AN EX-POST FACTO ANALYSIS ON THE BENEFITS OF INSTRUCTIONAL GAMES AND TOUCH MATH APPROACH BASED ON SEVENT GRADERS' PERCEPTIONS

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Abstract

This study primarily aimed to evaluate the benefits of the use of Touch Math and Instructional Games among seventh graders to generate inputs for instructional innovation. An ex post facto research design was used in the study, which investigated relationship among variables when manifestations have already occurred.

Respondents composed of 158 grade seven students of a public school that were organized into four groups with 40 students in two sections and another 39 students in two sections. There was no control group in this study; grade seven students were included except the students who were not attending their classes regularly or have dropped out of school. A researcher made instrument for the Instructional games and Touch Math approaches were used. The mean formula and standard deviation was used to determine the perceived benefits of students in both instructional methods.
Pearson Correlation coefficient r was computed to determine the relationship between the perceived benefits of Touch Math and Instructional Games and Mathematical Performance. Kendall's Tau or Kendall's Coefficient of Concordance was determined to find whether there is a probability that the students ranked the perceived benefits of the two instructional methods, Touch Math and Instructional Games, in the same order.

Results showed that Touch Mathematics approach and Instructional Games approach were seen to have nearly the same benefits based on students' responses. Results also disclosed that there was a significant relationship between the two approaches with their performance. It can then be construed that both math teaching strategies, if practiced, may contribute to the improved performance of students and in developing positive attitude of students toward Mathematics.

It is recommended that Mathematics teachers consider encouraging students to get involved in class activities; immersing students in hands-on Tasks with special focus on low performing ones and getting from them immediate feedback on classwork to address promptly their emerging needs.

Keywords: Instructional games, touch mathematics, mathematical perceptions, ex-post facto

INTRODUCTION

Mathematics is a series of challenges and hurdles, which for some students, it is faced with passion and determination. While for others, it is a daily experience of continued failures and irrelevance. As the community experiences rapid societal and environmental changes, basic mathematical knowledge is one of the keys which will give students the flexibility they need in order to adapt to this changing society.

It has been a belief that Mathematics is a difficult subject. This negative impression influences the students' appreciation and desire to learn the subject. While it is true that mathematical concepts and principles are not easily learned, much difficulty is expected in a learner who considers Mathematics a burden to his studies and feels a dislike for it. Thus, the teacher's primary concern in teaching Mathematics is to develop the learner's appreciation of the subject (Seras, 2009).

Good academic performance is very important not only to students and their parents, but also to institutions of learning. The quality of students' academic performance is influenced by a wide range of different factors not just teacher factors and psychological factors within the learners, but anxiety which are increasingly being seen as factors underpinning levels of motivation for academic performance (Kumar & Karimi, 2010).

As discussed by Belenky and Notes (2009), the academe believes that when students use hands-on they learn to solve problems. Others feel manipulative are a way of allowing the students additional play time in the classroom and are not thought of as teaching tools according to Moyer (2001).

While Schunk, Pintrich and Meece (2008) stated that students that are interested in an activity are more likely to be motivated to choose and persist at the activity. Researchers believed that concepts and ideas actively enjoyed by students will be comprehended more than those activities that are less enjoyable and fun. Manipulative are materials that are used to assist students' mathematical learning in more meaningful ways (Stein & Bovalino, 2001). Such concrete materials aid students from primary up to the tertiary level of education in terms of understanding mathematical processes, expressing their mathematical thinking, and developing their ideas toward higher order thinking levels.

Learning with manipulatives helps students build procedural fluency by increasing the level of engagement when using concrete materials in the future (Belenky & Nokes, 2009).

Reimer and Moyer (2005) found out that all students demonstrated significant improvement in fraction understanding after using virtual manipulatives that included dynamic visuals of fraction amounts.

In addition, both teachers and students are encouraged to employ multiple representations during mathematical instruction by the National Council for Teachers of

Mathematics (NCTM, 2000) and Principles and Standards for School Mathematics (PSSM). The PSSM stated that all students should "create and use representations to organize, record, and communicate mathematical ideas; select, apply, and translate among mathematical representations to solve problems; use representations to model and interpret physical, social, and mathematical phenomena" (p. 67).

Accordingly, "Math interventions, in comparison to the reading intervention, are quite uncommon for young learners (Jordan, 2007, p. 64). Generally speaking, teachers possess the skills and knowledge in bringing about meaningful and need-specific instruction in all aspects of reading but they seem to be less creative in the instruction of Mathematics.

Janet Bullock formulated the Touch math program, which is based on the study of Jean Piaget and Jerome Bruner in 1995. Bullock used Piaget and Bruner's suggestions in following a predicted set of stages in learning concepts. These stages include concrete, pictorial, and symbolic. Before the development of this program, Bullock found that many students were having difficulty comprehending mathematical concepts.

