games begin: Creative ways to enhance teaching and learning*. The Clearing House: A Journal of Educational Strategies, Issues and Ideas, 89(6), 215-222.
- 21) Sonnenschein, S., Metzger, S. R., Dowling, R., Gay, B., & Simons, C. L. (2016). "Extending an effective classroom-based math board game intervention to preschoolers' homes ". *Journal of Applied Research on Children: Informing Policy for Children at Risk*, 7(2), 1.
- 22) Tobias, S., Fletcher, J. D., & Wind, A. P. (2014). *Game-based learning*. Handbook of research on educational communications and technology, 485-503.
- 23) Velasco, M., & Cabadding, M. (2019). *Utilization of Project KAMATHISS in Improving the Basic Four Fundamental Skills of Grade Four Pupils in Sta. Cruz (Bucal) Elementary School, SY 2017-2018*. Ascendens Asia Journal of Multidisciplinary Research Abstracts, 3(2K).
- 24) Voigt, J. (2013). i In *Theories of mathematical learning* (pp. 33-62). Routledge.
- 25) Wriston, J. M. (2015). "The Importance of a Strong Mathematical Foundation."
- 26) White, K., & McCoy, L.P. (2019)." Effects of Game-Based learning on Attitude and Achievement in Elementary Mathematics ". *Networks: An Online Journal for Teacher Research*, 21 (1), 5.