As such, these students were very much in need of an intervention for them to increase not only their skills in Mathematics but also their confidence in the said subject (Bullock, 2009). She then started experimenting with the few students who were struggling in mathematics by putting counting points in numbers. She began to see improvements with her students shortly after the intervention was done. These mathematically challenged students were starting to shift from concrete to symbolic learning.

The ideas developed by Piaget and Bruner were utilized by Bullock when she used manipulatives. It shows that students benefits from it through gaining an understanding of the four basic arithmetic functions being taught. This intervention bears much similarity to enactive stage developed by Bruner and preoperational stage of intelligence founded by Piaget.

In the same manner, students who think that they have no mathematical skills will definitely evade the subject (Wadlington & Wadlington, 2008). These characteristics and circumstances brought them to the belief that these struggling learners will obtain a higher success in Math through the help of multi-sensory approach in math instructions.

The Touch Math program provides strategies that involve the different senses of the body thus fitting perfectly under a multi-sensory approach. Degeorge and Santoro (2004) believe that students benefit from hands-on instructions since it transcends traditional approach.

The use of manipulation is also important in classroom instruction (Kerekes, 2006). Kerekes cites his personal experience as a classroom teacher to further prove the effectiveness of using manipulative in the classroom. In addition, she provides various hands on activities that teachers can adapt and use to enable students in becoming literate in Mathematics.

More so, Stein and Bovalino (2001) addressed the impact on the use of manipulatives on many students: "manipulatives can be important tools in helping students to think and reason in more meaningful ways" (p. 356).

Conversely, instructional games promote mastery, automaticity (fluency) and/or skill maintenance. Giving instructions through game formats motivates learners and finds lessons fun, thus getting a higher percentage of students' participation. Data gathered on student performance provides avenue for evaluation and planning for future instruction and future practice.

The literature indicates strongly the educational value of using games within mathematics education (e.g., Jonker & van Galen, 2004).

Based on research, using educational or instructional games in classroom is an effective way to promote the attitudes or perception of student toward mathematics (e.g., Squire, 2005; Young-Loveridge, 2005; Ke, 2008).

With the use of educational games, children can build valuable skills such as strategic thinking, planning, communication, application of numbers, negotiating skills, group decision-making and data-handling (Kirriemuir & McFarlane, 2004; Pratt et al., 2009).

Majority of the students who participated in the study initially tended to focus almost solely on the playfulness of games, and they have now come to recognize the need for educational games to combine playfulness with instructional soundness (McDaniel & Telep, 2009).

Schrand (2008) explains the immense potential of interactive multimedia games or activities. In this type of game, students work together as a group in categorizing chart information by means of moving facts and placing them in the appropriate labeled columns. Games that bring out these higher level thinking skills are becoming more popular. However, they require more research and scientific assessment to measure and verify their effectiveness as a whole because they are relatively new. If an Instructional game or activity is designed well, regardless of the game format learners can develop their skill in problem solving while enjoying and having fun throughout the process (Mackenty, 2006, Harries, 2009).

Moreover, Van Eck (2006) and various researchers have discovered that instructional games promote learning and lessen the teaching time not only in Mathematics but also in different subjects and with students of different age.

Recently, there has been increased interest in the use of instructional games. It has been argued that young people, raised playing video games, have changed in ways that turn them off to conventional instruction (Prensky, 2001, p. 01-6).

Due to the active learning factor found in each, both game formats show benefits on learning (MacKenty, 2006, Schrand, 2008).

Games have been widely used to promote children's mathematics achievement in various domains including problem-solving and algebra skills (Abramovich, 2010).

Kebritchi (2010) on the other hand, express the concern toward games. These have become tools that are very innovative and may lead teachers into thinking that they do not need to lecture and instead they may "rely on the game and use it as a teaching replacement and not as a supplement" (p. 263). Teacher must remember that games are only supplement teaching tools and they themselves definitely need to actively facilitate and guide the students for them to be truly effective instructors or educators.

Regardless of the format of the game, students can simultaneously build their problem solving skills while having fun throughout the process if an instructional game is well-designed (MacKenty, 2006, Harris, 2009).

Figure 1 shows the paradigm of the study. The conceptual framework of this study was used to focus on the perceived benefits of two strategies based on the perceptions of the Grade Seven Students for the School Year 2016-2017.

This study was anchored on the concepts Stein and Bovalino (2001) addressed the impact in the use of manipulatives on many students: "manipulatives can be important tools in helping students to think and reason in more meaningful ways" (p. 356).

Schrand (2008) explains the immense potential of interactive multimedia games or activities. In this type of game, students work together as a group in categorizing chart information by means of moving facts and placing them in the appropriate labeled columns. Games that bring out these higher level thinking skills are becoming more popular.

There was strong evidence that Touch Math and Instructional Games do have potential to enhance student's learning of Mathematics (Simson et. Al, 2006).

Harris (2009) cited that the collaboration of Touch Math and Instructional Games approach in the teaching process will have benefits to their mathematical performance.

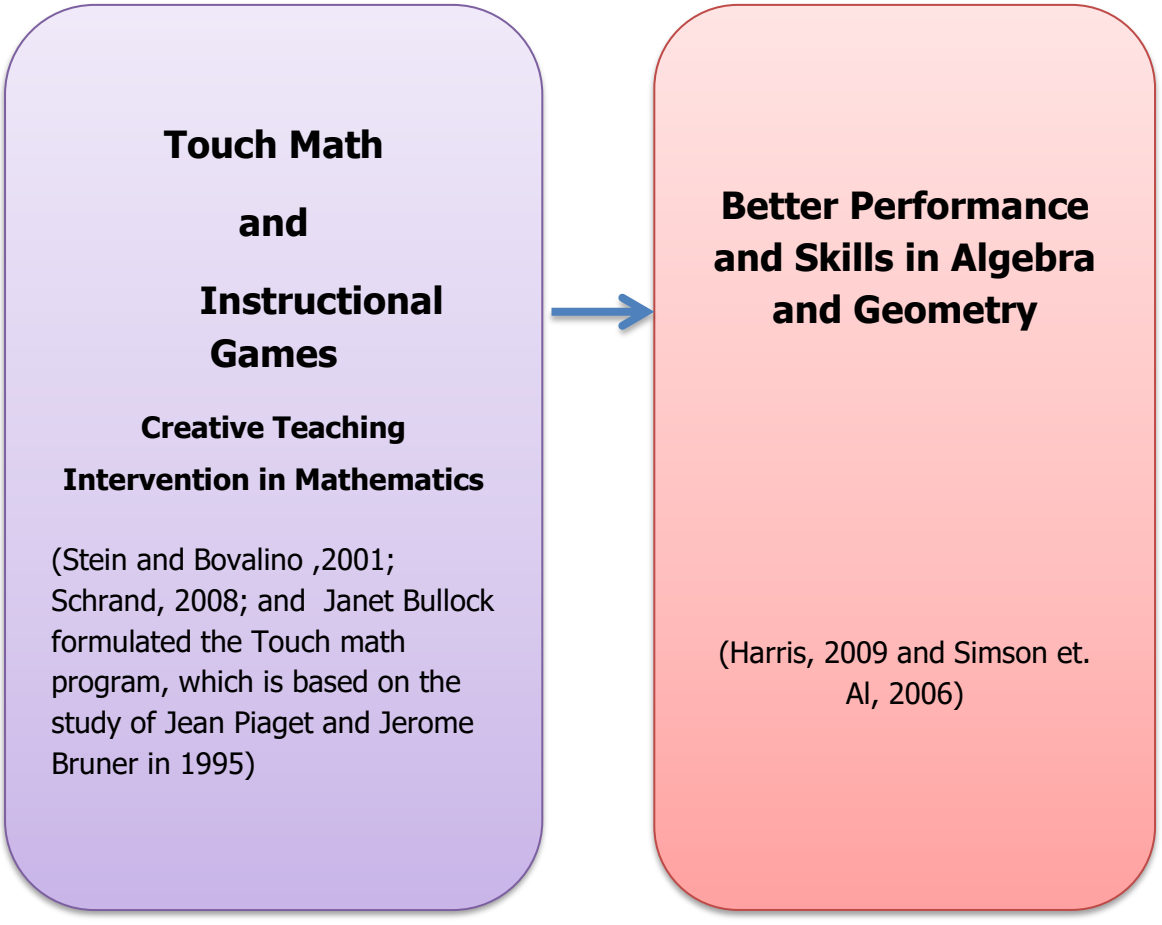

Figure 1: Paradigm of Study

This study primarily aimed to determine the perceptions of the students on the benefits of the use of Touch Math and Instructional Games among seventh graders in order to generate inputs for instructional innovation.

The specific objectives are: (1) describe how seventh graders perceive the benefits they get in the use of Touch Math and Instructional Games; (2) determine the relationship between the seventh graders perceived benefits in the use Touch Math and Instructional Games approach; and (3) determine the relationship between the perceived benefits of Touch Math and Instructional Games and Mathematical Performance.

METHOD

This study adopted an ex post facto research design, which investigates relationship among variables when manifestations have already occurred. This looked into the statistical relationship between the two approaches and mathematics performance (Kendra, 2008).

In conducting a social research where manipulation of characteristics of human participation is impossible or unacceptable, the ideal design for this type research is ex post facto.

Ex post Facto means after the fact. This was method used in this study to investigate the past event since the touch math and instructional games approach already existed for two consecutive quarters. Collecting of the was done data a using rating scale to determine the perceived benefits of the seventh graders students learning experiences from the two approaches.

Kerlinger and Rint (1986) explained that in the context of social science research an ex post facto investigation seeks to reveal possible relationships of observing an existing condition or state of affairs and searching back in time for plausible contributing factors.

Cohen, Manion and Morison (2000) noted that instead of taking groups that are equivalent and subjecting them to different treatments to determine differences in the dependent variables, an ex post facto experiment was implemented which begins with groups that are already different in some respect and searches in retrospect for factors that brought about the differences.

This study attempted to discover whether differences between groups have resulted in an observed difference in the independent variable.

To attain the objectives of the study, ex post facto method in analyzing the data was used. This method includes the use of researcher-made questionnaire and data analysis. This study was conducted to the total of 158 Grade Seven students in Telesforo and Natividad Alfonso High School composing of four (4) sections.

There was no control group in this study, rather all grade seven included in the study were considered as respondents since the main purpose is to determine the benefits of the two approaches.

All students who were not attending their class regularly or drop-outs were not considered as respondents of the study.

Names of the respondents were withheld and instead respondents were assigned corresponding numbers arranged in an order for reason of confidentiality. The list of the respondents' names was requested from the advisers of each section.

The main tool used in the study was a researcher-made instrument to determine the perceptions of the students on the benefits derived from using the two approaches namely Touch Math and Instructional Games.

The instrument was content validated by the experts in the field of education and Mathematics. After validation, the 25 item questionnaire had been reduced to 20 items. Solicited comments and suggestions to improve the questionnaire have been upheld and treated carefully.

The succeeding procedure was followed in order to generate the necessary data needed in this study. Permission from the Principal was requested to conduct the research. Then, teaching using Instructional Games and Touch Math was undertaken for the two grading periods. After the instruction, questionnaire was administered to the students determine their perceived benefits about the instruction. Lastly, data were tabulated, processed, and analyzed. The second and third grading math grades of the students as well as the results served as the bases for the analysis.

The following statistical tools were used to analyze and interpret the quantitative data gathered from the study: The Mean formula and Standard Deviation was used to summarize and describe the perceived benefits of students in both Touch Math and Instructional Games.Pearson Correlation coefficient *r* was computed in order to determine relationship between the perceived benefits of Touch Math and Instructional Games and Mathematical Performance. Kendall's Tau or Kendall's Coefficient of Concordance was computed to determine if the students ranked the perceived benefits of the two instructional methods, Touch math and Instructional games, in the same order.

In order to determine the respondents' perceived benefits, the following arbitrary scale was adopted:

Numerical Rating	Descriptive Rating
3.51 – 4.00	Very Highly Beneficial
2.5 1- 3.50	Highly Beneficial
1.51 - 2.50	Moderately Beneficial
1.00 - 1.50	Least Beneficial

The interpretation on the test results on mathematical performance were organized, tabulated, and interpreted, (David, 2007) using the following arbitrary scale.

Raw Scores	**Descriptive Rating**
92.50-100.00	----------Outstanding
84.50-92.49	----------Very Satisfactory (S)
76.50-84.49	---------- Satisfactory

68.50-76.49 ----------Fair Satisfactory
60.00-68.49 ----------Did not meet the Expectation

RESULTS

Perceived Benefits of Seventh Graders in the Use of Touch Mathematics Approach

Table 1 presents the perceived benefits of the seventh graders using the Touch Mathematics approach in the teaching and learning process. The respondents' responses ranged from 3.25 to 3.58.

Based on the results, the three highest ranked means were as follows: Exciting despite challenging; Feeling fulfilment; and, Better interaction with classmates and peers. While the three lowest means were as follow: Understanding of Math content regardless of difficulty; Easing of learning; and, Fulfillment in solving difficult problems.

The grand mean of the respondents' responses was 3.41 with standard deviation of 0.20 which fell under the descriptive rating "Very Highly Beneficial".

Table 1

Perceived benefits of seventh graders in the use of touch mathematics approach according to rank

Perceived Benefits	Mean	Mean Rank	SD	Verbal Description
1. Feeling of fulfilment.	3.58	1.5	0.57	Highly Beneficial
2. Exciting despite the challenges.	3.58	1.5	0.54	Highly Beneficial
3. Better interaction with classmates and peers.	3.54	3	0.50	Highly Beneficial
4. More willing to participate.	3.53	4	0.52	Highly Beneficial
5. Activity facilitation.	3.48	5	0.58	Very Highly Beneficial
6. Motivation to solve problems.	3.44	7	0.54	Very Highly Beneficial
7. Motivation to analyse error or mistakes.	3.44	7	0.60	Very Highly Beneficial
8. Connection of experiences.	3.44	7	0.63	Very Highly Beneficial
9. Understanding the content.	3.43	9	0.59	Very Highly Beneficial
10. Asking questions without hesitation.	3.39	10	0.07	Very Highly Beneficial

11. Completion of assignment and homework.	3.37	12	0.57	Very Highly Beneficial
12. Better understanding of Math concepts.	3.37	12	0.59	Very Highly Beneficial
13. Ability to explain concepts.	3.37	12	0.61	Very Highly Beneficial
14. Connection of Math concepts.	3.35	14	0.54	Very Highly Beneficial
15. Stimulation of Math thinking.	3.34	15.5	0.57	Very Highly Beneficial
16. Confidence in using Math.	3.34	15.5	0.61	Very Highly Beneficial
17. Confidence in Math test.	3.32	17.5	0.57	Very Highly Beneficial
18. Understanding of Math content regardless of difficulty.	3.32	17.5	0.64	Very Highly Beneficial
19. Easing of learning.	3.28	19	0.61	Very Highly Beneficial
20. Fulfillment in solving difficult problems.	3.25	20	0.61	Very Highly Beneficial
Grand Mean	**3.41**		**0.20**	**Very Highly Benefits**

Perceived Benefits of Seventh Graders in the Use of Instructional Games Approach

The perceived benefits of the seventh graders when it comes to the use of instructional games approach in the teaching and learning process were presented in Table 2. The respondents' perception ranged from 3.27 to 3.72.

Based on the results, the three highest ranked means were as follows: Understanding the content; Exciting yet challenging; and, Feeling of fulfilment.
While the three lowest means were as follows: Confidence in using Math; Easing of learning; and, Connection of Math concepts.

The grand mean of the respondents' responses was 3.44 with standard deviation of 0.25 which fell under the descriptive rating "Very Highly Beneficial".

Table 2
Perceived benefits of seventh graders in the use of instructional games approach according to rank

Perceived Benefits	Mean	Mean Rank	SD	Verbal Description

1. Understanding the content.	3.72	1	0.40	Highly Beneficial
2. Exciting despite the challenges.	3.60	2	0.54	Highly Beneficial
3. Feeling of fulfilment to got passing score.	3.56	3	0.57	Highly Beneficial
4. Activity facilitation.	3.50	4	0.55	Very Highly Beneficial
5. More willing to participate.	3.49	5	0.55	Very Highly Beneficial
6 Connection of experiences.	3.47	6.5	0.59	Very Highly Beneficial
7. Better interaction with classmates and peers.	3.47	6.5	0.54	Very Highly Beneficial
8. Ability to explain concepts.	3.46	8.5	0.60	Very Highly Beneficial
9. Stimulation of Math thinking.	3.46	8.5	0.55	Very Highly Beneficial
10. Motivation to analyse error or mistakes.	3.43	10	0.60	Very Highly Beneficial
11. Better understanding of Math concepts.	3.41	11.5	0.56	Very Highly Beneficial
12. Understanding of Math content regardless of difficulty.	3.41	11.5	0.53	Very Highly Beneficial
13. Confidence in Math test.	3.39	13.5	0.51	Very Highly Beneficial
14. Motivation to solve problems.	3.39	13.5	0.53	Very Highly Beneficial
15. Fulfillment in solving difficult problems.	3.37	15.5	0.53	Very Highly Beneficial
16 Completion of assignment and homework.	3.37	15.5	0.56	Very Highly Beneficial
17. Asking questions without hesitation	3.36	17	0.64	Very Highly Beneficial
18. Confidence in using Math.	3.35	18	0.68	Very Highly Beneficial
19. Easing of learning.	3.31	19	0.60	Very Highly Beneficial
20. Connection of Math concepts.	3.27	20	0.57	Very Highly Beneficial
Grand Mean	**3.44**		**0.25**	**Very Highly Beneficial**

Relationship between the Seventh Graders' Perceived Benefits in the Use of Touch Mathematics and Instructional Games Approach

Table 3 shows that students' perceptions on the level of benefits of using Touch math and Instructional Games differ based on the Kendall's rank coefficient of 0.546 and p-value of 0.001. This implies the students ranked perceived benefits differently. For the Touch Math ,"Feeling of Fulfillment" and " Exciting despite the challenges" first, while in Instructional Games "Understanding the Content" was ranked first.

Table 3
Comparison on the Perceived Benefits between Touch Math and Instructional Games

Perceived Benefits		TOUCH MATH		Instructional Games		Kendall's Tau
		Mean Rank	Overall Rank	Mean Rank	Overall Rank	
1.	Understanding of Math content regardless of difficulty.	3.32	17.5	3.41	11.5	Kendall's tau= .546** p-value= 0.001 (significant at the 0.01 level)
2.	Confidence in Math tests.	3.32	17.5	3.39	13.5	
3.	Connection of experiences.	3.44	7.0	3.47	6.5	
4.	Ability to explain concepts.	3.37	12.0	3.46	8.5	
5.	Connection of concepts.	3.35	14.0	3.27	20.0	
6.	Motivation to analyse error or mistakes.	3.44	7.0	3.43	10.0	
7.	Feeling of fulfilment.	3.58	1.5	3.56	3.0	
8.	Stimulation of Math thinking.	3.34	15.5	3.46	8.5	
9.	Motivation to solve problems.	3.44	7.0	3.39	13.5	
10.	Activity facilitation.	3.48	5.0	3.50	4.0	
11.	Understanding the content.	3.43	9.0	3.72	1.0	
12.	Fulfillment in solving difficult problems.	3.25	20.0	3.37	15.5	
13.	Exciting despite the challenges.	3.58	1.5	3.60	2.0	
14.	More willing to participate.	3.53	4.0	3.49	5.0	
15.	Ease of learning.	3.28	19.0	3.31	19.0	

16.	Completion of assignments and homework.	3.37	12.0	3.37	15.5	
17.	Confidence in using Math.	3.34	15.5	3.35	18.0	
18.	Better understanding of Math concepts.	3.37	12.0	3.41	17	
19.	Better interaction with classmates and peers.	3.54	3.0	3.47	6.5	
20.	Asking questions without hesitation.	3.39	10.0	3.36	17	

Correlation between Academic Performance as to the Touch Math and Instructional Games' Perceived Benefits

Shown in Table 4 the Pearson correlation coefficient of 0.221 is significant at the 0.05 level. This implies that there is low positive linear relationship between perceived benefits of Touch Math and performance in Math.

The coefficient of determination (r^2) of 0.049 or 4.9% further indicates that 4.9% of the students' performance in Math can be attributed to the variations on the perceived benefits of Touch Math. Other factors account for 95.1% of the variations in the performance in Math.

The Pearson correlation coefficient of 0.186 is significant at the 0.01 level. This implies that there is low positive linear relationship between perceived benefits of instructional games and performance in Math.

The coefficient of determination (r^2) of 0.035 or 3.5% further indicates that 3.5% of the students' performance in Math can be attributed to the variations on the perceived benefits of instructional games. Other factors account for 96.5% of the variations in the performance in Math.

Table 4

Pearson coefficients of correlation (r) between performance in mathematics performance and perceived benefits of touch math and perceived benefits of instructional games.

Bivariate	R	Interpretation	r^2	Interpretation
Perceived Benefits of Touch Math and Performance in Math	.221 *	Low correlation	.049	Variations on the perceived benefits of using Touch Math account for 4.9% of the variations in the Math performance.

Perceived benefits of Instructional Games and Performance in Math	.186*	Low Correlation	.035	Variations on the perceived benefits of using Instructional games account for 3.5% of the variations in the performance in Math.

Note: * *-significant at the 0.05 level*
** *- significant at the 0.01 level*

DISCUSSION

Mathematics is a complex collection of skills, concepts, and ideas which when acquired is endeavored to be passed on to the next generation.

It has been a belief that Mathematics is a difficult subject. This negative impression influences the students' appreciation and desire to learn the subject. While it is true that mathematical concepts and principles are not easily learned, much difficulty is expected in a learner who considers Mathematics a burden to his studies and feels a dislike for it. Thus, the teacher's primary concern in teaching Mathematics is to develop the learner's appreciation of the subject (Seras, 2009).

Based on different studies, there are a lot of reasons that may contribute to this thinking. Either they are afraid to be embarrassed, have a hard time computing problems, do not master the basic operations, afraid to approach the teacher, lack of self-confidence or sometimes it is because of the teacher's method of teaching.

Teachers should be open–minded to look into the needs and interests of every student and not focus on only one aspect of learning. We should be able to bring out the best in every student because they have individual differences not just only in Mathematics but also in various subjects.

Berger (2001) stated that achievement test is designed to measure how much a students has accomplished or learned in a specific subject area. It reveals not only what students have learned, but also their weaknesses in specific skills or subject areas. In several states, achievement tests are used to determine whether students will be promoted for the next grade level. They are sometimes used to group students so that the poorest achievers are in one class and the better achievers in another. In addition, achievement test scores of group of students are used by the administrators to evaluate how individual teachers in a school system are doing.

Hyde (2008) suggested that if the teachers are gearing instruction toward these assessments, the performance of both boys and girls in complex problem solving, leaving them ill-prepared for careers in Math, Science, and Engineering.

According to Canonizado (2009), students learn Mathematics through the experiences that teachers provide.

Teachers must know and understand deeply the Mathematics they are teaching, understand and be committed to their students as learners of Mathematics and human beings.

This evidence was seen during the first quarter. The students were less interested, had difficulty in understanding the lesson, afraid of raising their hands, and failed in their assignments and examinations. The use of traditional methods and multimedia were observed not effective in keeping students focused.

In the present study, Touch Math and Instructional Games were used in the instruction and the benefits were determined based on the perception of the grade seven students.

Janet Bullock formulated the Touch Math program, which is based on the study of Jean Piaget and Jerome Bruner, in 1995. Bullock used Piaget and Bruner's suggestions in following a predicted set of stages in learning concepts. These stages include concrete, pictorial, and symbolic. Before the development of this program, Bullock found that many students were having difficulty comprehending mathematical concepts.

As such, these students were very much in need of an intervention for them to increase not only their skills in Mathematics but also their confidence in the said subject (Bullock, 2009). She then started experimenting with the few students who were struggling in mathematics by putting counting points in numbers. She began to see improvements with her students shortly after the intervention was done. These mathematically challenged students were starting to shift from concrete to symbolic learning.

The ideas developed by Piaget and Bruner were utilized by Bullock when she used manipulatives. It shows that students benefit from it through gaining an understanding of the four basic arithmetic functions being taught. This intervention bears much similarity to enactive stage developed by Bruner and preoperational stage of intelligence founded by Piaget.

Instructional Games were being given to motivate the students to participate during the discussion, share their insight, develop their cooperation and make Math lesson fun.

Instructional games, on the other hand, provide many response opportunities promoting mastery, automaticity (fluency), and/or skill maintenance. Game format motivates students. Modeling of skill in isolation and in context provides memory retrieval assistance and skill generalization. Teacher support, modeling, and use of positive reinforcement facilitate student's willingness to take "learning risks". Data gathered on student performance provides avenue for evaluation and planning for future instruction and future practice.

Tom Schrand (2008) discusses the powerful capabilities of interactive multimedia games (or activities) where students work together as a class to categorize information in charts by moving facts so they rest in the appropriate labeled columns (p.81). Games that bring out these higher level thinking skills are becoming more popular, although more research and scientific assessment is necessary to measure their overall effectiveness since they are still relatively new. Regardless of the format of the game, students can simultaneously build their problem solving skills while having fun throughout the process if an instructional game is well-designed (MacKenty, 2006, Harris, 2009).

Goodrum, Hackling, and Ronnie (2001) states that the majority of students view the teaching of mathematics as unappealing, outdated, and not connected with their interest and experiences.

The literature indicates strongly the educational value of using games within mathematics education (e.g., Jonker & van Galen, 2004).

Research suggests that use of educational games is an effective means of improving students' attitudes towards mathematics. It has been shown that educational games attract and gain students' attention, contributing to their increased motivation and engagement with mathematics (e.g., Squire, 2005; Young-Loveridge, 2005; Ke, 2008).

There was strong evidence that appropriately designed educational games do have the potential to enhance children's learning of mathematics (e.g., Bragg, 2007; McGivern et al., 2007; Simpson et al, 2006).

Through the use of educational games, children can build valuable skills such as strategic thinking, planning, communication, the application of numbers, negotiating skills, group decision-making and data-handling (Kirriemuir & McFarlane, 2004; Pratt et al., 2009).

Ex post was method used in this study to investigate the past event since the touch math and instructional games approach already existed for two consecutive quarters. Collecting of the was done data a using researcher-made questionnaire to determine the perceived benefits of the seventh graders students learning experiences from the two approaches.

Since this study sought to explore the benefits of Touch Math and Instructional Games, it was determined that an ex post facto study was the most appropriate research design to be used in order to answer the research questions and to test the hypotheses. Ex post facto research, by its very design, investigates "the world as it naturally occurs" and explores phenomena that have already occurred (Johnson & Christensen, 2008, p. 257).

According to Newman et al. (2006), there are three types of ex post facto research. The first design uses no hypothesis and generally considered the weakest of the three. Another ex post facto design included the testing of hypotheses and has a slightly more scientific value. The third type of ex post facto research design includes the test of hypotheses along with the test for alternative hypotheses and is "considerably more powerful in terms of internal validity" (Newman, et al., 2006, p. 101).

Ary et al. (2010) noted that an ex post facto research design is useful when one wants to investigate the relationship between the dependent and independent variables when randomization or manipulation of the independent variable is not possible. While both an experimental and ex post facto design test relationships between variables and test hypotheses, the ex post facto design does not provide adequate safeguards; consequently, less evidence exists to infer a causal relationship (Ary et al., 2010). Despite these limitations, ex post facto research contributes valuable information to the field of education and other social sciences specifically in Mathematics.

The results of the study, the grand mean of the respondents' responses in Touch Math approach interpret under the descriptive rating "Very Highly Beneficials", the same results as students' perceived benefits in Instructional Games. This implies that Touch Math and Instructional Games approach were perceived to be beneficial for the students.

Based on the results, the three highest ranked mean were as follows: Exciting despite challenging; Feeling fulfilment; and, Better interaction with classmates and peers. While the three lowest ranked means were as follow: Understanding of Math content regardless of difficulty; Easing of learning; and, Fulfillment in solving difficult problems.

The perceived benefits of the seventh graders when it comes to the use of instructional games approach in the teaching and learning process were presented

The respondents' responses ranged from 3.27 to 3.72. Based on the results, the three highest ranked means were as follows: Understanding the content; Exciting yet challenging; and, Feeling of fulfilment.

While the three lowest ranked means were as follows: Confidence in using Math; Easing of learning; and, Connection of Math concepts.

When it comes to the relationship between the seventh graders' perceived benefits in the use of Touch Math and Instructional Games approach, it was found significant which means that both approaches were perceived to have differed ranked mean benefits for the students.

Lastly, as for the correlation of Touch Math and Instructional Games to the second grading and third grading Math grades of the students, the study revealed that both approaches were positively correlated which suggests that the perception and experience of

the students on the two approaches have direct relationship to the grades they get in Mathematics.

Harris (2009) corroborates the result of that the benefits of students from Touch Math and Instructional Games were related to the academic performance.

For the five highest ranked mean results for perceived benefits Touch Math and Instructional Games with the support of the documentation for their activities were as follows:

The two highest means rank bearing the same score of 3.58 with the verbal description of "Highly Beneficial" are "Fulfillment of students when they got a passing scores in Math test" and "Math lesson became more exciting even if it was challenging".

Students had a better understanding of the basic Mathematical concepts which helped developed their confidence in solving math problems. As a result, the student passed the test.

Mathematics is considered by many students as difficult, but this subject should not take away students' interest in learning it. Touch Math approach enabled students to find different strategies to solve mathematical problems as well as their computational fluency. This approach also opened opportunities for students to deepen their understanding and reasoning of mathematical concepts. Through Touch Math, students learned Mathematics in a fun and meaningful way.

The third highest ranked mean with numerical rating of 3.54 under the description of "Highly Beneficial" is when "students could interact with their classmates better".

Students had the opportunity to discuss mathematical concepts with one another through group work and class presentation.

The fouth highest ranked mean is when students were willing to "participate in learning math lessons" with a score of 3.50 and the verbal description of "Highly Beneficial".

Students became more engaged and participated better in the discussion. Students were afraid of reciting at first, however, because of the new strategy introduced to them, the class participation increased. Students also learned enhance their understanding of certain topic through the help of Touch Math.

Then, the fifth highest ranked mean is "when student participate in different Math activities" very easily with a rate of 3.48 and bears "Very Highly Beneficial" verbal description.

Through the use of Touch Math, the students were able to create different manipulatives like puzzles and models. As a result, they became more interest to solve and analyze mathematical problems to get the right answer or uncover the correct pattern.

On the other hand, the five highest ranked mean of Perceived Benefits in the use of Instructional Games are with a rating of 3.72 with the verbal description of "Highly Beneficial" is when students felt "fulfilled in understanding the content of the lesson".

An instructional game was used to increase student interest and sustain engagement in the discussion instead of teaching methods that only require students to memorize mathematical procedures.

The second highest ranked mean when the "math lesson became more exciting even if it was challenging" with the rating of 3.60 and interpreted as "Highly Beneficial".

Learner-centered instructional games were employed to make learning fun and exciting, making it easier for students to master the important math skills and concepts.

The "fulfillment of students when they got a passing score "in class with the total score of 3.56, interpreted as "Highly Beneficial".

Instructional games incorporated into the discussion revealed the enthusiasm, excitement, engagement and enjoyment of the students. They were highly motivated and totally involved in playing math games, which led to their sense of fulfillment and increased positive attitude towards Mathematics.

The rating of "participation of students in the different Math activities "with the result of 3.50 ad with the verbal description of "Very Highly Beneficial".

Playing games related to Mathematics made it easier for students to participate in the discussion. Active involvement of the students was evident in the teaching- learning process.

The fifth highest ranked mean is when the students having being more willing to "participate in learning math lesson" obtained a rating of 3.49 with the verbal description of "Very Highly Beneficial".

Instructional Games provided opportunities for students to work in small groups and practice teamworks. Through this intervention, students learned to cooperate and to communicate effectively with their classmates. Their willingness to participate in different activities increased

Teaching and learning mathematics is complex. Hence, in this study, the teacher reflects that there is no best teaching method or strategy because students have

different level of intelligence, personalities, and learning style that enable them to learn in different ways. For instance some students learned more through the traditional way, some through manipulative, some through games, and some through osmosis.

An effective and efficient Math teacher is a teacher who can adjust his or her teaching strategies for the needs and interest of his/her students.

The results of this study provided information that could practically be applied in the Mathematics education setting. Based on the results, discussion, and conclusion, the following recommendations are hereby provided: (a) Mathematics teachers should encourage students to get involved in various activities., (b) teachers should provide low performing students hands-on activities and immediate feedback on classwork so that students will be made aware of their progress; and (c) teachers or future researchers may undertake a study which includes the profile of the respondents or the individual performance of the respondents using the two proposed approaches.

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